COTTAGE GROVE PLANNING COMMISSION

October 27, 2025

12800 RAVINE PARKWAY SOUTH
COTTAGE GROVE, MN 55016

COUNCIL CHAMBER - 7:00 PM

1 Call to Order

2 Roll Call

3 Approval of the Agenda

4 Open Forum

5 Chair's Explanation of the Hearing Process

6 Public Hearing and Applications

- A Capital Improvement Program 2026-2030 - Case CP2025-027
  Discussion: The City of Cottage Grove has applied for a comprehensive plan amendment to amend the Capital Improvement Program (CIP) for 2026-2030.

7 Presentations

- A Draft 2025 East Ravine Alternative Urban Areawide Review (AUAR)

8 Approval of Minutes

- A Planning Commission Meeting - September 22, 2025

9 Reports

- A Recap of October 1 and October 15, 2025, City Council Meetings
- B Response to Planning Commission Inquiries
- C Planning Commission Requests

10 Adjournment

STAFF REPORT CASE: CP2025-027

ITEM: 6.1

PUBLIC MEETING DATE: 10/27/25 TENTATIVE COUNCIL REVIEW DATE: 11/19/25

APPLICATION

APPLICANT: City of Cottage Grove

REQUEST: A comprehensive plan amendment to amend the Capital Improvement Program (CIP) 2026-2030.

SITE DATA

LOCATION: N/A

ZONING: N/A

GUIDED LAND USE: N/A

LAND USE OF ADJACENT PROPERTIES:	CURRENT	GUIDED
NORTH:		
EAST:	N/A	
SOUTH:		
WEST:		

SIZE: N/A

DENSITY: N/A

RECOMMENDATION

Approval.

COTTAGE GROVE PLANNING DIVISION

Staff Contact: Brenda Malinowski, Finance Director; 651-458-2832; bmalinowski@cottagegrovemn.gov

Application Accepted: N/A 60-Day Review Deadline: N/A

Planning Staff Report
CIP 2026-2030 – Case No. CP2025-027
October 27, 2025

Proposal

On an annual basis, the city updates its five-year Capital Improvement Plan (CIP). In addition to its being a guide for capital spending decisions, the CIP is an element of the City's Comprehensive Plan. For this reason, the annual update of the CIP is an amendment to the Comprehensive Plan, which requires a public hearing by the Planning Commission.

Overview of CIP

The CIP is a planning document intended to provide an estimate of capital needs and funding. Projects included in the plan must be authorized by the City Council to proceed to construction.

Capital improvements include land acquisition and construction of public buildings, parks, streets, and utilities. A capital improvement is defined as any expenditure greater than $15,000 with a useful life of five years or more. The CIP lists planned capital improvements for the years 2026 through 2030. The CIP also identifies funding sources for each project.

For the 2026-2030 period, a total of $386.9 Million in capital projects are planned. One goal of the CIP process is to balance the amount of capital spending on an annual basis. This creates a more predictable demand on staff resources and creates consistency in capital funding.

In most CIP's, the first two years serve as a work plan of projects ready to be implemented. Based on financial happenings with the economy, the City may at its discretion choose to delay or postpone projects to adjust to current conditions.

A Ten-Year Financial Management Plan (FMP) was completed in 2023. The Plan strategically incorporated the projects included in this CIP document that require debt issuance with future operating budgets, equipment replacement needs, and growth in the community. With the use of the FMP, the goal is to not have significant tax impact swings from year to year. The projects identified in this CIP that will have debt issuance for the next two years are within the parameters of the FMP.

Project Summary

The summary document of the CIP is attached.

Recommendation

That the Planning Commission find that the 2026-2030 Capital Improvement Plan is consistent with the City's Comprehensive Plan and recommend that the City Council approve the document.

Prepared by:

Brenda Malinowski
Finance Director

Attachment:
2026-2030 CIP

Cottage Grove

Where Pride and Prosperity Meet









Capital Improvement Plan

2026 – 2030

CITY OF COTTAGE GROVE, MN

ENGINEERING AND FINANCE DEPARTMENT

12800 Ravine Parkway S, Cottage Grove, MN 55016 | 651-458-2800 | CottageGroveMN.gov

City of Cottage Grove

Capital Improvements Plan

2026-2030

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City of Cottage Grove
Capital Improvements Plan
2026-2030

Introduction

The Capital Improvement Plan (CIP) is a planning device to schedule proposed public capital improvements and purchases over a five-year period. The CIP matches proposed expenditures and revenues by project. A capital improvement is defined as a capital expenditure that is greater than $15,000 with a life expectancy of five years or longer. Capital improvements are projects, which require acquisition, construction, or replacement of various public facilities, public buildings, infrastructure, utilities, and parks in the community.

Every effort has been made to draft the document as conservatively and realistically as possible while maintaining the integrity of the funds. The concept of fund integrity includes accounting for certain projects, in particular designated funds that are only used for those purposes for which they are collected. These major funding sources include the operating funds (the General Fund and Enterprise Funds), the development fees and charges (including the Area and Park Trust Funds), as well as identifying larger general projects that are expected to be financed with the issuance of general obligation bonds to be repaid with future property tax levies.

A Ten-Year Financial Management Plan (FMP) was completed in 2023. The FMP incorporated the projects included in this CIP that include debt issuance as part of the funding source, future operating budgets including equipment replacement needs, and tax capacity changes (including growth). This FMP has been updated each year, and projects in this CIP were included in the FMP that was utilized during the 2026 budget process.

This CIP shows a total capital investment of $72.7 million for 2026 of which $34 million is related to the construction projects funded by the 3M settlement funds, including the Intermediate Zone Water Treatment Plant. $17 million is for the reconstruction of 80th Street from Ideal Avenue to Highway 61 ($5 million of this project will be paid with Federal funds and approximately $5 million will be reimbursed by the State and County for MnDOT intersection improvements). $7.4 million is related to various other street projects including Pavement Management (Thompson Grove Estates 11th Addition, south part Woodridge Park Addition (West of Jamaica)), and 80th Street/Keates Avenue roundabout which is a County led project.

Projects summarized by year are included on pages 8-9.

This document covers the period from 2026 to 2030 and is organized by the funding sources of the improvement project. Over the next five years $386.9 million in projected improvements have been identified. A significant portion of these projects (76% or $294.3 million) will be funded by other entities and other governmental entities. The remaining dollars come from other identified sources. A funding summary by year is included on page 11.

Details of all projects are included on pages 13-62. Maps of projects by year are included on pages 64-73.

Summary of Improvements

The identified improvements are included in the financial position statements by fund on pages 74-91. A fund is a related account that is used to maintain control over resources that have been segregated for specific activities or objectives. Eighteen funds are utilized for the accounting of the projects in the CIP.

Road and Trailway Maintenance Fund (Page 74)
The Road and Trailway Maintenance Fund records activities related to mill & overlaying, trail sealing, and trail replacement activities. Funding for these activities comes from franchise fees charged to property owners on their electric and natural gas utility bills.

2026 includes another mill and overlay project in the amount of $1,019,000. In addition, $673,000 will be spent for trail replacement.

Ice Arena Capital Fund (Page 75)
The naming rights revenue from NorthPoint is the primary source of revenue for the Ice Arena Capital Fund. 2026 projects include a Zamboni replacement.

Enterprise Funds (Pages 76-79)
The capital projects included in the Enterprise Fund section are those projects, which will be paid for with funds from the Storm Water, Water, Sanitary Sewer, and Street Light Utility Funds. Each of the Enterprise Funds is supported by user fees charged for the services provided.

Storm Water Utility Fund
The Storm Water Utility Fund projects include various drainage improvements and maintenance of the storm water utility system. The 2026 projects identified include storm water maintenance related to the 2026 Pavement Management project. Commitments of the Fund for the next five years are for various storm water activities throughout the City.

Water Utility Fund
The Water Utility Fund includes funding for SCADA upgrades and a meter replacement program beginning in 2026. Other capital projects in the Fund include the water costs for the annual Pavement Management Program, and well maintenance. Debt service for the new Utilities Building is also included in this fund.

Sanitary Sewer Utility Fund
Sewer costs related to the annual Pavement Management Program, and street reconstruction projects are included in the next five years.

Street Light Enterprise Fund
The improvements scheduled for the Street Light Utility Fund are traffic signals and system improvements. New traffic signals identified in the next five years are a signal at 80th Street and Jamaica Avenue in 2028, and Keats and Indian Boulevard in 2028.

Park Improvement Capital Project Fund (Page 80)
In 2013, the City Council directed that revenues derived from leasing space on the City's Water Towers/Reservoirs for cell phone antennas should be allocated to the purpose of renovation of existing parks and replacement of playground equipment. This revenue source will fund a total of $3.2 million in park and playground renovations over the next five years. Expenditures in 2026 include jump line improvements at the Bike park, sporting lighting improvements at Hamlet, and skate park surface replacement at Hamlet Park. The FMP completed in 2023 identified a need

to fund park improvements beyond the capacity of the cell phone antenna revenues. Therefore, a property tax levy has been included in the Fund beginning in 2026 in the amount of $190,000 per year.

Park Trust Fund (Page 81)
Improvements scheduled in the Park Trust Fund include the purchase of additional parkland, planning and development of parks and trails, and installing playground equipment in new parks. Revenues coming into the Park Trust Fund have been calculated to reflect the anticipated housing growth and a greater dedication of park land instead of park dedication fees. In 2026, the Jack and Marlys Denzer Park will be constructed, and construction will begin at Roberts Lake.

Landscape Initiative Fund (Page 82)
Improvements scheduled in the Landscape Initiative Fund include landscape beautification and tree mitigation. Funds from developers fund the projects in this fund.

Municipal Building Fund (Page 83)
This Fund derives its revenue from accumulated transfers from the General Fund pursuant to the Fund Balance policy, as well as several years of dedicated tax levy dollars. The property tax levy of $350,000 in 2025 will increase to $450,000 in 2026 to be used for municipal building maintenance expenses, and the interfund loan for the building of the Public Safety/City Hall (PSCH) building. In 2025, a facility assessment study was completed for the PSCH building and Central Fire Station. The maintenance items needed in the next five years for both buildings average $250,000 per year.

Economic Development Trust Fund (Page 84)
The primary source of revenue for this Fund is from an annual donation designated for economic development activities. 2025 and 2026 construction projects include Jamaica and 95th Street intersection improvements and preliminary construction project costs related to the CSAH 19 and TH 61 project.

MSA Construction Fund and Street Reconstruction and Overlay Fund (Pages 85-86)
The construction of new streets and other street reconstruction projects make up the vast majority of capital improvement projects in the MSA Construction Fund. Funding for these projects includes Municipal State Aid (MSA), other intergovernmental revenue, developer charges and special assessments.

Streets included on the “state aid” system are eligible to receive state aid for a portion of the projects. The MSA annual construction allotment for 2025 was $2.47 million. The projects noted below and, in the CIP, will depend on development, the timing of which will vary due to factors including the economy and available land.

The 2026 projects identified with their anticipated MSA funding include:

Year	Project	Description	Project Cost	City MSA Funding
2026	80th Street (Ideal to Hwy 61)	Reconstruction	17,000,000	4,545,700
2026	80th Street (80th /Keats)	Roundabout	4,000,000	2,000,000
		Total	$21,000,000	$6,545,700

Besides MSA revenue, these projects will be funded with other revenue sources including Federal, State, and County funds, assessments, utility funds, and possibly bonded debt.

Other projects that have been included in the MSA Fund that have funding sources other than MSA revenue include:

- Jamaica and 95th Improvements (Primary funding sources-ED Trust and development fees)
- Ravine Parkway constructions (Primary funding source-development fees)
- EPD and Ravine Parkway-Shoppes at Cottage View starting in 2028. (Funding sources-federal funds for $3 million, area funds, and assessments/development fees)
- 103rd Street Bridge in 2023. (Funding sources-federal and state funds)

A Street Reconstruction and Overlay Plan was approved in 2023 that allows for street reconstruction and overlay bonds to be issued for construction projects identified in the plan. These projects include:

- 100th Street 2026-2030.
    - The CSAH 19 and TH 61 project will be a county-led project that will be primarily funded with Federal and County Funds. The realignment portion of 100th Street of this project will be funded by the City.
- Jamaica Avenue from 70th to Military in 2028. (Funding source-bonded debt)
- Harkness Avenue in 2030. (Funding sources-area funds, developer fees, and bonded debt)

Details of these projects and funding sources are included in the detail of the projects located on pages 42-49.

Pavement Management Fund (Page 87)

Pavement Management Program projects are reflected in this Fund. The summary sheet identifies other funding sources when available, but for most projects it will be necessary to issue debt to be repaid with a property tax levy to finance the project. The continuation of the Pavement Management Program depends on assessments for a portion of each project to be used to repay a portion of the debt.

The Pavement Management projects included in the next five years total $23.8 million, of which $10.7 million would be assessed to benefiting property owners and $19.5 million would be bonded. Future property taxes levies would repay these bonds and have been included in the FMP.

			Funding		
	Location	Total	Assessments	Debt	Other
2026	Thompson Grove Estates 11th Add, south part Woodridge Park Add (W of Jamaica)	$3,415,000	$1,536,750	$2,420,000	$995,000
2027	East Point Douglas (Inwood to CDS), Kingsborough Trail	3,508,000	1,578,600	2,945,000	563,000
2028	Thompson Grove Estates 12 Add, north part Woodridge Park Add (W of Jamaica	3,766,000	1,694,700	2,668,000	1,098,000
2029	Thompson Grove Estates & Hillside Trail	6,066,000	2,729,700	4,485,000	1,584,000
2030	Pine Glen, Cottage Grove Estates	7,036,000	3,166,200	7,036,000	1,090,000

Area Funds (Pages 88-90)
The Water, Storm Sewer and Sanitary Sewer Area Funds are capital project funds that provide the resources to construct general infrastructure. Projects totaling $10.3 million are expected to be funded from the Area Funds over the next 5 years. The funding sources for these Funds are area charges and connection fees against developing properties and new building construction. The area charges and connection fees are based on rates established by the City Council.

Water Area Fund
Construction of a water tower in the Industrial Park will be completed in 2026. This project was funded with the Water Utility Fund, Water Area Fund, and bonds. The bonds will be repaid with future revenues (developer area charges) in the Water Area Fund, and the debt service payment is reflected in the fund. Other expenditures in the fund include the water portions for 100th Street, Shoppes at Cottage View, and east ravine development.

Sanitary Sewer Area Fund
Funding for projects identified in the Sanitary Sewer Area Fund includes activities regarding system-wide construction for 100th Street, Shoppes at Cottage View, and east ravine development.

Storm Water Area Fund
Funding for projects identified in the Storm Water Area Fund includes activities regarding system-wide construction for 100th Street, Shoppes at Cottage View, and east ravine development.

Other Funds (Page 91)

3M Settlement/MPCA Fund
3M settlement implementation funds will be used to construct the Intermediate Zone Water Treatment Plant in 2025 through 2029, and decommissioning of Well #1, Well #2, and the temporary treatment plants. 3M settlement funds will be received to fund the 2026-2029 projects totaling $76 million.

Bonds (Page 92)
Debt will be issued to fund specific projects identified in the CIP and debt issuance was identified as a financing mechanism in the preparation of the FMP in 2023 for certain CIP projects. The debt (bonds) that have been identified in the CIP are consistent with the debt identified in the FMP. Where there are differences, additional analysis in future years will need to be undertaken to understand the property tax impact. Due to rapid growth in the city, there will likely be little impact.

Conclusion

City staff has prepared this document in conjunction with those projects and capital items that are known and for which costs can be reasonably estimated. The CIP should be considered a planning tool and the projects included for 2026 and 2027 serve as a work plan for staff. This “work plan” means that these are the projects that staff will bring to Council for authorization before proceeding with a feasibility study, acquisition, or construction. All projects detailed in this document will be included in their respective budgets if the need is established at that time.

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City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

PROJECTS BY PROGRAM CATEGORY

NOTE: This recap includes the total project cost. See the individual project page for funding sources

PROGRAM CATEGORY	2026	2027	2028	2029	2030
General Public Buildings					
City Hall/Public Safety-Maintenance	178,950	142,100	250,850	219,900	446,171
Central Fire-Maintenance	33,183	76,580	70,364		2,325
Public Works-Maintenance		12,000	85,000	800,000	60,000
General Public Buildings Total	212,133	230,680	406,214	1,019,900	508,496
Parks & Recreation Facilities					
Bike Park Jump Line Improvements	75,000				
Mississippi Dunes Park		7,000,000	2,000,000	7,000,000	
Matching grant funds	10,000	10,000	10,000	10,000	10,000
Public Landscape initiative	80,000	100,000	120,000	100,000	100,000
Parks - design & planning	15,000	15,000	15,000	15,000	15,000
Parks-Automatic locks on buildings	35,000	35,000	35,000	35,000	35,000
Hamlet Park Skate Park Surface Replacement	100,000				
Hamlet- Park shelter replace & Skate park equip.		350,000			
Hearthside Park: Park Improvements				100,000	
Hemmingway and North Ideal play equipment				150,000	
Highlands Park Tennis Court Replacement			100,000		
Kingston Park Building Replacement		5,000,000			
Lamar Park Roof-not needed/replaced 2025		10,000			
Neighborhood Park Development	800,000	700,000	500,000	500,000	500,000
Peter Thompson Park Upgrades			315,000		
Picnic Shelters					60,000
Pine Coulee-Court Replacement		20,000			
Pine Glen Park Improvements					100,000
Pine Tree Pond Park Improvements			500,000	30,000	
Pine Tree Valley Ice Rink Board Replacement					150,000
River Oaks Scenic Overlook		100,000			
Woodridge Park Court Resurfacing					150,000
Woodridge Playground Surface Replacement					500,000
Sports Lighting Improvements	355,000	350,000	35,000		
Ice Arena Capital Projects	145,000	1,625,000	145,000	575,000	60,000
Parks & Recreation Facilities	1,615,000	15,315,000	3,775,000	8,515,000	1,680,000
Public Utilities Facilities					
Annual Sewer Spot Maintenance/Slip Lining	50,000	52,000	53,000	55,000	56,000
Streetlight System Improvements	100,000	103,000	106,000	109,000	112,000
Storm Water Maintenance	205,000	210,000	217,000	224,000	230,000
Trunk Utility Oversizing	20,000	20,000	20,000	20,000	20,000
East Ravine District Infrastructure	50,000	50,000	50,000	50,000	50,000
Annual Well Maintenance	90,000	93,000	96,000	99,000	102,000
SCADA & Well Upgrades	887,900	304,500			
Water Tower Painting/Rehab		1,000,000			
Traffic Signals, Traffic Improvements			1,480,000		
3M Settlement Implementation	34,045,192	30,045,192	12,518,830	4,003,766	
Water Softening					100,000,000
Pedestrian Improvements				350,000	
Public Utilities Facilities total	35,448,092	31,877,692	14,540,830	4,910,766	100,570,000

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

PROJECTS BY PROGRAM CATEGORY

NOTE: This recap includes the total project cost. See the individual project page for funding sources

PROGRAM CATEGORY	2026	2027	2028	2029	2030
Street & Road Improvement Projects					
Roadway Maintenance	1,979,000	2,078,000	2,183,000	2,292,000	2,407,000
Safe Streets & Roads for All (SS4A)	440,000				
CSAH 19 and TH 61	680,000	27,742,500	23,077,500		22,900,000
Jamaica Avenue			3,000,000		
Ravine Parkway - Shoppes at Cottage View	4,223,000		2,527,000	4,343,000	1,353,000
Ravine Parkway	3,200,000	1,200,000	1,000,000	1,000,000	200,000
80th Street (CSAH19 to TH 61) Reconstruction	17,290,100				
80th Street (80th/Keats roundabout cost share)	4,000,000				
Harkness Ave Reconstruction					3,162,000
103rd Street Railroad Bridge	150,000	150,000	800,000		8,000,000
Subtotal before PM	31,962,100	31,170,500	32,587,500	7,635,000	38,022,000
PM 2026	3,415,000				
PM 2027		3,508,000			
PM 2028			3,766,000		
PM 2029				6,066,000	
PM 2030					8,126,000
Road & Street Improvement projects total	3,415,000	3,508,000	3,766,000	6,066,000	8,126,000
GRAND TOTAL	$ 72,652,325	$ 82,101,872	$ 55,075,544	$ 28,146,666	$ 148,906,496

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City of Cottage Grove
Capital Improvement Plan 2026-2030
Funding Summary by Year

	2026	2027	2028	2029	2030	Total '26 to 30
Funding Source						
Bonds for Pavement Management	2,420,000	3,045,000	2,668,000	4,585,000	7,136,000	$ 19,854,000
Bonds for CSAH 19 & TH 61		2,621,250	198,750			2,820,000
Bonds for Shoppes at Cottage View			377,000	2,760,000	860,000	3,997,000
Bonds for Harkness Avenue					938,000	938,000
Bonds for Jamaica (Rose of Sharon to Military)			3,000,000			3,000,000
Bonds for Kingston Park		5,000,000				5,000,000
Bonds for Ice Arena		1,500,000				1,500,000
Bonds for Dunes Park		2,000,000	1,500,000	7,000,000		10,500,000
Park Improvement Fund	575,000	775,000	495,000	195,000	905,000	2,945,000
Park Trust	815,000	715,000	1,015,000	545,000	515,000	3,605,000
Public Landscape Initiative	80,000	100,000	70,000	100,000	100,000	450,000
Ice Arena Capital Fund	145,000	125,000	145,000	575,000	60,000	1,050,000
Municipal Building Fund	212,133	230,680	406,214	1,019,900	508,496	2,377,423
Franchise Fees	1,976,000	2,064,000	2,173,000	2,281,000	2,392,000	10,886,000
Federal/Grant Funding	8,352,000	19,000,000	19,000,000	-	120,433,000	166,785,000
State of Minnesota	5,436,000	5,150,000	550,000	350,000		11,486,000
Municipal State Aid	5,023,000		1,800,000		5,875,000	12,698,000
Washington County	2,250,000	2,971,250	1,098,750		4,075,000	10,395,000
Developer Assessments/Fees	5,011,600	1,200,000	2,520,000	1,869,000	1,756,000	12,356,600
3M Settlement	34,045,192	30,045,192	12,518,830	4,003,766		80,612,980
Utility Funds	2,381,400	2,339,500	2,320,000	2,079,000	1,605,000	10,724,900
Area Funds	1,293,000	3,220,000	3,220,000	784,000	1,748,000	10,265,000
TIF Funds	1,807,000					1,807,000
ED Trust	430,000					430,000
Other funding	400,000					400,000
	$ 72,652,325	$ 82,101,872	$ 55,075,544	$ 28,146,666	$ 148,906,496	$ 386,882,903

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CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

FACILITIES AND PARK PROJECTS

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy	$ -	$ -	$ -	$ -	$ -
Bonded Debt	$ -	$ 8,600,000	$ 1,500,000	$ 7,100,000	$ 100,000
State/Other Government Units	$ -	$ -	$ -	$ -	$ -
Park Improvement Fund	$ 575,000	$ 775,000	$ 495,000	$ 195,000	$ 905,000
Park Trust Fund	$ 815,000	$ 715,000	$ 1,015,000	$ 545,000	$ 515,000
Landscape Initiative	$ 80,000	$ 100,000	$ 70,000	$ 100,000	$ 100,000
Municipal Building Fund	$ 212,133	$ 230,680	$ 406,214	$ 1,019,900	$ 508,496
Other:	$ 145,000	$ 5,125,000	$ 695,000	$ 575,000	$ 60,000
TOTAL	1,827,133	15,545,680	4,181,214	9,534,900	2,188,496

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements	$ -	$ -	$ -	$ -	$ -
Engineering/Architect	$ 15,000	$ 1,615,000	$ 465,000	$ 1,415,000	$ 15,000
Admin/Legal	$ -	$ -	$ -	$ -	$ -
Construction	$ 1,510,000	$ 13,590,000	$ 3,180,000	$ 6,990,000	$ 1,555,000
Maintenance	$ 212,133	$ 230,680	$ 406,214	$ 1,019,900	$ 508,496
Other	$ 90,000	$ 110,000	$ 130,000	$ 110,000	$ 110,000
TOTAL	1,827,133	15,545,680	4,181,214	9,534,900	2,188,496
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
City Hall Public Safety Major Maintenance	Major maintenance projects for the City Hall-Public Safety building per the Kraus Anderson Facility Condition Assessment.
Department City Hall	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund					
Park Trust Fund					
Landscape Initiative					
Municipal Building	178,950	142,100	250,850	219,900	446,171
Other:					
TOTAL	178,950	142,100	250,850	219,900	446,171

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction					
Maintenance	178,950	142,100	250,850	219,900	446,171
Other					
TOTAL	178,950	142,100	250,850	219,900	446,171
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project description**
Central Fire Station Major Maintenance	Major maintenance projects for the Central Fire Station per the Kraus Anderson Facility Condition Assessment.
Department Fire	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund					
Park Trust Fund					
Landscape Initiative					
Municipal Building	33,183	76,580	70,364		2,325
Other:					
TOTAL	33,183	76,580	70,364	0	2,325

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction					
Maintenance	33,183	76,580	70,364		2,325
Other					
TOTAL	33,183	76,580	70,364	0	2,325
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project description**
Public Works Major Maintenance	Major maintenance projects for the public works facility. 2027 - Water heater 2028 - Garage doors and flooring
Department	2029 - Roof replacement
Public Works	2030 - Vinyl Tile Replacement

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund					
Park Trust Fund					
Landscape Initiative					
Municipal Building		12,000	85,000	800,000	60,000
Other: LOST					
TOTAL	0	12,000	85,000	800,000	60,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction					
Maintenance		12,000	85,000	800,000	60,000
Other					
TOTAL	0	12,000	85,000	800,000	60,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Matching Funds Program	Funds used to match donations from outside organizations on specific park projects
Department	
Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund	10,000	10,000	10,000	10,000	10,000
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other:					
TOTAL	10,000	10,000	10,000	10,000	10,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction					
Maintenance					
Other	10,000	10,000	10,000	10,000	10,000
TOTAL	10,000	10,000	10,000	10,000	10,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Public Landscape Initiative	2026 - 80th St HWY 61 to Ideal ($50,000), Oakwood Park Restoration ($10,000), Diseased Tree Mitigation ($10,000), Arbor Day Tree Planting ($10,000) 2027 - Jamaica 100th to Hwy 61 Ramps ($50,000), Woodridge Park Woodland Restoration ($30,000), Diseased Tree Mitigation ($10,000), Arbor Day Tree Planting ($10,000) 2028 - Future ROW Beautification ($50,000), Pine Tree Valley & Pine Tree Pond Park Open Space Restoration Grant Match ($50,000), Diseased Tree Mitigation ($10,000), Arbor Day Tree Planting ($10,000) 2029 - 80th St HWY 61 to Ideal ($50,000), West Draw Park Landscape Enhancements/Restoration ($30,000), Diseased Tree Mitigation ($10,000), Arbor Day Tree Planting ($10,000) 2030 - Future ROW Beautification ($50,000), Park Landscape Enhancements/Restoration ($30,000), Diseased Tree Mitigation ($10,000), Arbor Day Tree Planting ($10,000)
Department	
Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund					
Park Trust Fund					
Landscape Initiative	80,000	100,000	70,000	100,000	100,000
Municipal Building					
Other: Grant			50,000		
TOTAL	80,000	100,000	120,000	100,000	100,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction					
Maintenance					
Other	80,000	100,000	120,000	100,000	100,000
TOTAL	80,000	100,000	120,000	100,000	100,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Park Design and Planning	Funding for design and planning of parks as development occurs.
Department	
Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund					
Park Trust Fund	15,000	15,000	15,000	15,000	15,000
Landscape Initiative					
Municipal Building					
Other:					
TOTAL	15,000	15,000	15,000	15,000	15,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect	15,000	15,000	15,000	15,000	15,000
Admin/Legal					
Construction					
Maintenance					
Other					
TOTAL	15,000	15,000	15,000	15,000	15,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project description**
Building Locks	Annual addition of automatic locks for various park building restrooms throughout the community
Department	2026 - Highlands
Parks	2027 - Kingston
	2028 - Hamlet
	2029 - Peter Thompson
	2030 - Woodridge

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund	35,000	35,000	35,000	35,000	35,000
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other:					
TOTAL	35,000	35,000	35,000	35,000	35,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction	35,000	35,000	35,000	35,000	35,000
Maintenance					
Other					
TOTAL	35,000	35,000	35,000	35,000	35,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Picnic Shelters	2030 - Nina's Park ($30,000), Fabric Replacement: Hamlet, Highlands, Granada ($30,000)
Department	
Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund					60,000
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other:					
TOTAL	-	-	-	-	60,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction					60,000
Maintenance					
Other					
TOTAL	-	-	-	-	60,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Replace Playground equipment	2029 - Hemingway and North Ideal - $150,000 2030 - Woodridge Playground Surface Replacement - $500,000
Department Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund				150,000	500,000
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other:					
TOTAL	0	0	0	150,000	500,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction				150,000	500,000
Maintenance					
Other					
TOTAL	0	0	0	150,000	500,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Sports Lighting Improvements	2026 - Hamlet Football/Soccer, Courts and Ice Rink 2027 - Lamar Park LED & Poles 2028 - Old CG Park Sports Lighting Replacement
Department Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund	355,000	350,000	35,000		
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other:					
TOTAL	355,000	350,000	35,000	-	-

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction	355,000	350,000	35,000		
Maintenance					
Other					
TOTAL	355,000	350,000	35,000	-	-
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project description**
Pavement Management	2027 - River Oaks Scenic Overlook ($100,000) 2029 - Hearthside Park Improvements ($100,000) 2030 - Pine Glen ($100,000)
Department	
Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt		100,000		100,000	100,000
State/Other Government Units					
Park Improvement Fund					
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other: Donations					
TOTAL	0	100,000	0	100,000	100,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction		100,000		100,000	100,000
Maintenance					
Other					
TOTAL	0	100,000	0	100,000	100,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project description**
Neighborhood Park Development	2026 - Denzer Park ($300,000), Roberts Lake Neighborhood Development ($500,000) 2027 - Still Ponds ($500,000), Military Trailhead ($200,000) 2028 - East Ravine Neighborhood or 100th Street Park Development (development driven) 2029 - East Ravine Neighborhood or 100th Street Park Development (development driven) 2030 - East Ravine Neighborhood or 100th Street Park Development (development driven)
Department Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund					
Park Trust Fund	800,000	700,000	500,000	500,000	500,000
Landscape Initiative					
Municipal Building					
Other:					
TOTAL	800,000	700,000	500,000	500,000	500,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction	800,000	700,000	500,000	500,000	500,000
Maintenance					
Other					
TOTAL	800,000	700,000	500,000	500,000	500,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Bike Park	2026 - Jump Line Improvements ($75,000)
Department	
Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund	75,000				
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other:					
TOTAL	75,000	0	0	0	0

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction	75,000				
Maintenance					
Other					
TOTAL	75,000	0	0	0	0
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project description**
Dunes Park	2027 - Infrastructure, Parking Lot, Trails, Boat Ramp 2028 - Recreation Facilities 2029 - Park Building
Department	
Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt		2,000,000	1,500,000	7,000,000	
State/Other Government Units					
Park Improvement Fund					
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other: Grants		5,000,000	500,000		
TOTAL	0	7,000,000	2,000,000	7,000,000	0

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect		1,400,000	400,000	1,400,000	
Admin/Legal					
Construction		5,600,000	1,600,000	5,600,000	
Maintenance					
Other					
TOTAL	0	7,000,000	2,000,000	7,000,000	0
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Hamlet Park	2026 - Skate Park Surface Replacement 2027 - Picnic Shelter Replacement ($50,000), Skate Park Equipment ($300,000)
Department Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund	100,000	350,000			
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other:					
TOTAL	100,000	350,000	-	-	-

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction	100,000	350,000			
Maintenance					
Other					
TOTAL	100,000	350,000	-	-	-
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Highlands Park	Tennis Court Replacement
Department	
Facilities	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund			100,000		
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other: Project Description					
TOTAL	-	-	100,000	-	-

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction			100,000		
Maintenance					
Other					
TOTAL	-	-	100,000	-	-
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Kingston Park	2027 - Building Replacement ($5,000,000) - bond in 2027
Department	
Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt		5,000,000			
State/Other Government Units					
Park Improvement Fund					
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other:					
TOTAL	0	5,000,000	0	0	0

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction		5,000,000			
Maintenance					
Other					
TOTAL	0	5,000,000	0	0	0
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description** 2027 - Roof Replacement
Lamar Park	Note-Actually replaced in 2025. This can be deleted in future CIP.
Department	
Facilities	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund		10,000			
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other:					
TOTAL	0	10,000	0	0	0

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction		10,000			
Maintenance					
Other					
TOTAL	0	10,000	0	0	0
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Peter Thompson Park	2028 - Peter Thompson Park Upgrades: Rink Boards, Sport Courts, Reshingle Building Roof
Department	
Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement fund			315,000		
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other:					
TOTAL	0	0	315,000	0	0

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction			315,000		
Maintenance					
Other					
TOTAL	0	0	315,000	0	0
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Pine Coulee	2027 - Court Replacement
Department	
Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund		20,000			
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other: Land Sale					
TOTAL	0	20,000	0	0	0

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction		20,000			
Maintenance					
Other					
TOTAL	0	20,000	0	0	0
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project description**
Pine Tree Pond Park	2028 - Pine Tree Pond Park Improvements 2029 - Pine Tree Pond Court Replacement
Department	
Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund					
Park Trust Fund			500,000	30,000	
Landscape Initiative					
Municipal Building					
Other: 3M Settlement					
TOTAL	0	0	500,000	30,000	0

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect			50,000		
Admin/Legal					
Construction			450,000	30,000	
Maintenance					
Other					
TOTAL	0	0	500,000	30,000	0
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Pine Tree Valley	2030 - Ice Rink Board Replacement ($150,000)
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund					150,000
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other: Utility Fund					
TOTAL	0	0	0	0	150,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction					150,000
Maintenance					
Other					
TOTAL	0	0	0	0	150,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project description**
Woodridge	2030 - Court Resurfacing
Department	
Parks	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State/Other Government Units					
Park Improvement Fund					150,000
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other:					
TOTAL	0	0	0	0	150,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect					
Admin/Legal					
Construction					150,000
Maintenance					
Other					
TOTAL	0	0	0	0	150,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Ice Arena Capital Projects	2026 - Zamboni Replacement ($145,000) 2027 - Locker Room 7/8/9 Furnace ($10,000), Floor Scrubber ($15,000), Water Treatment System ($100,000), Office & Interior Remodel ($1,500,000), bond for remodel in 2028
Department	2028 - Zamboni Replacement ($145,000)
Parks	2029 - Commons Area Rooftop HVAC Unit ($75,000), Steel Roof ($500,000) 2030 - Office/Mezzanine Furnace Replacement ($60,000)

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt		1,500,000			
State/Other Government Units					
Park Improvement Fund					
Park Trust Fund					
Landscape Initiative					
Municipal Building					
Other: NorthPoint Naming Rights Fund and/or Operating Fund	145,000	125,000	145,000	575,000	60,000
TOTAL	145,000	1,625,000	145,000	575,000	60,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements					
Engineering/Architect		200,000			
Admin/Legal					
Construction	145,000	1,425,000	145,000	575,000	60,000
Maintenance					
Other					
TOTAL	145,000	1,625,000	145,000	575,000	60,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

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CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

ALL TRANSPORTATION AND PUBLIC WORKS PROJECTS

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy	$ -	$ -	$ -	$ -	$ -
Bonded Debt	$ 2,420,000	$ 5,566,250	$ 6,243,750	$ 7,245,000	$ 8,834,000
State of Minnesota/MSA	$ 10,309,000	$ -	$ 1,800,000	$ -	$ 5,875,000
Washington County	$ 2,250,000	$ 2,971,250	$ 1,098,750	$ -	$ 4,075,000
Federal/Grant Funding	$ 8,352,000	$ 19,000,000	$ 19,000,000	$ -	$ 120,433,000
Area Funds	$ 1,293,000	$ 3,220,000	$ 3,220,000	$ 784,000	$ 1,748,000
Utility Funds	$ 2,381,400	$ 2,339,500	$ 2,320,000	$ 2,079,000	$ 1,605,000
Assessments/Developer Fees	$ 5,011,600	$ 1,200,000	$ 2,520,000	$ 1,869,000	$ 1,756,000
Other:	$ 38,808,192	$ 32,259,192	$ 14,691,830	$ 6,634,766	$ 2,392,000
TOTAL	70,825,192	66,556,192	50,894,330	18,611,766	146,718,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation	$ 845,000	$ 4,845,000	$ -	$ -	$ 250,000
Engineering/Architect	$ 14,286,059	$ 10,000,039	$ 7,916,766	$ 3,655,754	$ 23,921,000
Admin/Legal	$ -	$ -	$ -	$ -	$ 104,000
Construction	$ 53,436,133	$ 49,349,153	$ 40,505,564	$ 12,369,012	$ 119,738,000
Maintenance	$ 1,239,000	$ 1,292,000	$ 1,348,000	$ 1,407,000	$ 1,466,000
Other	$ 1,019,000	$ 1,070,000	$ 1,124,000	$ 1,180,000	$ 1,239,000
TOTAL	70,825,192	66,556,192	50,894,330	18,611,766	146,718,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET

2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Roadway Maintenance	Annual maintenance including: 4 miles of mill & overlay Concrete removal & replacement (2% per year)
Department	6 miles trail maintenance (crack seal/fog seal) 2 miles trail reconstruction
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					
Area Funds					
Utility Funds	3,000	14,000	10,000	11,000	15,000
Assessments/Developer Fees					
Other: Maintenance Fund	1,976,000	2,064,000	2,173,000	2,281,000	2,392,000
TOTAL	1,979,000	2,078,000	2,183,000	2,292,000	2,407,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect	166,000	174,000	183,000	192,000	202,000
Admin/Legal					
Sealcoating Contract/Rock					
Maintenance	794,000	834,000	876,000	920,000	966,000
Other: Mill and Overlay	1,019,000	1,070,000	1,124,000	1,180,000	1,239,000
TOTAL	1,979,000	2,078,000	2,183,000	2,292,000	2,407,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET

2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Pavement Management (includes ADA improvements)	2026 - Thompson Grove Estates 11th Add, south part Woodridge Park Add (W of Jamaica) 2027 - East Point Douglas (Inwood to CDS), Kingsborough Trail 2028 - Thompson Grove Estates 12 Add, north part Woodridge Park Add (W of Jamaica) 2029 - Thompson Grove Estates and Hillside Trail 2030 - Pine Glen, Cottage Grove Estates
Department Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt	2,420,000	2,945,000	2,668,000	4,485,000	7,036,000
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					
Area Funds					
Utility Funds	995,000	563,000	1,098,000	1,581,000	1,090,000
Assessments/Developer Fees					
Other:					
TOTAL	3,415,000	3,508,000	3,766,000	6,066,000	8,126,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect	683,000	702,000	753,000	1,213,000	1,625,000
Admin/Legal					
Construction	2,732,000	2,806,000	3,013,000	4,853,000	6,501,000
Maintenance					
Other					
TOTAL	3,415,000	3,508,000	3,766,000	6,066,000	8,126,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
80th Street Reconstruction	2026 - 80th Street (Ideal to Hwy 61) & East Point Douglas Road (80th Street to T-Intersection) - Includes pavement replacement, spot curb replacement, signal replacement and upgrades, ADA improvements, landscaping, trail replacement and MnDOT interchange improvements. State of Minnesota/MSA incldues $2,934,868 in City MSA and $5,286,026 in MnDOT/County funding for interchange improvements.
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA	8,221,000				
Washington County					
Federal/Grant Funding	5,000,000				
Area Funds					
Utility Funds	50,500				
Assessments/Developer Fees	2,211,600				
Other: TIF 1-12	1,807,000				
TOTAL	17,290,100	0	0	0	0

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect	3,458,020				
Admin/Legal					
Construction	13,832,080				
Maintenance					
Other					
TOTAL	17,290,100	0	0	0	0
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
80th Street & Keats Avenue Roundabout	Installation of a roundabout at 80th Street and Keats Avenue, County led project
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA	2,000,000				
Washington County	2,000,000				
Federal/Grant Funding					
Area Funds					
Utility Funds					
Assessments/Developer Fees					
Other: ED Trust/Park Trust ($130k)					
TOTAL	4,000,000	-	-	-	-

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect	800,000				
Admin/Legal					
Construction	3,200,000				
Maintenance					
Other					
TOTAL	4,000,000	-	-	-	-
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
CSAH 19 and TH 61	2026-2028 - County 19A & 100th Street Realignment Project $680,000 in engineering costs in 2025, $430,000 City/$250,000 County
Department	
Public Works	2030 - Reconstruction/realignment of bridge/overpass over Highway 61 at County Rd 19

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt		2,621,250	198,750		
State of Minnesota/MSA					4,075,000
Washington County	250,000	2,971,250	728,750		4,075,000
Federal/Grant Funding		19,000,000	19,000,000		14,033,000
Area Funds		3,150,000	3,150,000		
Utility Funds					
Assessments/Developer Fees					717,000
Other: ED Trust	430,000				
TOTAL	680,000	27,742,500	23,077,500	0	22,900,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation		4,845,000			
Engineering/Architect	680,000	2,395,000	2,575,000		
Admin/Legal					
Construction		20,502,500	20,502,500		22,900,000
Maintenance					
Other					
TOTAL	680,000	27,742,500	23,077,500	0	22,900,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET

2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project description**
Harkness Ave Reconstruction	Reconstruct Harkness Avenue to an urban section with utilities, from Oakwood Park to the north Hardwood Ave intersection.
Department Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					938,000
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					
Area Funds					1,456,000
Utility Funds					
Assessments/Developer Fees					768,000
Other:					
TOTAL	0	0	0	0	3,162,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					250,000
Engineering/Architect		0			728,000
Admin/Legal					104,000
Construction					2,080,000
Maintenance					
Other					
TOTAL	0	0	0	0	3,162,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Jamaica Ave	2028 - Cost share of reconstruction of Jamaica Ave from Rose of Sharon Church to Military Road to
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt			3,000,000		
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					
Area Funds					
Utility Funds					
Assessments/Developer Fees					
Other:					
TOTAL	0	0	3,000,000	0	0

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect					
Admin/Legal					
Construction			3,000,000		
Maintenance					
Other					
TOTAL	0	0	3,000,000	0	0
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Ravine Parkway	2026 - Ravara Trails (Tank/Brier) 2027 - 2029: Tank North, Tank South, Geis, Goebel 2030 - Kemp
Department Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA					200,000
Washington County					
Federal/Grant Funding					
Area Funds					
Utility Funds					
Assessments/Developer Fees	2,800,000	1,200,000	1,000,000	1,000,000	
Other: Interfund Loan	400,000				
TOTAL	3,200,000	1,200,000	1,000,000	1,000,000	200,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect	1,100,000	400,000	300,000	300,000	30,000
Admin/Legal					
Construction	2,100,000	800,000	700,000	700,000	170,000
Maintenance					
Other					
TOTAL	3,200,000	1,200,000	1,000,000	1,000,000	200,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET

2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Ravine Parkway - Shoppes at Cottage View	2026 - Phase 1 - EPD to first intersection & hotel access 2028 - Phase 2 - First access to Roundabout 2029 - Phase 3 - Roundabout to CSAH 19
Department Public Works	2030 - Phase 4 - North of Roundabout *includes 8% inflation adjustment above Feasibility Report costs * Money to be used by August 31, 2030

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt			377,000	2,760,000	860,000
State of Minnesota/MSA			1,000,000		
Washington County					
Federal/Grant Funding	3,000,000				
Area Funds	1,223,000			714,000	222,000
Utility Funds					
Assessments/Developer Fees			1,150,000	869,000	271,000
Other:					
TOTAL	4,223,000	-	2,527,000	4,343,000	1,353,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocati	845,000				
Engineering/Architect			506,000	1,080,000	336,000
Admin/Legal					
Construction	3,378,000		2,021,000	3,263,000	1,017,000
Maintenance					
Other					
TOTAL	4,223,000	-	2,527,000	4,343,000	1,353,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
103rd St Railroad Bridge	2026 & 2027 - 103rd St Bridge Feasibility Study 2028 - 103rd St Bridge Preliminary & Final Design 2030 - Reconstruct 103rd Street railroad bridge
Department Public Works	Post 2030 - Grey Cloud Trail Bridge Reconstruction

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA			800,000		1,600,000
Washington County					
Federal/Grant Funding					6,400,000
Area Funds					
Utility Funds					
Assessments/Developer Fees					
Other: Future Projects	150,000	150,000			
TOTAL	150,000	150,000	800,000	0	8,000,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect	150,000	150,000	800,000		1,000,000
Admin/Legal					
Construction					7,000,000
Maintenance					
Other					
TOTAL	150,000	150,000	800,000	0	8,000,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Traffic Signals	2028 - 80th/Jamaica, Keats/Indian Blvd
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA					
Washington County			370,000		
Federal/Grant Funding					
Area Funds					
Utility Funds			740,000		
Assessments/Developer Fees			370,000		
Other: 1-12 TIF District					
TOTAL	0	0	1,480,000	0	0

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect			296,000		
Admin/Legal					
Construction			1,184,000		
Maintenance					
Other					
TOTAL	0	0	1,480,000	0	0
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
East Ravine District	As residential development occurs in the East Ravine, various infrastructure will be constructed to support the new housing. This infrastructure will be paid for by developers either through City financed construction supported by assessments or by Developer constructed of same.
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					
Area Funds	50,000	50,000	50,000	50,000	50,000
Utility Funds					
Assessments/Developer Fees					
Other:					
TOTAL	50,000	50,000	50,000	50,000	50,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect					
Admin/Legal					
Construction	50,000	50,000	50,000	50,000	50,000
Maintenance					
Other					
TOTAL	50,000	50,000	50,000	50,000	50,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Water Tower Painting/Rehab	2027 - Pine Hill Water Tower
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					
Area Funds					
Utility Funds		1,000,000			
Assessments/Developer Fees					
Other: Newport					
TOTAL	-	1,000,000	-	-	-

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect		170,000			
Admin/Legal					
Construction		830,000			
Maintenance					
Other					
TOTAL	-	1,000,000	-	-	-
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Annual well maintenance	Each year a well is 'pulled' for inspection and repair of the pump and other vital parts.
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					
Area Funds					
Utility Funds	90,000	93,000	96,000	99,000	102,000
Assessments/Developer Fees					
Other:					
TOTAL	90,000	93,000	96,000	99,000	102,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect					
Admin/Legal					
Construction					
Maintenance	90,000	93,000	96,000	99,000	102,000
Other					
TOTAL	90,000	93,000	96,000	99,000	102,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
SCADA & Well Upgrades	2026 - IZWTP Watermain Replacement ($476,900) and Wells 3/10 Electrical Upgrades($420,000) 2027 - IZWTP Well SCADA Upgrades
Department	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					
Area Funds					
Utility Funds	887,900	304,500			
Assessments/Developer Fees					
Other: Roadway Maintenance					
TOTAL	887,900	304,500	0	0	0

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect					
Admin/Legal					
Construction	887,900	304,500			
Maintenance					
Other					
TOTAL	887,900	304,500	0	0	0
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
3M Settlement Implementation	2025-2029 - Intermediate Zone Water Treatment Plant - $90,135,600 2026 - Intermediate Zone Raw Water Line - $3,000,000 2026 - Well 1 & Well 2 Decommissioning - $1,000,000
Department Public Works	2029 - Wells 3, 7, and 8 Interim Treatment Plant Decommissioning- $1,500,000

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					
Area Funds					
Utility Funds					
Assessments/Developer Fees					
Other: 3M Settlement	34,045,192	30,045,192	12,518,830	4,003,766	
TOTAL	34,045,192	30,045,192	12,518,830	4,003,766	0

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect	6,809,039	6,009,039	2,503,766	800,754	
Admin/Legal					
Construction	27,236,153	24,036,153	10,015,064	3,203,012	
Maintenance					
Other					
TOTAL	34,045,192	30,045,192	12,518,830	4,003,766	0
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project description**
Water System	2030 - Water Softening ($70,000,000 Intermediate Plant; $30,000,000 Low Plant)
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					100,000,000
Area Funds					
Utility Funds					
Assessments/Developer Fees					
Other:					
TOTAL	0	0	0	0	100,000,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect					20,000,000
Admin/Legal					
Construction					80,000,000
Maintenance					
Other					
TOTAL	0	0	0	0	100,000,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Trunk Utility Oversizing	Trunk oversizing of water and sewer facilities as part of development projects
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					
Area Funds	20,000	20,000	20,000	20,000	20,000
Utility Funds					
Assessments/Developer Fees					
Other:					
TOTAL	20,000	20,000	20,000	20,000	20,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect					
Admin/Legal					
Construction	20,000	20,000	20,000	20,000	20,000
Maintenance					
Other					
TOTAL	20,000	20,000	20,000	20,000	20,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Stormwater maintenance	Annual costs of pond and structure maintenance for City Stormwater system.
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					
Area Funds					
Utility Funds	205,000	210,000	217,000	224,000	230,000
Assessments/Developer Fees					
Other:					
TOTAL	205,000	210,000	217,000	224,000	230,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect					
Admin/Legal					
Construction					
Maintenance	205,000	210,000	217,000	224,000	230,000
Other					
TOTAL	205,000	210,000	217,000	224,000	230,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Annual sewer line maintenance/spot sliplining	
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					
Area Funds					
Utility Funds	50,000	52,000	53,000	55,000	56,000
Assessments/Developer Fees					
Other:					
TOTAL	50,000	52,000	53,000	55,000	56,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect					
Admin/Legal					
Construction					
Maintenance	50,000	52,000	53,000	55,000	56,000
Other					
TOTAL	50,000	52,000	53,000	55,000	56,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project Description**
Streetlight system improvements	Annual cost to refurbish and upgrade the City Streetlight infrastructure.
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					
Area Funds					
Utility Funds	100,000	103,000	106,000	109,000	112,000
Assessments/Developer Fees					
Other:					
TOTAL	100,000	103,000	106,000	109,000	112,000

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect					
Admin/Legal					
Construction					
Maintenance	100,000	103,000	106,000	109,000	112,000
Other					
TOTAL	100,000	103,000	106,000	109,000	112,000
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

Project Title	**Project description**
Pedestrian Improvements	2029 - Install Pedestrian Crossing Infrastructure, including Rectangular Rapid Flashing Beacon and marked crosswalk: 80th Street at Pinetree Valley Park and Pinetree Pond Park ($300,000), and Hadley Avenue at 92nd Street ($50,000)
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA					
Washington County					
Federal/Grant Funding					
Area Funds					
Utility Funds					
Assessments/Developer Fees					
Other: Grants				350,000	
TOTAL	0	0	0	350,000	0

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect				70,000	
Admin/Legal					
Construction				280,000	
Maintenance					
Other					
TOTAL	0	0	0	350,000	0
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

CITY OF COTTAGE GROVE
5 YEAR CAPITAL IMPROVEMENT BUDGET
2026-2030 CAPITAL IMPROVEMENT PROGRAM

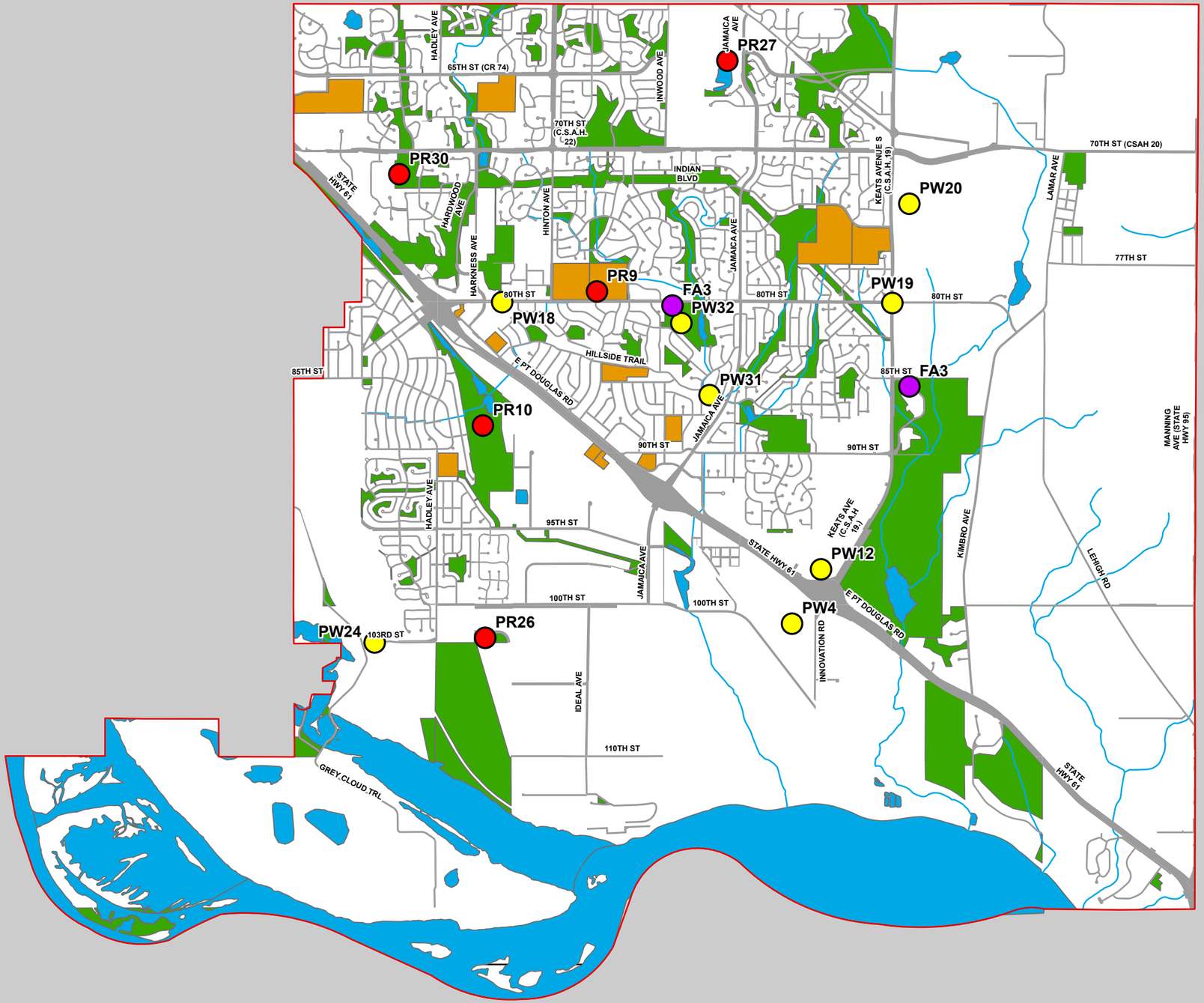
Project Title	**Project Description**
Safe Streets and Roads for All (SS4A)	Develop a Safe Street and Roads for All plan
Department	
Public Works	

Funding Sources	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Levy					
Bonded Debt					
State of Minnesota/MSA	88,000				
Washington County					
Federal/Grant Funding	352,000				
Area Funds					
Utility Funds					
Assessments/Developer Fees					
Other:					
TOTAL	440,000	-	-	-	-

Project Expenses	**2026**	**2027**	**2028**	**2029**	**2030**
Land/Easements/Utility Relocation					
Engineering/Architect	440,000				
Admin/Legal					
Construction					
Maintenance					
Other					
TOTAL	440,000	-	-	-	-
Project Balance	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

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Current Year CIP	Last Year CIP	points	Location	Description	map	Maintenance	Replace	New	Total
2026	2026		Parks	Funds used to match donations for park projects				10,000	10,000
2026	2026		Public Landscape initiative	See Project Sheet Detail				80,000	80,000
2026	2026		Parks	Park design & master planning				15,000	15,000
2026	2026		Parks	Annual addition of auto. locks on park buildings				35,000	35,000
2026	2026		Parks	Sports lighting improvements - Hamlet Park	PR10		355,000		355,000
2026	2025		Denzer Park	Neighborhood park development	PR26			300,000	300,000
2026	2027		Roberts Lake Neighborhood	Neighborhood park development	PR27			500,000	500,000
2026	2026		Hamlet Park	Skate park surface replacement	PR10		100,000		100,000
2026			Bike Park	Jump line improvements	PR30		75,000		75,000
2026	2026		Ice Arena	See Project Sheet Detail	PR9		145,000		145,000
2026			City Hall & Central Fire	Major maintenance projects	FA3	212,133			212,133
2026	2026		Roadway & trail maintenance	Streets, sidewalk/curb replacement, & trails		1,979,000			1,979,000
2026	2025		Pavement Management	Thompson Grove Estates 11th Add, south part Woodridge Park Add (W of Jamaica)	PW31		3,415,000		3,415,000
2026	2026	**511**	CSAH 19 and TH 61	100th Street Extension	PW4		680,000		680,000
2026	2028		Ravine Parkway-Shoppes at CV	Phase 1 Construction-EPD to first intersection & hotel access	PW12			4,223,000	4,223,000
2026	2026		80th Street	Ideal to Hwy 61 (see Project Sheet)	PW18		17,290,100		17,290,100
2026	2026		80th Street	Roundabout at Keats Ave (cost share)	PW19			4,000,000	4,000,000
2026	2026		Ravine Parkway	Ravara Trails (Tank/Brier)	PW20			3,200,000	3,200,000
2026	2025		Safe Streets and Roads for all	Develop plan				440,000	440,000
2026	2026		3M Settlement Implementation	Intermediate zone water treatment plant	PW32			34,045,192	34,045,192
2026	2026		East Ravine District	City share of development infrastructure				50,000	50,000
2026			103rd Street Railroad Budget	Reconstruction of 103rd Street Railroad Bridge	PW24		150,000		150,000
2026	2026		Trunk oversizing	Utilities				20,000	20,000
2026	2026		Well Maintenance	Pull well		90,000			90,000
2026			SCADA & Well upgrades	IZWTP watermain replacement & Well 3/10		887,900			887,900
2026	2026		Various sewer	Spot replacement/slip lining		50,000			50,000
2026	2026		various stormwater	Storm water maintenance		205,000			205,000
2026	2026		various streetlights	System improvements		100,000			100,000
						3,524,033	22,210,100	46,918,192	72,652,325



CIP Projects

- Parks and Recreation
- Public Works
- Facilities

2026 CIP Project Locations

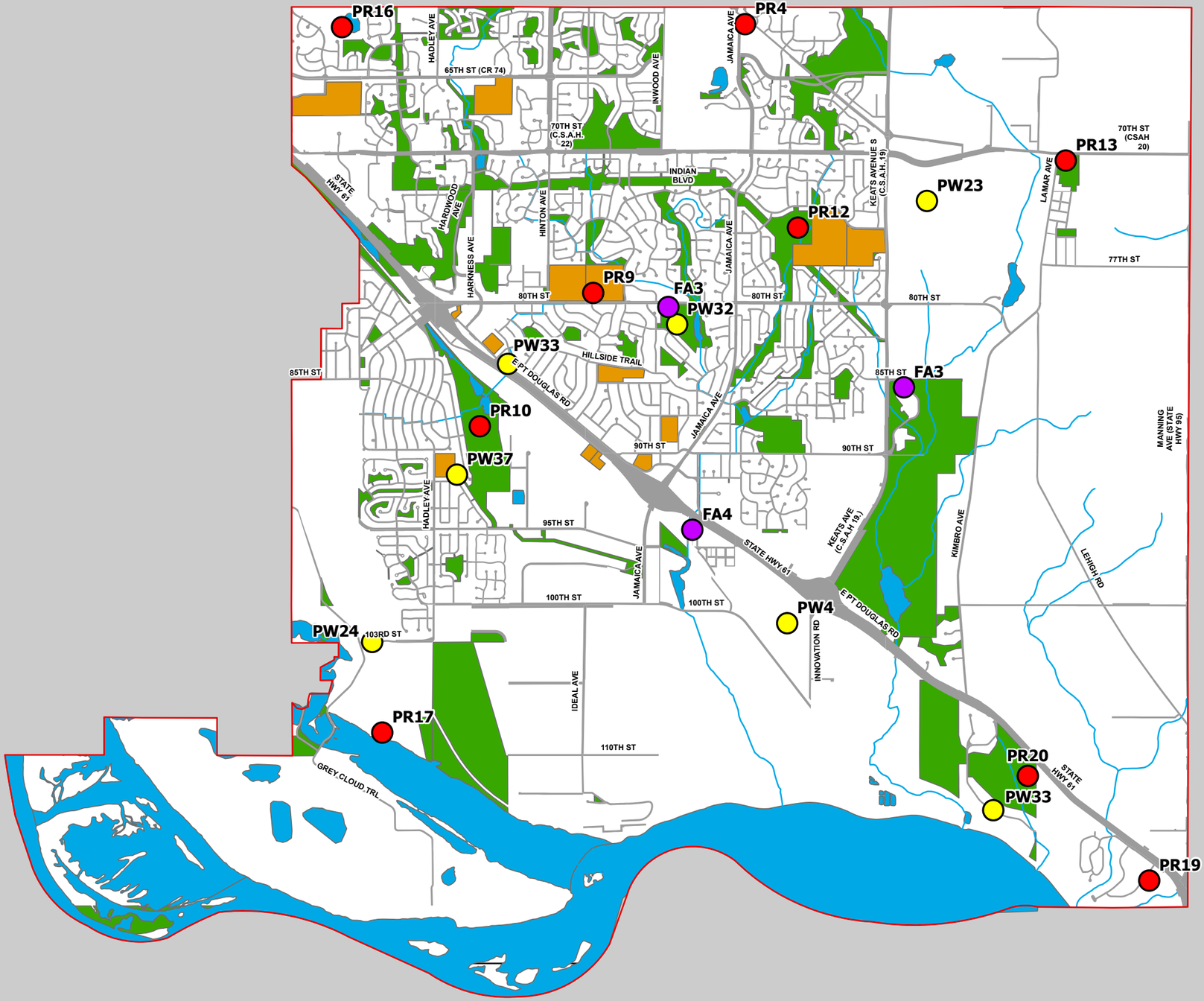
Cottage Grove, MN

Date: 10/8/2024

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Current Year CIP	Last Year CIP	points	Location	Description	map	Maintenance	Replace	New	Total
2027	2027		Parks	Funds used to match donations for park projects				10,000	10,000
2027	2027		Public Landscape initiative	See Project Sheet Detail				100,000	100,000
2027	2027		Parks	Park design & master planning				15,000	15,000
2027	2027		Parks	Annual addition of auto. locks on park buildings				35,000	35,000
2027	2027		Parks	Sports lighting improvements - Lamar Park	PR13		350,000		350,000
2027	2026		Still Ponds	Neighborhood park development	PR16			500,000	500,000
2027	2027		Military Trailhead	Neighborhood park development	PR4			200,000	200,000
2027			River Oaks scenic overlook	Scenic overlook	PR20		100,000		100,000
2027	2027		Hamlet Park	Shelter replacement	PR10		50,000		50,000
2027	2026		Hamlet Park	Skate park equipment	PR10		300,000		300,000
2027	2027		Lamar Park	Roof-Replaced 2025 remove from future CIP	PR13		10,000		10,000
2027	2026		Kingston Park	Building replacement	PR12		5,000,000		5,000,000
2027	2027		Pine Coulee	Court replacement	PR19		20,000		20,000
2027	2027		Ice Arena	See Project Sheet Detail	PR9		125,000		125,000
2027			Ice Arena	Office & Interior remodel	PR9		1,500,000		1,500,000
2027			City Hall & Central Fire	Major maintenance projects	FA3	218,680			218,680
2027			Public Works	Water heater	FA4		12,000		12,000
2027	2027		Mississippi Dunes	Infrastrucutre, Parking lot, trails, boat ramp	PR17			7,000,000	7,000,000
2027	2027		Roadway & trail maintenance	Streets, sidewalk/curb replacement, & trails		2,078,000			2,078,000
2027	2027		Pavement Management	East Point Douglas (Inwood to CDS), Kingsborough Trail	PW33		3,508,000		3,508,000
2027	2026	**511**	CSAH 19 and TH 61	100th Street Extension	PW4		27,742,500		27,742,500
2027	2027		Ravine Parkway	Tank North, Tank South, Geis, Goebel	PW23			1,200,000	1,200,000
2027	2027		3M Settlement Implementation	Intermediate Zone Water Treatment Plant	PW32		30,045,192		30,045,192
2027	2027		Pine Hill	Water tower painting	PW37	1,000,000			1,000,000
2027	2027		East Ravine District	City share of development infrastructure				50,000	50,000
2027			103rd Street Railroad Budget	Reconstruction of 103rd Street Railroad Bridge	PW24		150,000		150,000
2027	2027		Trunk oversizing	Utilities				20,000	20,000
2027	2027		Well Maintenance	Pull well		93,000			93,000
2027			SCADA & Well upgrades	IZWTP Well SCADA Upgrades		304,500			304,500
2027	2027		Various sewer	Spot replacement/slip lining		52,000			52,000
2027	2027		Various stormwater	Storm water maintenance		210,000			210,000
2027	2027		Various streetlights	System improvements		103,000			103,000
						4,059,180	68,912,692	9,130,000	82,101,872



CIP Projects

- Parks and Recreation
- Public Works
- Facilities

Cottage Grove
Where Pride and Prosperity Meet

2027 CIP Project Locations

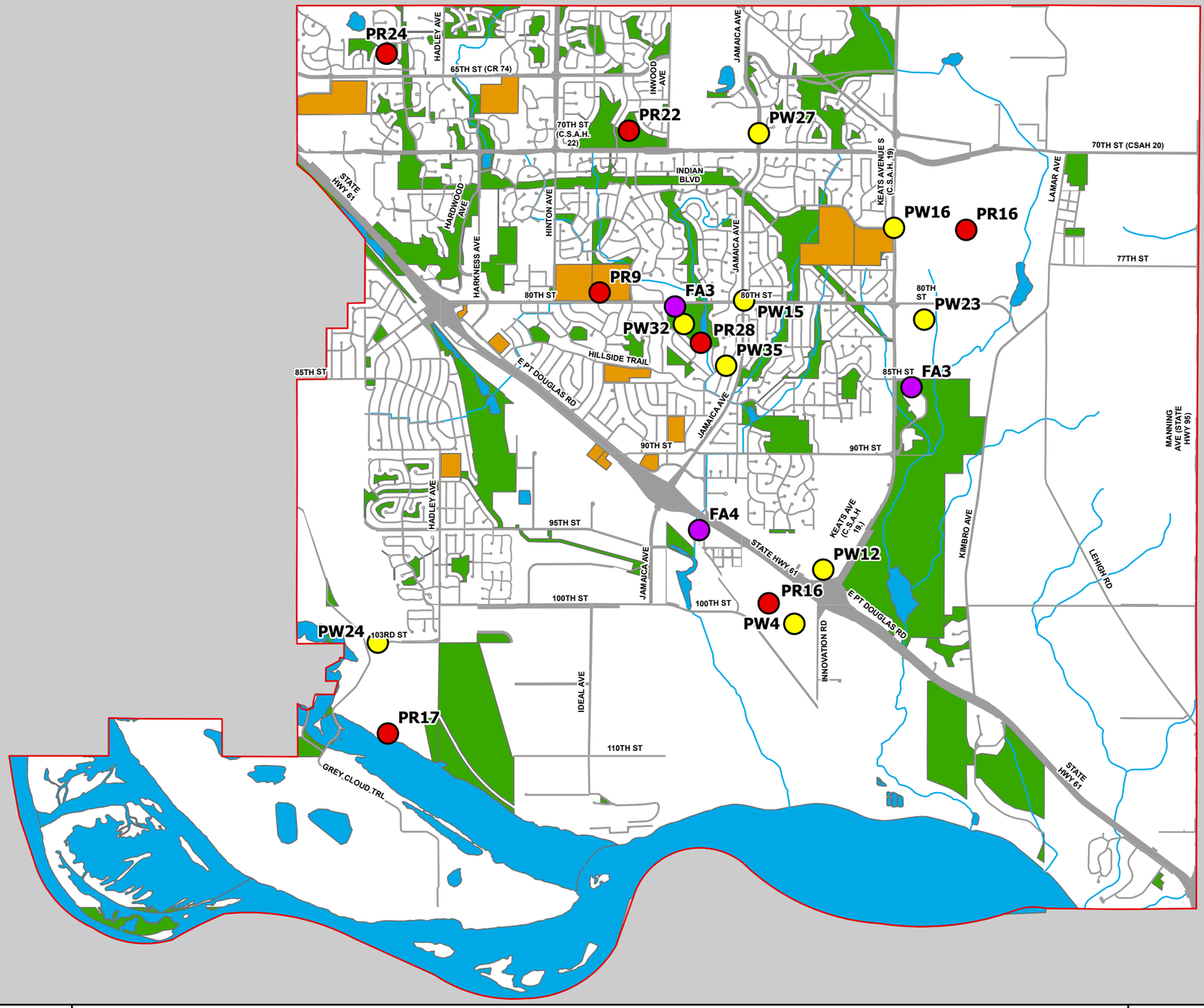
Cottage Grove, MN

Date: 10/8/2024

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Current Year CIP	Last Year CIP	points	Location	Description	map	Maintenance	Replace	New	Total
2028	2028		Parks	Funds used to match donations for park projects				10,000	10,000
2028	2028		Public Landscape initiative	See Project Sheet Detail				120,000	120,000
2028	2028		Parks	Park design & master planning				15,000	15,000
2028	2028		Parks	Annual addition of auto. locks on park buildings				35,000	35,000
2028	2028		Parks	Sports lighting replacement			35,000		35,000
2028	2028		East Ravine or 100th Street Park	Neighborhood park development	PR16			500,000	500,000
2028	2028		Highlands Park	Tennis court replacement	PR22		100,000		100,000
2028	2028		Peter Thompson Park	Rink boards and sport courts	PR24		315,000		315,000
2028	2025		Pine Tree Pond Park	Park Improvements	PR28		500,000		500,000
2028	2028		Ice Arena	See Project Sheet Detail	PR9		145,000		145,000
2028	2028		Mississippi Dunes	Recreation facilities	PR17			2,000,000	2,000,000
2028			City Hall & Central Fire	Major maintenance projects	FA3	321,214			321,214
2028			Public Works	Garage doors & flooring	FA4		85,000		85,000
2028	2028		Roadway & trail maintenance	Streets, sidewalk/curb replacement, & trails		2,183,000			2,183,000
2028	2028		Pavement Management	Thompson Grove Estates 12 Add, north part Woodridge Park Add (W of Jamaica)	PW35		3,766,000		3,766,000
2028	2027	**511**	CSAH 19 and TH 61	100th Street Extension	PW4			23,077,500	23,077,500
2028	2028		Jamaica	Rose of Sharon to Military	PW27		3,000,000		3,000,000
2028	2028		Ravine Parkway	Tank North, Tank South, Geis, Goebel	PW23			1,000,000	1,000,000
2028	2028		Ravine Parkway-Shoppes at CV	Phase 2-First access to roundabout	PW12			2,527,000	2,527,000
2028	2027		3M Settlement Implementation	Intermediate Zone Water Treatment Plant	PW32		12,518,830		12,518,830
2028	2026		Traffic Signal	80th & Jamaica	PW15			740,000	740,000
2028	2026		Traffic Signal	CSAH 19 & Indian Blvd.	PW16			740,000	740,000
2028	2028		East Ravine District	City share of development infrastructure				50,000	50,000
2028			103rd Street Railroad Budget	Reconstruction of 103rd Street Railroad Bridge	PW24		800,000		800,000
2028	2028		Trunk oversizing	Utilities				20,000	20,000
2028	2028		Well Maintenance	Pull well		96,000			96,000
2028	2028		Various sewer	Spot replacement/slip lining		53,000			53,000
2028	2028		various stormwater	Storm water maintenance		217,000			217,000
2028	2028		various streetlights	System improvements		106,000			106,000
						2,976,214	21,264,830	30,834,500	55,075,544



CIP Projects

- Parks and Rec
- Public Works
- Facilities

Cottage Grove
Where Pride and Prosperity Meet

2028 CIP Project Locations

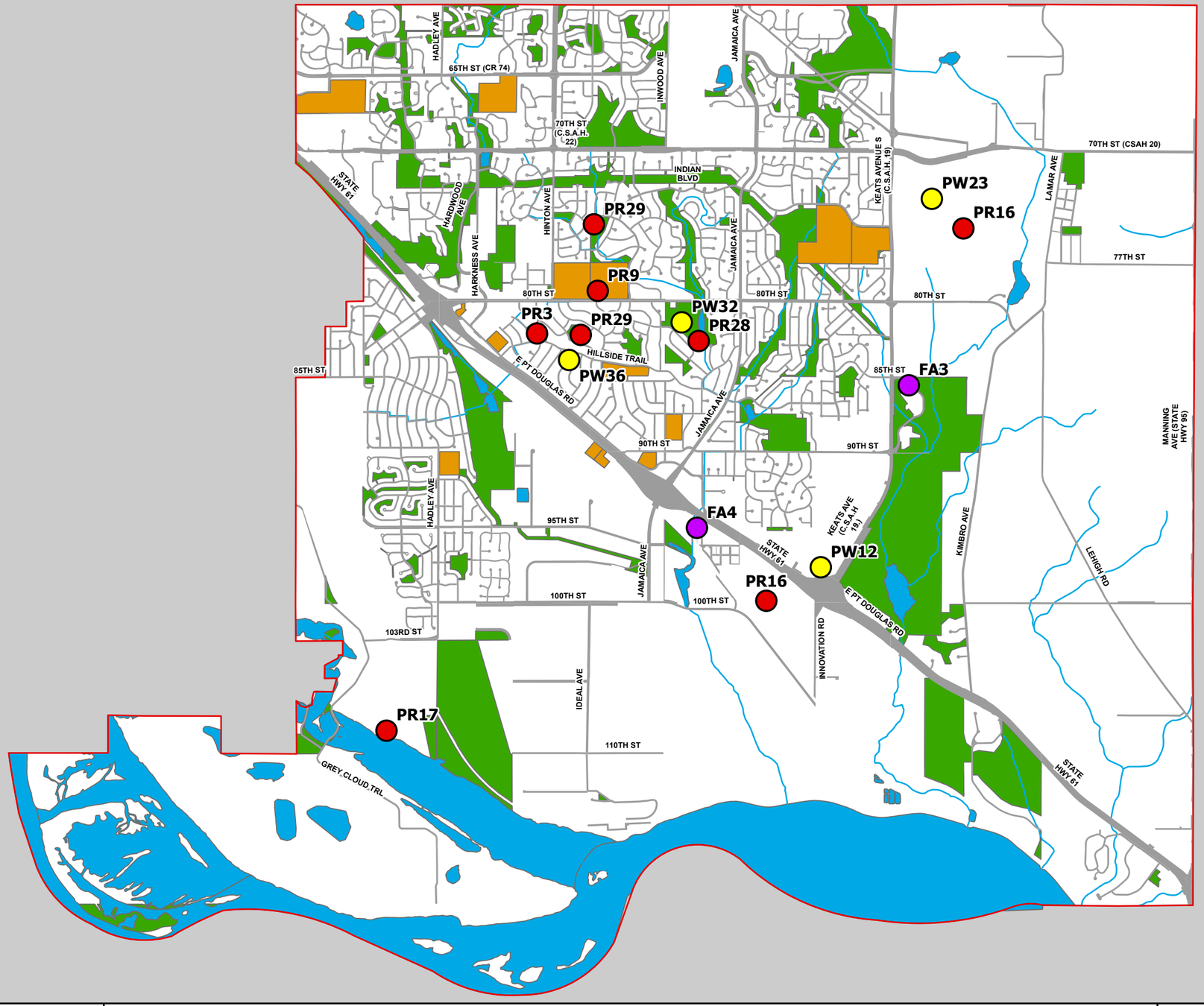
Cottage Grove, MN

Date: 10/16/2025

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Current Year CIP	Last Year CIP	points	Location	Description	map	Maintenance	Replace	New	Total
2029	2029		Parks	Funds used to match donations for park projects				10,000	10,000
2029	2029		Public Landscape initiative	See Project Sheet Detail				100,000	100,000
2029	2029		Parks	Park design & master planning				15,000	15,000
2029	2029		Parks	Annual addition of auto. locks on park buildings				35,000	35,000
2028	2028		Hearthside Park	Park improvements as part of pavement mgmt.	PR3		100,000		100,000
2028	2028		Hemingway & North Ideal	Replace playground equipment	PR29		150,000		150,000
2029	2029		East Ravine or 100th Street Park	Neighborhood park development	PR16			500,000	500,000
2029	2029		Pine Tree Pond Park	Court replacement	PR28		30,000		30,000
2029	2029		Ice Arena	See Project Sheet Detail	PR9		575,000		575,000
2029	2028		Mississippi Dunes	Park Building	PR17			7,000,000	7,000,000
2029			City Hall & Central Fire	Major maintenance projects	FA3	219,900			219,900
2029			Public Works	Roof replacement	FA4		800,000		800,000
2029	2029		Roadway & trail maintenance	Streets, sidewalk/curb replacement, & trails		2,292,000			2,292,000
2029	2029		Pavement Management	Thompson Grove Estates and Hillside Trail	PW36		6,066,000		6,066,000
2029	2029		Ravine Parkway	Tank North, Tank South, Geis, Goebel	PW23			1,000,000	1,000,000
2029	2029		Ravine Parkway-Shoppes at CV	Phase 3 Roundabout to CSAH 19	PW12			4,343,000	4,343,000
2027	2027		3M Settlement Implementation	Intermediate Zone Water Treatment Plant	PW32		4,003,766		4,003,766
2029	2029		Pedestrian Improvements	See Project Sheet Detail				350,000	350,000
2029	2029		East Ravine District	City share of development infrastructure				50,000	50,000
2029	2029		Trunk oversizing	Utilities				20,000	20,000
2029	2029		Well Maintenance	Pull well		99,000			99,000
2029	2029		Various sewer	Spot replacement/slip lining		55,000			55,000
2029	2029		various stormwater	Storm water maintenance		224,000			224,000
2029	2029		various streetlights	System improvements		109,000			109,000
						2,998,900	11,724,766	13,423,000	28,146,666



CIP Projects

- Parks and Rec
- Public Works
- Facilities

2029 CIP Projects

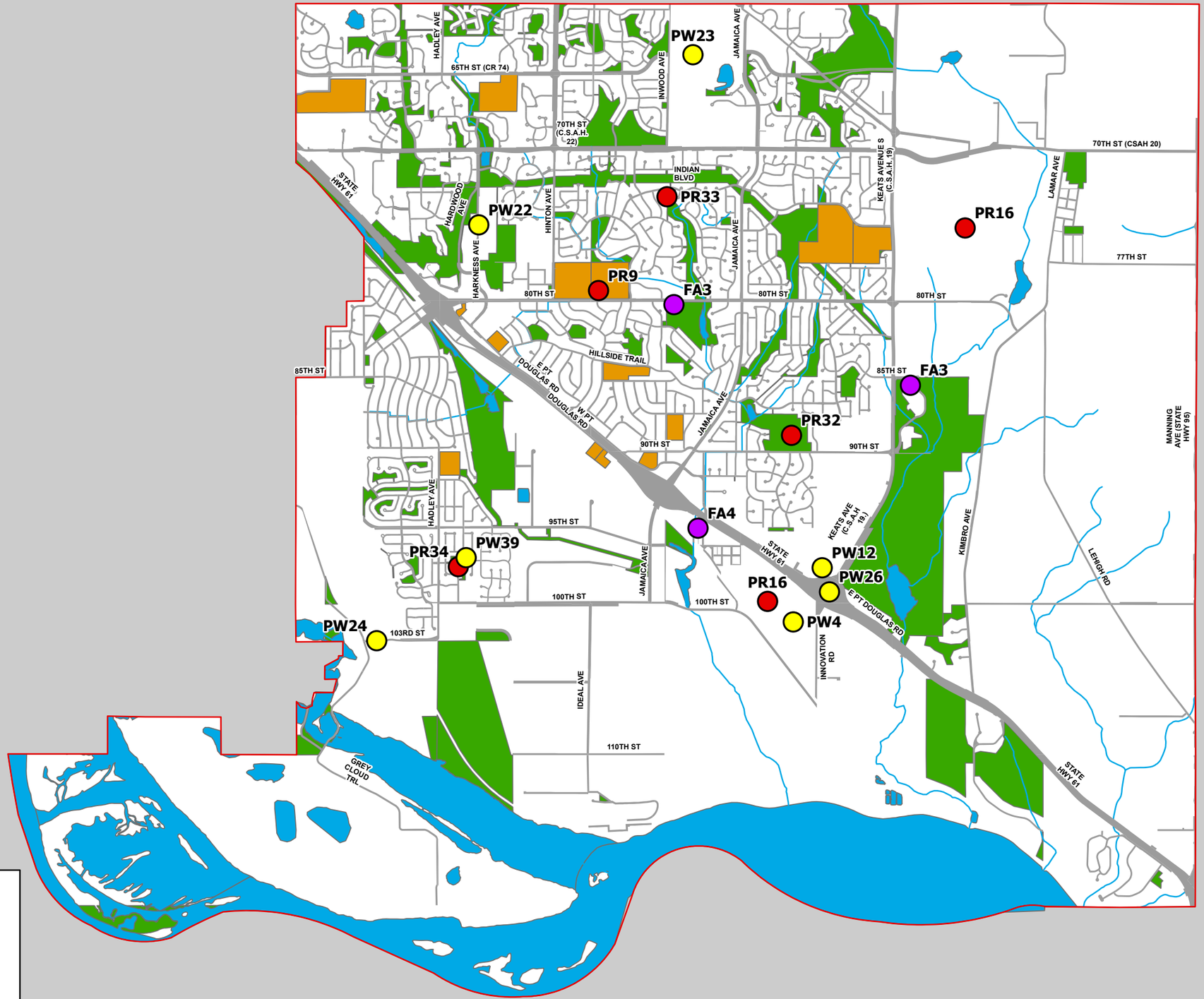
Cottage Grove, MN

Date: 10/16/2025

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Current Year CIP	Last Year CIP	points	Location	Description	map	Maintenance	Replace	New	Total
2030			Parks	Funds used to match donations for park projects				10,000	10,000
2030			Public Landscape initiative	See Project Sheet Detail				100,000	100,000
2030			Parks	Park design & master planning				15,000	15,000
2030			Parks	Annual addition of auto. locks on park buildings				35,000	35,000
2030			Nina, Hamlet, Highlands, Granada	Picnic shelter replacement				60,000	60,000
2030			Woodridge	Playground surface replacement	PR32		500,000		500,000
2030			Woodridge	Court resurfacing	PR32		150,000		150,000
2030			Pine Glen	Park improvements	PR34		100,000		100,000
2030			Pine Tree Valley	Ice rink board replacement	PR33		150,000		150,000
2030			East Ravine or 100th Street Park	Neighborhood park development	PR16			500,000	500,000
2030			Ice Arena	See Project Sheet Detail	PR9		60,000		60,000
2029			City Hall & Central Fire	Major maintenance projects	FA3	448,496			448,496
2029			Public Works	Vinyl tile replacement	FA4		60,000		60,000
2030			Roadway & trail maintenance	Streets, sidewalk/curb replacement, & trails		2,407,000			2,407,000
2030			Pavement Management	Pine Glen and Cottage Grove Estates	PW39		8,126,000		8,126,000
2030		**511**	CSAH 19 and TH 61	Realignment of bridge (see project sheet)	PW26		22,900,000		22,900,000
2030			Ravine Parkway	Kemp Property	PW23			200,000	200,000
2030			Ravine Parkway-Shoppes at CV	Phase 4-North of roundabout	PW12			1,353,000	1,353,000
2030	2029		Harkness Ave - Hardwood to Woodridge	Reconstruct roadway	PW22		3,162,000		3,162,000
2030	2029		103rd Street Railroad Budget	Reconstruction of 103rd Street Railroad Bridge	PW24		8,000,000		8,000,000
2030			East Ravine District	City share of development infrastructure				50,000	50,000
2030			Trunk oversizing	Utilities				20,000	20,000
2030			Well Maintenance	Pull well		102,000			102,000
2030			Various sewer	Spot replacement/slip lining		56,000			56,000
2030			various stormwater	Storm water maintenance		230,000			230,000
2030			various streetlights	System improvements		112,000			112,000
2030	2029		Water softening	Federal/Grant Funding				100,000,000	100,000,000
						3,355,496	43,208,000	102,343,000	148,906,496



CIP Projects

- Parks and Rec
- Public Works
- Facilities

2030 CIP Projects

Date: 10/16/2025

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City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Road and Trailway Maintenance Fund (235)
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Aggregate tax	$ 38,775	$ 20,314	$ 22,000	$ 22,000	$ 22,000	$ 22,000	$ 22,000	$ 22,000
Grant Funds								
Franchise fees	860,203	2,071,626	1,994,400	2,130,000	2,200,000	2,244,000	2,289,000	2,335,000
Investment Interest	9,928	32,435	10,000	10,000	10,000	20,100	21,800	22,600
Charges for services	54,121	45,300	-	-	-	-	-	-
Developer charges	34,624	1,720	-	-	-	-	-	-
Total Revenue	997,651	2,171,395	2,026,400	2,162,000	2,232,000	2,286,100	2,332,800	2,379,600
EXPENDITURES								
Commodities								
Trail fog seal, crack seal and sidewalk/curb repair	193,670	295,442	252,000	287,000	302,000	317,000	333,000	350,000
CR 74 trail		5,979						
Mill and Overlay	546,614	1,203,983	970,000	1,019,000	1,070,000	1,124,000	1,180,000	1,239,000
Trail replacement			504,000	507,000	532,000	559,000	587,000	616,000
Engineering for M&O and Trail replacement			158,000	166,000	174,000	183,000	192,000	202,000
Contractual services	4,142	510						
Total Expenditures	744,426	1,505,914	1,884,000	1,979,000	2,078,000	2,183,000	2,292,000	2,407,000
Other Financing Sources (uses)								
Transfer In/(out)	-	(306,728)	-	3,000	14,000	10,000	11,000	15,000
Total transfers	-	(306,728)	-	3,000	14,000	10,000	11,000	15,000
Increase (decrease) in fund balance	253,225	358,753	142,400	186,000	168,000	113,100	51,800	(12,400)
FB Balance beginning of year	230,719	483,944	842,697	985,097	1,171,097	1,339,097	1,452,197	1,503,997
FB Balance end of year	483,944	842,697	985,097	1,171,097	1,339,097	1,452,197	1,503,997	1,491,597

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Ice Arena Capital Fund (526)
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Donation	80,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Grant								
Interest	14,682	21,031	11,900	-	-	-	-	-
Miscellaneous			4,000	146,000				
Total Revenue	94,682	101,031	95,900	226,000	80,000	80,000	80,000	80,000
EXPENDITURES								
Solar Panels	24,447	440,046						
South Rink Rubber Floor		5,719						
West Rink Cooling Tower		76,921						
Water treatment system			100,000					
West Rink-bleacher heat			35,000					
Dehumidifier wheel replacement			35,000					
Ice Arena Space Needs Study			40,000					
Zamboni replacement				145,000				
Locker 5/6/7-furnace					10,000			
Floor scrubber					15,000			
Water treatment system					100,000			
Office & Interior Remodel					1,500,000			
Zamboni replacement						145,000		
Common areas rooftop HVAC unit							75,000	
Steel roof							500,000	
Office/Mezzanine Furnace								60,000
Miscellaneous	5,840							
Total Expenditures	30,287	522,686	210,000	145,000	1,625,000	145,000	575,000	60,000
Other Financing Sources (uses)								
Bond Proceeds					1,500,000			
Transfer in from Ice Operating								
Total other sources	-	-	-	-	1,500,000	-	-	-
Increase (decrease) in fund balance	64,395	(421,655)	(114,100)	81,000	(45,000)	(65,000)	(495,000)	20,000
FB Beginning balance	-	64,395	(357,260)	(471,360)	(390,360)	(435,360)	(500,360)	(995,360)
FB Ending balance	64,395	(357,260)	(471,360)	(390,360)	(435,360)	(500,360)	(995,360)	(975,360)
Cash Balance	384,395	282,740	88,640	89,640	(35,360)	(180,360)	(755,360)	(815,360)

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Storm Water Utility Fund (230)
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Charges for Services*	$ 1,132,552	$ 1,214,681	$ 1,251,100	$ 1,283,500	$ 1,322,000	$ 1,361,700	$ 1,402,600	$ 1,444,700
Intergovernmental - County/State	165,084	360,976						
Interest	107,709	126,867	10,000	23,500	23,500	23,900	22,900	19,300
Miscellaneous	17,414			14,900	14,900	14,900	14,900	14,900
Total Revenue	1,422,759	1,702,524	1,261,100	1,321,900	1,360,400	1,400,500	1,440,400	1,478,900
EXPENDITURES								
Operating expenses	712,613	829,809	803,280	858,430	892,760	919,543	947,129	975,543
Pavement Management	123,033	22,125	132,000	244,700	242,000	270,000	453,400	156,700
Roadway & Trail Maintenance				1,000	4,700	3,400	3,700	5,000
Annual maintenance projects	89,842	145,882	200,000	205,000	210,000	217,000	224,000	230,000
East Point Douglas and Jamaica		714,430						
EastbBooke 2nd Addition-Basins		163,219						
Capital Outlay		354,439	350,000					
Total Expenditures	925,488	2,229,904	1,485,280	1,309,130	1,349,460	1,409,943	1,628,229	1,367,243
OTHER FINANCING SOURCES (USES)								
Transfers in								
Transfers out	(45,096)	(46,450)	(47,850)	(49,300)	(50,800)	(52,300)	(53,900)	(55,500)
Total other sources	(45,096)	(46,450)	(47,850)	(49,300)	(50,800)	(52,300)	(53,900)	(55,500)
Increase (decrease) in fund balance	452,175	(573,830)	(272,030)	(36,530)	(39,860)	(61,743)	(241,729)	56,157
FB Beginning balance	2,060,248	2,512,423	1,938,593	1,666,563	1,630,033	1,590,173	1,528,430	1,286,701
FB Ending balance	2,512,423	1,938,593	1,666,563	1,630,033	1,590,173	1,528,430	1,286,701	1,342,858

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Water Utility Fund (610)
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Charges for Services*	$ 3,973,360	$ 3,360,540	$ 3,874,152	$ 4,427,000	$ 5,161,900	$ 6,018,800	$ 7,017,900	$ 7,551,300
Intergovernmental	67,054	124,710	98,000	232,200	243,000	250,300		100,000,000
Interest	440,954	756,885	53,748	93,700	86,300	97,500	117,200	143,700
Miscellaneous	200,700	184,280	225,600	294,000	305,000	322,700	335,800	344,600
Total Revenue	4,682,068	4,426,415	4,251,500	5,046,900	5,796,200	6,689,300	7,470,900	108,039,600
EXPENDITURES								
Operating expenses	2,853,085	2,924,409	3,337,540	3,717,050	3,858,800	3,974,564	4,093,801	4,216,615
Capital Equipment				65,000	147,000	215,700	224,000	45,000
Well maintenance			70,000	90,000	93,000	96,000	99,000	102,000
Water Tower Painting					1,000,000			
Water tower			6,000,000					
SCADA upgrades				887,900	304,500			
Utilities Building								
Water Softening								100,000,000
Pavement management		9,202	132,000	244,700	121,000	270,000	453,400	156,700
Roadway & Trail Maintenance				1,000	4,700	3,400	3,700	5,000
80th Street Reconstruction				31,300				
EPD & Jamaica		418,078						
Debt Payment & Issuance Cost-Water Tower				224,100	424,375	425,750	421,500	421,625
Debt Payment & Issuance Cost-Building		328,006	500,900	592,000	591,000	590,000	591,100	592,100
Total Expenditures	2,853,085	3,679,695	10,040,440	5,853,050	6,544,375	5,575,414	5,886,501	105,539,040
OTHER FINANCING SOURCES (USES)								
Bond issuance		8,551,882	3,690,000					
Changes in assets and liabilities	(177,253)	(8,163,083)						
Transfers in			1,000,000	224,100	424,375	425,750	421,500	421,625
Transfers out	(953,493)	(207,752)	(209,850)	(216,100)	(222,600)	(229,300)	(236,200)	(243,300)
Total other sources	(1,130,746)	181,047	4,480,150	8,000	201,775	196,450	185,300	178,325
Increase (decrease) in net position	698,237	927,767	(1,308,790)	(798,150)	(546,400)	1,310,336	1,769,699	2,678,885
Unrestricted Net Position Beginning balance	7,528,192	8,226,429	9,154,196	7,845,406	7,047,256	6,500,856	7,811,192	9,580,891
Unrestricted Net Position Ending balance	8,226,429	9,154,196	7,845,406	7,047,256	6,500,856	7,811,192	9,580,891	12,259,776

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Sewer Utility Fund (620)
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Charges for Service	$ 3,600,456	$ 3,977,841	$ 4,185,870	$ 4,620,200	$ 5,017,600	$ 5,398,900	$ 5,809,200	$ 6,250,700
Interest	175,014	185,133	37,000	34,900	34,800	69,600	73,100	77,900
Interfund Interest			19,200	17,000	15,000	12,700	10,000	7,300
Grant-Met Council								
Miscellaneous	(26,140)	12,943	2,500	90,000	89,900	89,900	89,900	89,900
Total Revenue	3,749,330	4,175,917	4,244,570	4,762,100	5,157,300	5,571,100	5,982,200	6,425,800
EXPENDITURES								
Operating Expenses	3,387,402	3,726,414	4,027,670	4,273,450	4,447,400	4,580,822	4,718,247	4,859,794
Pavement Management	248,941	15,925	132,000	244,700	121,000	270,000	453,400	156,700
Roadway & Trail Maintenance				1,000	4,700	3,400	3,700	5,000
Vac Truck			350,000					
Sewer slip lining - spot replacement			550,000	50,000	52,000	53,000	55,000	56,000
EPD & Jamaica		3,330						
80th Street Reconstruction				19,200				
Debt Payment & Issuance Cost-Building		109,335	166,957	197,231	196,950	196,481	197,044	197,356
Total Expenditures	3,636,343	3,855,004	5,226,627	4,785,581	4,822,050	5,103,703	5,427,391	5,274,850
OTHER FINANCING SOURCES (USES)								
Bond issuance		2,850,628						
Changes in assets and liabilities		(2,765,574)						
Transfers in								
Transfers out	(197,796)	(206,303)	(209,850)	(216,150)	(222,600)	(229,300)	(236,200)	(243,300)
Total other sources	(197,796)	(121,249)	(209,850)	(216,150)	(222,600)	(229,300)	(236,200)	(243,300)
Increase (decrease) in net position	(84,809)	199,664	(1,191,907)	(239,631)	112,650	238,097	318,609	907,650
Unrestricted Net Position Beginning balance	5,842,533	5,757,724	5,957,388	4,765,481	4,525,850	4,638,500	4,876,597	5,195,206
Unrestricted Net Position Ending balance	5,757,724	5,957,388	4,765,481	4,525,850	4,638,500	4,876,597	5,195,206	6,102,856

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Street Light Utility Fund (630)
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Charges for Services	$ 972,404	$ 1,083,525	$ 1,152,400	$ 1,239,200	$ 1,338,300	$ 1,405,200	$ 1,475,500	$ 1,549,300
City Supplied Poles	$ 67,600	$ 201,177	$ 170,500	$ 170,500	$ 170,500	$ 170,500	$ 170,500	$ 170,500
Intergovernmental - County/State						370,000	350,000	
Development Charge						370,000		
Interest	20,782	26,694	5,000	5,000	5,000	9,400	(500)	2,200
Miscellaneous	18,032	76,019	20,000	35,100	35,100	35,100	35,100	35,100
Total Revenue	1,078,818	1,387,415	1,347,900	1,449,800	1,548,900	2,360,200	2,030,600	1,757,100
EXPENDITURES								
Operating expenses	929,424	1,193,225	987,630	1,035,920	1,065,500	1,086,810	1,108,546	1,130,717
Street Light Service Truck			230,000					
Pavement management	82,527			261,000	79,000	288,000	221,000	623,000
Traffic Signal-Hardwood Ave/Hardwood Ct			700,000					
Traffic Signal-80th/Jamaica						740,000		
Traffic Improvement-Keats/Indian Blvd						740,000		
Jamaica and 95th Intersection			13,000					
Annual system improvements			100,000	100,000	103,000	106,000	109,000	112,000
Pedestrian Crossings			100,000				350,000	
Total Expenditures	1,011,951	1,193,225	2,130,630	1,396,920	1,247,500	2,960,810	1,788,546	1,865,717
OTHER FINANCING SOURCES (USES)								
Transfers in			700,000					
Transfers out	(51,500)	(53,000)	(56,000)	(57,680)	(59,400)	(61,200)	(63,000)	(64,900)
Total other sources	(51,500)	(53,000)	644,000	(57,680)	(59,400)	(61,200)	(63,000)	(64,900)
Increase (decrease) in net position	15,367	141,190	(138,730)	(4,800)	242,000	(661,810)	179,054	(173,517)
Unrestricted Net Position Beginning balance	374,809	390,176	531,366	392,636	387,836	629,836	(31,974)	147,080
Unrestricted Net Position Ending balance	390,176	531,366	392,636	387,836	629,836	(31,974)	147,080	(26,437)

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Park Improvement Fund (515)
Projected Financial Position

	2023 ACTUAL	2024 Actual	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Cell Tower Leases	486,781	607,370	533,800	486,800	496,200	513,400	535,500	554,100
Property Tax Levy				190,000	190,000	190,000	190,000	190,000
Interest	211,300	64,275	50,000	10,900	12,600	11,500	14,800	23,000
other (including donations)	10,780	-						
Total Revenue	708,861	671,645	583,800	687,700	698,800	714,900	740,300	767,100
EXPENDITURES								
Belden playground equipment			70,000					
Bike park-jump line improvements				75,000				
Donations - matching funding			10,000	10,000	10,000	10,000	10,000	10,000
Glacial Valley	13,751	86,461						
Hamlet skate park surface replacement				100,000				
Hamlet-shelter replacement & skate park equip					350,000			
Hamlet-Court Reconstruction	110,365							
Hardwood playground equipment			70,000					
Hearthside Park Improvements as part of PM							100,000	
Hemmingway playground equipment							75,000	
Hidden Valley as part of PM			150,000					
Highland playground equipment	161,570							
Highlands-Tennis court replacement						100,000		
Ideal playground equipment	89,358							
North Ideal playground equipment							75,000	
Kingston Park -Building replacement & power supply	151,947	193,053	200,000		5,000,000			
Lamar Park-shade shelter replace. & roof replace.			80,000		10,000			
Sport Lighting Improvements		89,000	65,000	355,000	350,000	35,000		
Picnic shelters (Nina's, Hamlet, Highlands, Granada)								60,000
Peter Thompson play equipment	116,542							
Peter Thompson-Building door replacement			40,000					
Peter Thompson-park upgrades including roof						315,000		
Pine Coulee-Court Replacement					20,000			
Pine Glen & Pine Tree Park-Picnic shelter			60,000					
Pine Glen								100,000
Pine Tree Pond Play equipment	79,000							
Pine Tree Valley Hockey & Skate Rink	64,295							
Pine Tree Valley-ice rink board replacement								150,000
River Oaks-Scenic Overlook					100,000			
Woodridge shelter/hockey boards & pickleball courts			300,000					
Woodridge-inclusive playground repair & sealing			60,000					
Woodridge-playground surface replacement								500,000
Woodridge-court resurfacing								150,000
West Draw, Granada & Nina Park play equipment		242,928						
West Draw Park Shelter	40,532							
Automatic locks on park buildings			35,000	35,000	35,000	35,000	35,000	35,000
Miscellaneous	95,519	20,004						
Total Expenditures	922,879	631,446	1,140,000	575,000	5,875,000	495,000	295,000	1,005,000
OTHER FINANCING SOURCES (USES)								
Bond proceeds					5,000,000			
Transfer (to) from pavement management			150,000		100,000		100,000	100,000
Transfer (to) from park trust								
Total other sources	-	-	150,000	-	5,100,000	-	100,000	100,000
Increase (decrease) in fund balance	(214,018)	40,199	(406,200)	112,700	(76,200)	219,900	545,300	(137,900)
FB Beginning balance	1,309,704	1,095,686	1,135,885	729,685	842,385	766,185	986,085	1,531,385
FB Ending balance	1,095,686	1,135,885	729,685	842,385	766,185	986,085	1,531,385	1,393,485

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Park Trust Fund (570)
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Intergovernmental	$ 1,000,000	$ -	$ 350,000	$ -	$ -	$ 500,000	$ -	$ -
Intergovernmental-3M Settlement			$ 678,000					
Park Dedication Fees	767,094	763,941	1,011,000	750,000	750,000	750,000	750,000	750,000
Interest	122,895	30,139	-	-	13,000	13,700	9,900	13,100
Other-Grants					5,000,000			
Miscellaneous - Refunds & Reimbursements	2,697							
Total Revenue	1,892,686	794,080	2,039,000	750,000	5,763,000	1,263,700	759,900	763,100
EXPENDITURES								
Miscellaneous	90,670	36,913						
East Ravine Neighborhood						500,000	500,000	500,000
Glacial Valley Park	1,048,538	187,476	113,120					
Glacial Valley Park Building	4,299,248	157,316						
Hamlet Park Expansion	51,169							
Mississippi Dunes	1,041,492	42,267			7,000,000	2,000,000	7,000,000	
Military Trailhead					200,000			
Jack and Marlys Denzer Park		28,251	200,000	300,000				
Oakwood Park	8,203	145						
Parks - Master Planning	12,534	23,907	15,000	15,000	15,000	15,000	15,000	15,000
Oltman Middle School		8,166	3,000,000					
Pine Tree Pond Park Improvements						500,000		
Pine Tree Pond Court Replacement							30,000	
Roberts Lake Neighborhood development				500,000				
Still Ponds park development					500,000			
Highway 61 trail planning		11,555						
Trails as part of development	50,000	21,000						
Total Expenditures	6,601,854	516,996	3,328,120	815,000	7,715,000	3,015,000	7,545,000	515,000
OTHER FINANCING SOURCES (USES)								
Bond Proceeds	4,816,062	(492,801)		2,300,000	2,000,000	1,500,000	7,000,000	
Transfer from Park Improvement Fund		-						
Transfer (to) park improvement & ED Trust			(120,000)	-	-	-	-	-
Total other sources	4,816,062	(492,801)	(120,000)	2,300,000	2,000,000	1,500,000	7,000,000	-
Increase (decrease) in fund balance	106,894	(215,717)	(1,409,120)	2,235,000	48,000	(251,300)	214,900	248,100
FB Beginning balance	147,658	254,552	38,835	(1,370,285)	864,715	912,715	661,415	876,315
FB Ending balance	254,552	38,835	(1,370,285)	864,715	912,715	661,415	876,315	1,124,415

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Landscape Initiative-in Fund 510
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Grants	8,382	36,831	88,674	31,502	-	50,000	-	-
Tree Mitigation-6489	118,281	-	40,000	40,000	40,000	40,000	40,000	40,000
Total Revenue	126,663	36,831	128,674	71,502	40,000	90,000	40,000	40,000
EXPENDITURES								
Landscape Initiative	125,191	119,141	120,000	80,000	100,000	120,000	100,000	100,000
Ravine Parkway Landscaping								
EPD and Jamaica Landscaping		71,450						
Total Expenditures	125,191	190,591	120,000	80,000	100,000	120,000	100,000	100,000
Other Financing Sources (uses)								
Transfer In								
Transfer Out-EPD & Jamaica	-	-	-	-	-	-	-	-
Total other sources	-	-	-	-	-	-	-	-
Increase (decrease) in fund balance	1,472	(153,760)	8,674	(8,498)	(60,000)	(30,000)	(60,000)	(60,000)
FB Beginning balance	687,108	688,580	534,820	543,494	534,996	474,996	444,996	384,996
FB Ending balance	688,580	534,820	543,494	534,996	474,996	444,996	384,996	324,996

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Municipal Building Fund (525)
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Property taxes	250,134	298,365	300,000	450,000	450,000	500,000	500,000	500,000
intergovernmental								
Tower Rental - PW Tower	90,921	104,053	64,700	66,600	68,600	70,700	72,800	75,000
Investment interest	9,610	8,702	12,000	-	-	-	-	-
Miscellaneous		32,376						
Total Revenue	350,665	443,496	376,700	516,600	518,600	570,700	572,800	575,000
EXPENDITURES								
Municipal building expenses		6,624						
Shop & Wash Bay Modifications			500,000					
City Hall Remodel	131,211							
City Hall/Public Safety-Maintenance				178,950	142,100	250,850	219,900	446,171
Central Fire- Maintenance				33,183	76,580	70,364		2,325
Public Works-Maintenance					12,000	85,000	800,000	60,000
Total Expenditures	131,211	6,624	500,000	212,133	230,680	406,214	1,019,900	508,496
Other Financing Sources (uses)								
Interfund loan interest	(23,350)	(21,250)	(19,150)	(17,050)	(14,950)	(12,650)	(10,025)	(7,272)
Interfund loan payment	(210,000)	(210,000)	(210,000)	(210,000)	(210,000)	(250,000)	(275,000)	(275,000)
Funded with the IT & Roadway Maint Funds				97,700		63,110		
Transfer from General Fund	5,302							
Total other sources	(228,048)	(231,250)	(229,150)	(129,350)	(224,950)	(199,540)	(285,025)	(282,272)
Increase (decrease) in fund balance	(8,594)	205,622	(352,450)	175,117	62,970	(35,054)	(732,125)	(215,768)
FB Beginning balance	(2,284,769)	(2,083,363)	(1,667,741)	(1,810,191)	(1,425,074)	(1,152,104)	(937,158)	(1,394,283)
FB Ending balance	(2,083,363)	(1,667,741)	(1,810,191)	(1,425,074)	(1,152,104)	(937,158)	(1,394,283)	(1,335,051)
Cash Balance at year-end	116,125	271,807	(80,643)	94,474	157,444	122,390	(609,735)	(825,503)
Interfund Payable at year-end	2,230,000	2,020,000	1,810,000	1,600,000	1,390,000	1,140,000	865,000	590,000

Capital Improvement Plan 2026-2030

ED Trust Fund (286)
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Land sales	617,313							
Donation	150,000	150,002						
Interest	282,792	203,040	67,800	55,900	72,200	70,900	69,600	68,200
South District Assessments	981,536	244,347	1,343,122	1,121,896				
Miscellaneous	105	210						
Total Revenue	2,031,746	597,599	1,410,922	1,177,796	72,200	70,900	69,600	68,200
EXPENDITURES								
Professional Services		686	60,000	60,000	60,000	60,000	60,000	60,000
Jamaica & 95th Intersection Improve.			330,000					
CSAH 19 and TH 61			666,500	430,000				
South District Street & Utility	689,085	3,633,454						
Total Expenditures	689,085	3,634,140	1,056,500	490,000	60,000	60,000	60,000	60,000
Other Financing Sources (uses)								
Interfund loan interest		44,847						
Interfund loan payment								
Transfer in for South District		626,020						
Transfer to EDA Fund	(312,500)	-	(1,150,000)	400,000	(100,000)	(100,000)	(100,000)	(100,000)
Total other sources	(312,500)	670,867	(1,150,000)	400,000	(100,000)	(100,000)	(100,000)	(100,000)
Increase (decrease) in fund balance	1,030,161	(2,365,674)	(795,578)	1,087,796	(87,800)	(89,100)	(90,400)	(91,800)
FB Beginning balance	5,858,244	6,888,405	4,522,731	3,727,153	4,814,949	4,727,149	4,638,049	4,547,649
FB Ending balance	6,888,405	4,522,731	3,727,153	4,814,949	4,727,149	4,638,049	4,547,649	4,455,849
Goal	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000	5,000,000
Cash Balance	4,341,553	2,504,929	3,464,388	4,631,684	4,551,384	4,469,784	4,386,884	4,302,584

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

MSA Construction Fund (520)
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Municipal State Aid Construction funds	$ 5,985,250	$ 310,201	$ 718,216	$ 6,633,702		$ 1,000,000		$ 5,875,000
LRIP	$ 1,187,500							
Special assessments	6,103	5,826	5,700					
Intergovernmental - Federal funding Shoppes at CV				3,000,000				
Intergovernmental - Federal funding 80th Street				5,000,000				
Intergovernmental - Federal funding 103rd St RR Bridge								6,400,000
Intergovernmental - Federal funding SS4A				352,000				
Intergovernmental - State-MNDOT-80th Street		1,012,184		5,286,000				
Intergovernmental-Washington County				2,000,000				
Assessment/Development Fees				5,011,600	1,200,000	2,150,000	1,869,000	271,000
Interest	46,560	131,313	11,200	-	12,200	12,400	12,600	12,800
Miscellaneous - Grant-Other		6,223		150,000	150,000	800,000		
Total Revenue	7,225,413	1,465,747	735,116	27,433,302	1,362,200	3,962,400	1,881,600	12,558,800
EXPENDITURES								
Professional services-miscellaneous	15	71,531						
Safe Streets and Roads for All				440,000				
103rd Street Railroad Bridge				150,000	150,000	800,000		8,000,000
80th Street (Ideal to Hwy 61)	59,401	186,005	665,006	17,290,100				
80th Street (80th/Keats roundabout)-SROP Approved				4,000,000				
East Point Douglas - Jamaica intersection	7,905,857	3,886,847	500,000					
Ravine Pkwy - Shoppes at Cottage View				4,223,000		2,527,000	4,343,000	1,353,000
Jamaica Avenue and 95th Intersection Improvements			443,000					
Jamaica Ave - 80th to 90th		1,356,943						
Ravine Parkway	223,522		250,000	3,200,000	1,200,000	1,000,000	1,000,000	200,000
River Oaks Hwy 61 RCUT	138,896	1,348,758						
Total Expenditures	8,327,691	6,850,084	1,858,006	29,303,100	1,350,000	4,327,000	5,343,000	9,553,000
OTHER FINANCING SOURCES (USES)								
Bond Proceeds		4,744,996				377,000	2,760,000	860,000
Transfers in		1,595,025	443,000	3,080,500			714,000	222,000
Transfers out - CSAH 19 & TH 61								(4,075,000)
Total other sources	-	6,340,021	443,000	3,080,500	-	377,000	3,474,000	(2,993,000)
Increase (decrease) in fund balance	(1,102,278)	955,684	(679,890)	1,210,702	12,200	12,400	12,600	12,800
Beginning balance, FB	431,429	(670,849)	284,835	(395,055)	815,647	827,847	840,247	852,847
Ending balance, FB	(670,849)	284,835	(395,055)	815,647	827,847	840,247	852,847	865,647
MSA Beginning Balance	1,195,043	(3,705,538)	(1,862,873)	0	(4,000,000)	(1,305,700)	388,600	3,082,900
Allocation	1,968,470	2,137,127	2,581,089	2,633,702	2,694,300	2,694,300	2,694,300	2,694,300
Disbursements	(6,869,051)	(294,462)	(718,216)	(6,633,702)	-	(1,000,000)	-	(5,875,000)
MSA Ending Balance	(3,705,538)	(1,862,873)	0	(4,000,000)	(1,305,700)	388,600	3,082,900	(97,800)

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Street Reconstruction and Overlay Fund

Projected Financial Position

	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES						
Special Asessments-Developer Fees						$ 1,485,000
Intergovernmental - Federal funding 19 & 61			19,000,000	19,000,000		14,033,000
Intergovernmental - County 19 & 61		250,000	2,971,250	728,750		4,075,000
Interest						
Miscellaneous						
Total Revenue	-	250,000	21,971,250	19,728,750	-	19,593,000
EXPENDITURES						
Prof Svcs - assmt fees						
CSAH 19 and TH 61		680,000	27,742,500	23,077,500		22,900,000
Harkness Avenue reconcstruction						3,162,000
Jamaica Ave - Rose of Sharon to Military				3,000,000		
Total Expenditures	-	680,000	27,742,500	26,077,500	-	26,062,000
Revenue over Expenditures	-	(430,000)	(5,771,250)	(6,348,750)	-	(6,469,000)
Other Financing Sources (uses)						
Bond proceeds			2,621,250	3,198,750		938,000
Transfers from Area Funds			3,150,000	3,150,000		1,456,000
Transfer from MSA Fund						4,075,000
Transfers from ED Trust		430,000				
Total other sources	-	430,000	5,771,250	6,348,750	-	6,469,000
Increase (decrease) in fund balance	-	-	-	-	-	-
FB Beginning balance	-	-	-	-	-	-
FB Ending balance	-	-	-	-	-	-

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Pavement Management Fund (560)
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
	$	$	$	$	$	$	$	$
REVENUES								
Special Assessments	21	42						
Interest	158,869	155,970	26,100	34,800	35,400	35,900	36,400	37,000
Miscellaneous								
Total Revenue	158,890	156,012	26,100	34,800	35,400	35,900	36,400	37,000
EXPENDITURES								
PM 2023	3,547,055							
PM 2024		1,485,694						
PM 2025-Hidden Valley			2,699,000					
PM 2026 - Thompson Grove Estates 11th Add, south part Woodridge Park Add (W of Jamaica)				3,415,000				
PM 2027 - East Point Douglas (Inwood to CDS), Kingsborough Trail					3,508,000			
PM 2028 - Thompson Grove Estates 12 Add, north part Woodridge Park Add (W of Jamaica)						3,766,000		
PM 2029 - Thompson Grove Estates and Hillside Trail							6,066,000	
PM 2030 - Pine Glen, Cottage Grove Estates								8,126,000
Total Expenditures	3,547,055	1,485,694	2,699,000	3,415,000	3,508,000	3,766,000	6,066,000	8,126,000
Revenue over Expenditures	(3,388,165)	(1,329,682)	(2,672,900)	(3,380,200)	(3,472,600)	(3,730,100)	(6,029,600)	(8,089,000)
Other Financing Sources (uses)								
Bond proceeds	2,994,722	1,025,000	2,303,000	2,420,000	2,945,000	2,668,000	4,485,000	7,036,000
Transfers from utility funds	563,729	47,251	396,000	995,000	563,000	1,098,000	1,581,000	1,090,000
Total other sources	3,558,451	1,072,251	2,699,000	3,415,000	3,508,000	3,766,000	6,066,000	8,126,000
Increase (decrease) in fund balance	170,286	(257,431)	26,100	34,800	35,400	35,900	36,400	37,000
FB Beginning balance	2,384,140	2,554,426	2,296,995	2,323,095	2,357,895	2,393,295	2,429,195	2,465,595
FB Ending balance	2,554,426	2,296,995	2,323,095	2,357,895	2,393,295	2,429,195	2,465,595	2,502,595
Goal (35% of next 5-year avg capital spend)	1,041,159	1,361,780	1,800,575	1,993,717	2,194,267	2,356,822	2,306,656	2,359,544

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Water Area Fund (575)
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Developer fees	$ 677,066	$ 500,388	$ 761,000	$ 761,000	$ 761,000	$ 761,000	$ 761,000	$ 761,000
Special Assessments								
Intergovernmental - County/State		40,000						
Interest	199,567	215,885	200,000	60,000	61,300	48,700	35,900	36,800
Miscellaneous								
Total Revenue	876,633	756,273	961,000	821,000	822,300	809,700	796,900	797,800
EXPENDITURES								
East Ravine Infrastructure Development			18,000	17,000	17,000	17,000	17,000	17,000
Miscellaneous		5,911	12,000					
Water Comp Plan	36,916							
Water Main Oversizing	74,743	55,249	67,500	7,000	7,000	7,000	7,000	7,000
South District Street & Utilities	708,007							
Ravine Pkwy - Shoppes at Cottage View				489,200			285,600	88,800
CSAH 19 & TH 61					1,215,000	1,215,000		
Ravine Parkway I & II	87,960							
Harkness Avenue								485,400
Jamaica Avenue & 95th Intersection			100,000					
Industrial Park Water Tower	7,310							
100th St watermain	66,799							
Total Expenditures	981,735	61,160	197,500	513,200	1,239,000	1,239,000	309,600	598,200
OTHER FINANCING SOURCES (USES)								
Bond Proceeds								
Transfers in								
Transfers out	(237,909)	(118,540)	(1,000,000)	(224,100)	(424,375)	(425,750)	(421,500)	(421,625)
Total other sources	(237,909)	(118,540)	(1,000,000)	(224,100)	(424,375)	(425,750)	(421,500)	(421,625)
Increase (decrease) in fund balance	(343,011)	576,573	(236,500)	83,700	(841,075)	(855,050)	65,800	(222,025)
FB Beginning balance	4,005,715	3,662,704	4,239,277	4,002,777	4,086,477	3,245,402	2,390,352	2,456,152
FB Ending balance	3,662,704	4,239,277	4,002,777	4,086,477	3,245,402	2,390,352	2,456,152	2,234,127

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Sewer Area Fund (580)
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Developer fees	$ 552,117	$ 523,733	$ 774,200	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000
Special Assessments	-	-	-	-	-	-	-	-
Intergovernmental - County/State/Federal	(66,481)	-	-	-	-	-	-	-
Interest	5,017	-	20,000	20,100	25,600	24,600	23,500	31,100
Miscellaneous	-	-	209,100	-	-	-	-	-
Total Revenue	490,653	523,733	1,003,300	720,100	725,600	724,600	723,500	731,100
EXPENDITURES								
East Ravine Infrastructure Development	74,157		17,000	17,000	17,000	17,000	17,000	17,000
Miscellaneous	13,077	34,209						
Comp Plan	40,660							
South District Street & Utilities	874,379							
Ravine Pkwy - Shoppes at Cottage View				330,210			192,780	59,940
CSAH 19 & TH 61					770,000	770,000		
Lift Stations	18,970							
Harkness Avenue								485,300
Trunk sewer extension - Met council	1,152							
Trunk Oversizing			7,000	7,000	7,000	7,000	7,000	7,000
Total Expenditures	1,022,395	34,209	24,000	354,210	794,000	794,000	216,780	569,240
OTHER FINANCING SOURCES (USES)								
Debt Service - principal & interest	-	-	-	-	-	-	-	-
Transfers in								
Transfers out		(192,536)						
Total other sources	-	(192,536)	-	-	-	-	-	-
Increase (decrease) in fund balance	(531,742)	296,988	979,300	365,890	(68,400)	(69,400)	506,720	161,860
FB Beginning balance	596,180	64,438	361,426	1,340,726	1,706,616	1,638,216	1,568,816	2,075,536
FB Ending balance	64,438	361,426	1,340,726	1,706,616	1,638,216	1,568,816	2,075,536	2,237,396

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

Storm Water Area Fund (585)
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
Developer fees	$ 555,074	$ 656,326	$ 998,600	$ 700,000	$ 700,000	$ 700,000	$ 700,000	$ 700,000
Special Assessments	7,754							
Intergovernmental - County/State								
Interest	48,849	13,908	10,000	7,000	11,200	-	-	-
Miscellaneous			7,000					
Total Revenue	611,677	670,234	1,015,600	707,000	711,200	700,000	700,000	700,000
EXPENDITURES								
East Ravine Infrastructure Development		4,335	10,000	17,000	17,000	17,000	17,000	17,000
TG-14	10,060	4,158	91,800					
L-P3 Pond Improvements	87,082	24,901	800					
East Ravine infrastructure & AUAR	224,728							
Kwik Trip-95th & Jamaica		40,733	4,900					
100th Street Extension	35,744							
Miscellaneous	308	59,450	28,400					
Jamaica Avenue-Trunk storm sewer realignment		300,513	21,300					
South District Trunk Storm Sewer	65,267	15,662						
South District Street & Utilities	867,166							
CSAH 19 & TH 61					1,165,000	1,165,000		
Ravine Pkwy - Shoppes at Cottage View				403,590			235,620	73,260
Lake Flora Ponds	490,327							
Harkness Avenue								485,300
Trunk Oversizing		24,407	70,400	7,000	7,000	7,000	7,000	7,000
West draw modeling		16,422	16,100					
Total Expenditures	1,780,682	490,581	243,700	427,590	1,189,000	1,189,000	259,620	582,560
OTHER FINANCING SOURCES (USES)								
Transfers in - 95th &Jamaica								
Transfers in (out)		(314,944)						
Total other sources	-	(314,944)	-	-	-	-	-	-
Increase (decrease) in fund balance	(1,169,005)	(135,291)	771,900	279,410	(477,800)	(489,000)	440,380	117,440
FB Beginning balance	999,281	(169,724)	(305,015)	466,885	746,295	268,495	(220,505)	219,875
FB Ending balance	(169,724)	(305,015)	466,885	746,295	268,495	(220,505)	219,875	337,315

City of Cottage Grove, MN
Capital Improvement Plan 2026-2030

3M Settlement/MPCA Fund 455
Projected Financial Position

	2023 ACTUAL	2024 ACTUAL	2025 ESTIMATED	2026 ESTIMATED	2027 ESTIMATED	2028 ESTIMATED	2029 ESTIMATED	2030 ESTIMATED
REVENUES								
3M Settlement funds	$ 16,781,220	$ 29,717,773	$ 38,312,758	$ 34,045,192	$ 30,045,192	$ 12,518,830	$ 4,003,766	$ -
Interest	-	-	-	-	-	-	-	-
Miscellaneous								
Total Revenue	16,781,220	29,717,773	38,312,758	34,045,192	30,045,192	12,518,830	4,003,766	-
EXPENDITURES								
Prior Year Projects	17,328,462	30,505,296	2,713,500					
High Zone Raw Water Main			5,120,500					
Low Zone Water Treatment Plant & Well 13			14,000,000					
Intermediate Zone Water Treatment Plant			15,022,620	30,045,192	30,045,192	12,518,830	2,503,766	
Intermediate Zone Raw Water Line				3,000,000				
Well 1 & 2 Decommissioning				1,000,000				
Well 3,7,8 Interim Treatment Plant Decommissioning							1,500,000	
Total Expenditures	17,328,462	30,505,296	36,856,620	34,045,192	30,045,192	12,518,830	4,003,766	-
OTHER FINANCING SOURCES (USES)								
Bond Proceeds								
Transfers in								
Transfers out								
Total other sources	-	-	-	-	-	-	-	-
Increase (decrease) in fund balance	(547,242)	(787,523)	1,456,138	-	-	-	-	-
FB Beginning balance	(121,373)	(668,615)	(1,456,138)	-	-	-	-	-
FB Ending balance	(668,615)	(1,456,138)	-	-	-	-	-	-

Bond Issuance Amounts Identified in 2026-2030 CIP

Capital Improvement Plan 2026-2030

Project	2026	2027	2028	2029	2030	Total
Pavement Management	2,420,000	3,045,000	2,668,000	4,585,000	7,136,000	19,854,000
CSAH 19 & TH 61		2,621,250	198,750			2,820,000
Shoppes at Cottage View			377,000	2,760,000	860,000	3,997,000
Harkness Avenue					938,000	938,000
Jamaica (Rose of Sharon to Military)			3,000,000			3,000,000
Oltman-lacrosse complex&parking lot	2,300,000					2,300,000
Kingston Park		5,000,000				5,000,000
Ice Arena		1,500,000				1,500,000
Dunes Park		2,000,000	1,500,000	7,000,000		10,500,000
Equipment	1,310,000	345,000				1,655,000
Total Bonds	6,030,000	14,511,250	7,743,750	14,345,000	8,934,000	51,564,000

Bond Issuance Amounts Identified in FMP

Project	2026	2027	2028	2029	2030	Total
Pavement Management	2,420,000	3,045,000	2,668,000	3,918,000	6,229,000	18,280,000
CSAH 19 & TH 61		2,621,250	198,750			2,820,000
Shoppes at Cottage View			377,000	2,760,000	860,000	3,997,000
Harkness Avenue					938,000	938,000
Jamaica (Rose of Sharon to Military)			3,000,000			3,000,000
Oltman-lacrosse complex&parking lot	2,300,000					2,300,000
Kingston Park		5,000,000				5,000,000
Ice Arena						-
Dunes Park						-
Equipment	1,310,000	345,000				1,655,000
Total Bonds	6,030,000	11,011,250	6,243,750	6,678,000	8,027,000	37,990,000

TO: Chair Frazier and Commissioners

FROM: Emily Schmitz, Community Development Director
Jenni Faulkner, Bolton & Menk

DATE: October 27, 2025

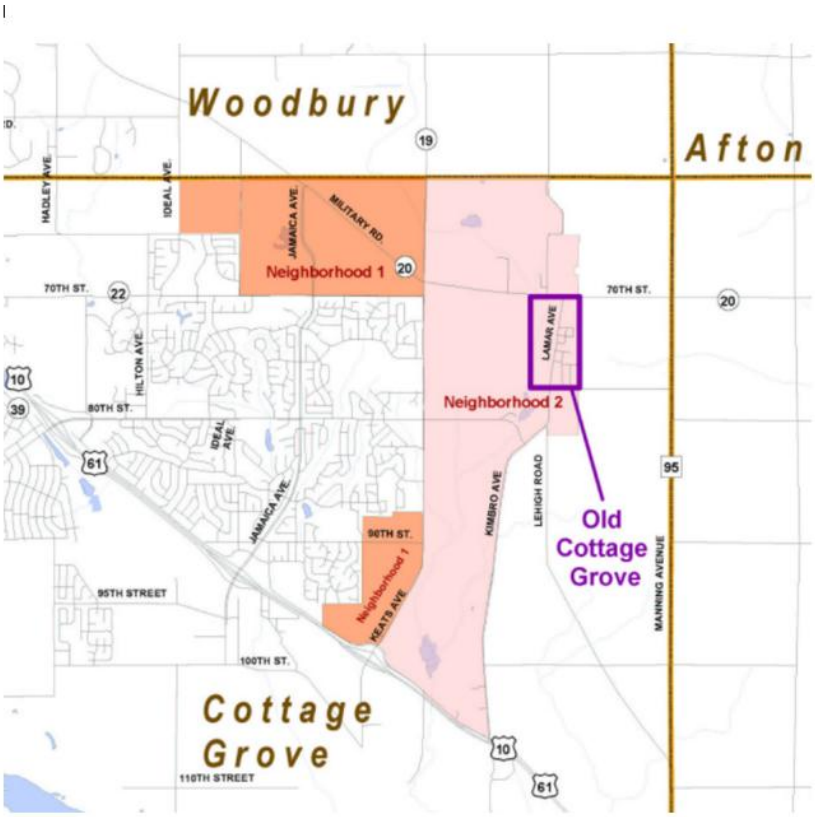
RE: East Ravine 2025 Alternative Urban Areawide Review (AUAR) Update

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Introduction

The East Ravine area is approximately 3,988 acres and contains some areas of historical and ecological significance within the city. In 2005, the City undertook an Alternative Urban Areawide Review (AUAR) that identified potential environmental impacts from future development and mitigation strategies of the East Raine Area. For study purposes, the AUAR area was broken into two neighborhoods. In addition to identifying environmental impacts, this type of review can assist with informing the development community prior to development projects as well as expediting development review as the necessary environmental review has already been completed. (This can save a developer one to two years of time on the front end of a project).

The AUAR process is a unique environmental review meant to understand cumulative development/land use impacts at a high level when site and project specifics are unknown. The AUAR questionnaire is similar to other environmental reviews and contains a mitigation plan that is used when reviewing specific developments within the studies area. An AUAR is currently required to be updated every 5 years to remain valid and is only needed until the area studied is developed or the AUAR is no longer needed. The AUAR plan was last updated in 2015 and 2020.



Location Map

Proposed Updates

This update builds on the 2020 AUAR update and incorporates the current AUAR questionnaire. The State questionnaire has been updated since the last AUAR update in 2020 and includes a couple of new questions. No new development scenarios have been introduced in this development area, and this update is consistent with the future land uses identified in the 2040 Comprehensive Land Use Plan. As much of the development has yet to occur, many of the questions/data have been carried over from the previous AUAR Update.

1.-4. RGU Information: Updated accordingly.

5. Project Location: Updated to include PID's and acreages (for parcels over 1 acre).

6. Project Description: Updated to reflect current conditions as previous projects referenced have since been completed, primarily residential neighborhoods within Neighborhood 1. The only land-use change was to amend a small area in the Cedarhurst area that was amended with the 2040 Comp Plan.

7. Climate Adaptation and Resilience: This is a new question that primarily addresses temperature and precipitation. Data is provided by the DNR and mitigation strategies to impacts have been provided. Impacts include potential for higher temperatures and more frequent heavy rainfall events (flooding). Mitigation measures include encouraging lighter colored roofing, use of Stormwater Management Best Practices, encouraging more vegetation to reduce urban heat islands, etc.

8. Cover Types: Have been updated with current 2025 data.

9. Permits and Approvals: Have been updated to reflect updated City Code/Zoning Code as well as current statutory/agency references.

10. Land Use: Updated Land Use text, tables, and map to reflect the 2040 Comp Plan and current land uses.

11. Geography, Soils, Topography: Updated with current detailed soil types from the USDA Web Soil Survey.

12. Water Resources: Updated to include well inventory and 2023 updated inventory of the sanitary sewer systems and projections for wastewater flows. Wetland delineations were not updated.

13. Contamination/Hazardous Waste: Updated to include MPCA identified permitted activities and tanks within the study area.

14. Plant, Fish and Wildlife: Updated with Federal species and MNDNR on-line data. Waiting for letter from DNR with site specific species and mitigation measures. This information is expected to be incorporated into the draft prior to adoption.

15. Historic Properties: Updated with current information from the Statewide Historic Inventory and high-level cultural resources assessment to identify areas that may require future study or survey.

16. Visual: Updated to include mitigation measures from development.

17. Air: Some text carried over, although this question is no longer applicable to an AUAR with the updated form.

18. Greenhouse Gas Emissions/Carbon Footprint: This is a new question that incorporates a previous question about emissions and is expanded to include GHG's and Carbon specifically. Emission calculations used guidance from the EPA, and are provided for construction, land use

conversion, vehicles, homes, electricity, natural gas, and waste. Emissions will increase with development. Mitigation strategies include carbon sequestration, reduction of GHG emission by increasing vegetative cover, and increasing the use of high efficiency appliances. However, because they are dependent on end-user, they are not in the proposed mitigation plan.

19. Noise: No major updates as a noise study was not conducted and noise thresholds have not changed significantly, if at all, since the last AUAR update.

20. Traffic: Updated to reflect 2024 existing AADTs and forecasted 2040 AADT volumes based on historical AADTs and population growth estimates from the City's 2040 Comprehensive Plan.

21. Cumulative Potential Effects: Updated to provide a response and note that no known significant adjacent cumulative impacts are anticipated and the permitting process can address impacts as development occurs.

Draft Mitigation Plan

The plan contains actions the city should take to ensure identified environmental impacts are mitigated or avoided if possible. The draft Mitigation Plan can be found on the final four pages of the AUAR document. Outside of the general permitting, state and federal requirements, and existing city requirements and plans, the following are proposed in this mitigation plan:

- Compliance with FEMA floodplain regulations including setbacks, vegetation buffers, and impervious surface limits.
- Requirements for landscape buffers along major roadways.
- Requirements for residential and commercial landscaping which provide sufficient green space minimizing irrigation requirements. Residential design standards which ensure a variety of housing design. Requirements for screening requirements between commercial and residential areas.
- Development projects will incorporate best practices in lighting design to reduce glare and light pollution.
- Development within the project area will increase the amount of storm water runoff. The City will require the development of a storm water management system which limits flooding and negative impacts on water quality within the watershed. Specific strategies are listed in the plan.
- Application of the Wellhead Protection Plan to seal old wells and protect new municipal wells from contamination.
- All requirements set forth by the DNR and USFWS during consultation will be implemented in the project area. This may include avoidance of certain areas during different times of the year, erosion control measures, or others. If any threatened or endangered species or designated critical habitat are believed to be in jeopardy, permits to take and mitigation will be determined through agency coordination. Further coordination with the USFWS will be required to determine impacts to the Rusty Patched Bumble Bee.
- Level 2 wetland delineations will be required for identified areas prior to development, ensuring accurate assessment and compliance with regulatory standards. (Delineations are valid for 5 years).

- Further study of identified historic/cultural sites and SHPO concurrence is recommended before any construction can be completed to identify site boundaries to determine if Phase II investigations are necessary. Further investigation will be needed to narrow down the location of the identified unknown cemetery.
- Military Heritage Road Corridor recommendations for retaining and preserving the historic route.
- Developer/construction considerations for best management practices to reduce greenhouse gas emissions such as energy-efficient equipment and vehicles, minimizing idling time, sourcing materials locally to reduce transportation emissions, recycling construction waste, low-carbon building materials, and renewable energy sources.
- Barriers such as earthen berms or landscaping to reduce traffic noise levels. Increasing the distance between the source and the receiver also reduces traffic noise levels (i.e. larger setbacks from arterial or collector roadways).
- Monitoring of actual development versus AUAR assumptions using the City's GIS system, including tracking of platted lots and building permits.

Next Steps

The draft AUAR and mitigation plan is planned to be published in the EQB Monitor on October 28, 2025, and will be available for comment for 10 working days per State Statute Rules until November 10, 2025. All substantial comments will be incorporated into the final Updated AUAR document and presented to Council for adoption and publication. The AUAR will be reviewed and updated again in 2030.

Attachments
Draft East Ravine AUAR Update

Cottage Grove East Ravine AUAR and Mitigation Plan Update

November 2025

Completed by:
Bolton & Menk, Inc.
12224 Nicollet Avenue
Burnsville, MN 55337

Cottage Grove
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Note: This AUAR update follows the format of the current Minnesota Environmental Quality Board AUAR form, which differs from the version used in the original AUAR. As a result, not all sections from the original document are carried over exactly, and some sections are newly introduced. In general, the responses to questions remain consistent with the original AUAR unless otherwise noted. Updates are identified throughout the document using revised content, supporting materials, or other indicators to reflect changes in development, environmental conditions, or planning considerations since the original AUAR was adopted.

1. Project Title

Cottage Grove East Ravine Alternative Urban Areawide Review (AUAR) Update 2025

2. Proposer

Proposer: City of Cottage Grove

Contact Person: Emily Schmitz

Title: Community Development Director

Address: 12800 Ravine Parkway South

City, State, ZIP: Cottage Grove, MN 55016

Phone: 651-458-2874

Email: eschmitz@cottagegrovemn.gov

3. RGU

RGU: City of Cottage Grove

Contact Person: Emily Schmitz

Title: Community Development Director

Address: 12800 Ravine Parkway South

City, State, ZIP: Cottage Grove, MN 55016

Phone: 651-458-2874

Email: eschmitz@cottagegrovemn.gov

4. Reason for Preparation

AUAR Guidance: Not applicable to an AUAR.

5. Project Location

County: Washington

City/Township: Cottage Grove

PLS Location (¼, ¼, Section, Township, Range): Section 27 West, Township 21 North, Ranges 1, 2, 3, 4, 11, 12, 13, 14, 15, 22, 23, 26, and 27.The Cottage Grove East Ravine Planning District, is an approximately 4,000 acre portion of largely undeveloped land stretching along the east side of County Road 19 from Highway 61 north to the City of Cottage Grove's border with Woodbury and including a portion north of 70th Street east of CR 19 generally to Ideal Avenue.

Watershed (81 major watershed scale): Mississippi River (Twin Cities) and St. Croix River (Stillwater/Lower)

Tax Parcel Numbers:

Table 1 - Parcels over 1 acre Within the Study Area

Parcel ID	Parcel Acreage	Parcel ID	Parcel Acreage	Parcel ID	Parcel Acreage
2202721110001	146.37	0102721230007	5.03	1102721430001	1.94
1102721120003	129.69	0202721140001	5.02	0302721420057	1.92
0202721310002	124.32	0202721140003	5.02	1202721330010	1.92
1102721310001	79.48	0202721140004	5.01	1402721110004	1.92
1102721420001	71.64	0202721140008	5.01	2602721210007	1.9
0402721120001	67.28	0202721140009	5.01	0202721330003	1.88
1102721240001	60.54	2302721310005	5.01	0202721410008	1.86
1102721220001	59.15	0202721110007	5	2602721240013	1.83
0402721110001	51.74	1102721440003	5	0202721410009	1.81
2202721440001	44.76	2302721240010	4.94	2602721240007	1.81
1402721220001	41.04	1402721420004	4.91	1402721110005	1.8
1102721320001	40.34	1102721440005	4.9	1402721110008	1.8
0102721320001	40.31	0102721230005	4.87	0202721410006	1.77
1402721240001	40.19	1102721440006	4.87	0302721340097	1.74
0202721130001	40.16	2302721430002	4.87	0302721340099	1.74
0202721230002	40.14	1202721320002	4.86	0402721220043	1.74
0402721420001	39.99	2202721430003	4.86	1502721440085	1.74
0402721430001	39.93	2302721240004	4.73	0202721410005	1.7
2302721230001	39.78	1402721420003	4.72	0202721410007	1.68
2302721320001	39.75	2602721240003	4.71	0302721320081	1.66
2302721330001	39.75	0102721230001	4.7	1202721230029	1.66
1402721310002	39.63	0102721330001	4.64	0302721430035	1.6
1402721230003	39.53	2702721110002	4.55	0402721410054	1.53
1102721330001	39.13	1402721330002	4.43	1202721230030	1.53
2202721420002	38.42	2302721130002	4.4	2602721210004	1.53
0402721440001	37.98	1402721420006	4.39	2602721240008	1.53
1402721430005	37.79	2302721240005	4.36	2602721240012	1.52
0202721120001	35.12	2302721340005	4.35	0202721340001	1.5
0202721210001	34.98	0202721430004	4.17	2602721210005	1.5
0202721220001	34.82	0302721420004	4.16	2602721210009	1.5
0302721230003	34.29	2302721240009	4.12	2602721240006	1.5
2202721410001	32.15	1402721110003	4.05	2602721240011	1.5
0202721330006	32.06	0202721330002	4.01	2602721240014	1.5
1102721110004	31.81	2302721340010	4.01	2602721240015	1.5
0202721430011	31.26	0402721230102	4	0302721410127	1.48
1502721430010	31.16	0202721140005	3.99	0302721140006	1.46
1402721120012	30.67	2302721340011	3.99	0302721310049	1.45
1102721410001	30.36	1202721320069	3.96	2202721320081	1.39
1402721210009	29.94	1202721230020	3.9	0302721410100	1.34
2602721220001	29.7	1202721320015	3.9	1202721330016	1.34
2202721310009	25.03	0302721240002	3.88	0302721220063	1.33

Parcel ID	Parcel Acreage	Parcel ID	Parcel Acreage	Parcel ID	Parcel Acreage
0302721130008	23.32	0302721240005	3.86	1202721230018	1.33
0302721110006	23.07	0202721430005	3.72	1202721320004	1.33
1202721330003	22.51	1202721220002	3.7	0302721410166	1.25
2202721310006	21.27	0302721420061	3.64	1202721330004	1.25
1402721330012	20.41	0202721110009	3.62	1102721330002	1.22
0202721240002	20.1	2202721340002	3.59	1402721220002	1.22
0402721140001	20.03	2302721340006	3.58	1202721220007	1.21
1102721230001	20.01	0302721410003	3.56	1402721420001	1.21
2302721220001	19.94	0302721410004	3.56	0302721410128	1.19
2302721220002	19.92	1402721130009	3.54	1502721420013	1.18
1202721220003	17.87	0202721430006	3.52	0302721110008	1.17
1402721430003	16.75	0302721420074	3.48	1202721330012	1.14
2302721210001	16.35	1402721120010	3.44	0302721240080	1.13
2602721220003	16.17	0302721320075	3.43	0302721330037	1.11
1302721220001	16.04	2602721420006	3.34	0302721340002	1.11
0302721110009	15.76	0302721420043	3.32	0302721410126	1.11
0302721330002	15.55	0102721230002	3.29	0302721220064	1.09
0402721410053	14.99	2302721210006	3.23	0302721320006	1.08
1102721210004	14.93	0102721230004	3.22	1202721230024	1.08
0302721430002	14.36	1102721430002	3.17	1202721230028	1.08
2202721140001	14.21	1202721320016	3.13	1202721230040	1.08
0202721230003	13.9	2302721120008	3.1	0302721240061	1.07
0302721310056	13.82	1402721130010	3.08	0302721330040	1.06
2302721310002	13.8	1402721110002	3.04	0402721240120	1.03
2302721340002	13.8	0202721140007	3.03	1202721230022	1.03
2302721240002	13.79	0202721140006	3.02	0102721330008	1
2602721240005	12.97	0202721110010	3.01	0102721330009	1
0202721420003	12.13	0202721140005	3.99	0102721330010	1
0202721410001	12.03	2302721340011	3.99	0202721110001	1
1102721440001	11.23	1202721320069	3.96	0302721230001	1
0302721330041	10.88	1202721230020	3.9	0402721230068	1
1402721110007	10.76	1202721320015	3.9	1202721330006	1
0302721140007	10.66	0302721240002	3.88	1202721330007	1
2302721310006	10.17	0302721240005	3.86	1202721330008	1
0302721440001	10.1	0202721430005	3.72	1202721330009	1
0102721330003	10.02	0202721440003	3.01	1202721330015	1
0402721240136	9.91	0302721440002	3.01		
1102721440004	9.9	0202721110011	3		
1402721320003	9.68	0202721440002	3		
1502721440005	9.52	0202721440004	3		
0202721110012	9.49	0202721440005	3		
2302721210005	9.34	1202721330005	3		
0302721140003	9.28	1402721210004	3		
0302721130004	9.14	2302721120006	3		
0202721440006	9.11	2702721110007	3		
2202721410002	9.09	0102721330002	2.99		

Parcel ID	Parcel Acreage	Parcel ID	Parcel Acreage	Parcel ID	Parcel Acreage
1402721130001	9.02	1302721220002	2.99		
1402721320005	9.02	0402721410057	2.98		
2302721310003	9	0102721230006	2.96		
0202721420005	8.86	1402721130005	2.96		
1402721320004	8.71	0302721210042	2.92		
0202721420001	8.61	1402721110006	2.86		
1202721220016	8.55	1402721130006	2.81		
0202721410004	8.52	0302721120048	2.75		
2302721120007	8.39	2602721210011	2.7		
2702721110006	8.36	0202721430008	2.69		
0102721330005	8.25	2602721210006	2.68		
0202721110005	7.98	0402721230091	2.62		
1402721330007	7.91	2202721340004	2.59		
2602721230004	7.39	0202721330004	2.58		
2602721210002	7.22	2602721220002	2.57		
0402721210012	7.11	1402721120009	2.55		
2302721210003	6.9	1502721440002	2.49		
1402721320001	6.82	0302721120081	2.46		
2202721430006	6.78	1402721120004	2.39		
2302721240003	6.78	0102721330018	2.38		
1402721110001	6.6	2602721210008	2.38		
0302721310055	6.38	2602721240009	2.37		
0302721140009	6.23	2602721230009	2.33		
1402721130003	6.21	2602721240010	2.29		
0202721230001	6.18	0302721440079	2.25		
0202721440007	6	0302721240034	2.23		
2302721340007	6	1202721220012	2.23		
0302721410002	5.93	2602721210010	2.22		
1102721440008	5.91	0302721130037	2.2		
1402721210010	5.9	0302721420165	2.16		
0402721130001	5.75	1202721230019	2.16		
2602721420002	5.75	0302721220065	2.1		
0202721430007	5.56	2602721230007	2.08		
0202721430003	5.3	0102721330007	2.06		
2302721240006	5.2	0402721440002	2.05		
0202721420004	5.18	1202721220019	2.04		
2602721310001	5.18	1502721440087	2.01		
1202721230021	5.17	0202721410010	2		
0202721420002	5.14	0302721410207	2		
1102721440002	5.1	2302721310008	2		
0302721140008	5.04	2602721210003	1.96		
1402721420005	5.04	1202721220013	1.95		

At a minimum, attach each of the following to the AUAR:

- **US Geological Survey 7.5 minute, 1:24,000 scale map indicating project boundaries** (Figure 2)

- **Map depicting the boundaries of the AUAR and any subdistricts used in the AUAR analysis** (Figure 1)
- **List of data sources, models, and other resources (from the Item-by-Item Guidance: Climate Adaptation and Resilience or other) used for information about current Minnesota climate trends and how climate change is anticipated to affect the general location of the project during the life of the project** (*Section 7*)
- **Cover type map as required for Item 8** (Appendix 5)
- **Land use and planning and zoning maps as required in conjunction with Item 10** (Figure 5 and Appendix 6)

6. Project Description

AUAR Guidance: Instead of the information called for on the EAW form, the description section of an AUAR should include the following elements for each major development scenario included:

- *Anticipated types and intensity (density) of residential and commercial/warehouse/light industrial development throughout the AUAR area.*
- *Infrastructure planned to serve development (roads, sewers, water, stormwater system, etc.). Roadways intended primarily to serve as adjoining land uses within an AUAR area are normally expected to be reviewed as part of an AUAR. More "arterial" types of roadways that would cross an AUAR area are an optional inclusion in the AUAR analysis; if they are included, a more intensive level of review, generally including an analysis of alternative routes, is necessary.*
- *Information about the anticipated staging of various developments, to the extent known, and of the infrastructure, and how the infrastructure staging will influence the development schedule.*

The East Ravine Pre-Design Planning Project consists of roughly 3,988-acre area of land that is in the process of being developed that generally lies north of 70th Street, east of County Road 19, and west of Lamar and Kimbro Avenues.

The proposed development scenario is thoughtfully aligned with the goals and vision outlined in the 2040 Comprehensive Plan, aiming to achieve full build-out consistent with the designated future land use for the area. See figure 1 for project location, figure 2 for AUAR Boundary/USGS Map, and figure 3 for the Cottage Grove East Ravine Districts.

Large areas of predominantly Single-Family residential housing are interspersed with a combination of medium and higher density attached residences to provide a balance of housing opportunities and meet the lifecycle housing needs and desires of the community. The housing products that have been developed to date have provided a variety of single and multiple family products and affordability offerings, as well as smaller lot sizes while still meeting the established densities for the area.

The development scenario identifies two commercial areas or "nodes." One in the Cedarhurst area at 70th Street and Keats Avenue would have a smaller scale, integrated neighborhood commercial emphasis. This area has not had any development activity to date. The Cottage View area node in the south near Highway 10/61 is being oriented toward larger scale community commercial uses. One of the primary goals of the planning process is to design an efficient, safe, and interconnected system of local and collector streets.

The area of the East Ravine saw the 2016 development of a 27-acre commercial site for a Walmart store and included improvements to East Point Douglas Road and the construction of a roundabout at the Highway 61 interchange. One of the major features to emerge from the East Ravine planning process is

Ravine Parkway. The parkway will provide both a transportation corridor and a major design feature for the project. As a new collector street, the parkway will traverse the entire project area beginning in the northwest and meandering east and south towards Highway 10/61. Portions of the parkway will include natural landscaped areas, trailways, ponds, and wetlands. Other portions will appear more like Summit Avenue in St. Paul with large green boulevard and median areas. Along the parkway, local residential street loops will create neighborhood focal points and amenities out of green island areas. Sidewalks and trails linking area homes to the parkway, will allow safe and convenient movement throughout the eastern portion of Cottage Grove and connect to the remainder of the community. A small portion of the parkway, east of Keats Avenue, was completed with the municipal campus in 2012. Two major segments of Ravine Parkway were installed in 2018 and 2019 between Keats Avenue and Jamaica Avenue and east of Hinton Avenue (north of 70th Street). The missing connection portion that links these two project areas will be completed as development occurs.

Transportation planning also includes the proposal to realign portions of Military Road to correct system design inefficiencies. The proposal would use a realigned portion of existing Jamaica Avenue to connect southward to 70th Street. Given the historic role of Military Road, the character and location of the former road alignment will be reflected in a new system of adjacent local streets and trails.

Major roadways and streets including 70th Street, 80th Street and Keats Avenue (County Road 19) will be established as green corridors throughout the project area. Expanded right-of-way and easement areas will create larger scale open spaces that will provide buffers to adjacent land uses and a continuation of the community's open space heritage. These green corridors will include trails and landscaping treatments that will vary in form and style depending on the specific location in the project area.

The City utilizes current management practices and policies to plan for local ponding and surface water management needs in the planned neighborhoods. The City is also coordinating with the South Washington Watershed District to address regional storm water drainage needs to minimize redundant expenditures and loss of taxable development area.

The following tables represent original project magnitude data for the Cottage Grove East Ravine project. This data was generated with an understanding of the market forces and land development interests in the project areas trade market. Residential and commercial development trends were reviewed in conjunction with building permit data to support market research conducted by McComb Group, Ltd. in Fall of 2003. A report titled *East Ravine Development Potential: Retail and Residential* completed by the McComb Group was published in December of 2003

Table 2 - Project Magnitude Data – 2006 20-year Residential Growth

East Ravine Land Use Category	Neighborhood 1 (Acres)	Neighborhood 2 (Acres)
Low Density Residential	578	567
Medium Density Residential	86	139
High Density Residential	57	70
Commercial	35	5
Industrial	0	1
Institutional	17	27
Major ROW & River	6	121
Mixed Use/Village Center	68	57
Parks/Open Space	352	642

Rural Estate	0	516
Undeveloped/Uncategorized	186	455
Total Acreage	1383*	2600*

East Ravine Project Areas	Residential Acres	Total Units	Density (Units per Acre)
Neighborhood 1	720	3,207	4.45
Neighborhood 2	775	3,474	4.32
Total	1495	6,554	4.38

Residential Land Use	Units	Percent of Overall Total
Single Family Detached	2,994	46%
Multi-Family Attached	1,602	24%
Multi-Family Stacked	1,958	30%
Total Units	6,554	100%
Unit Type	Units	Percent of Overall Total

* Acreage totals from the 2006 AUAR may be 5–10 acres lower than the 2025 GIS totals due to improved mapping technology and alignment with parcel boundaries.

Note: density is represented as a "net" acreage including land areas guided as residential excluding wetlands, bodies of water, regional parks and greenways and major road right-of-way.

There are two primary Commercial land use nodes in the project area. Neighborhood 1 includes the bulk of the commercial area at the Cottage View area at CR 19 and Highway 61. The other area is the Cedarhurst area at 70th Street east of CR 19 in Neighborhood 2. Collectively, these two areas could accommodate approximately 850,000 square feet of new commercial retail development. The East Ravine Development Potential: Retail and Residential market study provided the research to support this level of retail growth over the 20-year period (2006-2026). Given that the development has not fully come to fruition, projected growth will likely go into 2045.

In 2012, the City Council approved a 23.5-acre commercial development that is located in the Cottage View Area of Neighborhood 1 South, which was completed in March 2014. The City's adopted 2040 Comprehensive Plan includes a land use designation change from Commercial to Mixed Use for this area. To support this change, a new Mixed Use zoning ordinance was drafted. This ordinance allows vertical mixed use residential development, in addition to traditional retail and office uses, within the East Ravine. At this time, it is premature to estimate what the ratio of units or density that the market would support. Infrastructure and roadway improvements will be analyzed and required as development occurs. Appendix 3 illustrates the update to the original land-use plan from the 2030 Comprehensive Plan Land Use to the 2040 Comprehensive Plan Land Use.

Table 3 – Planned Land Use (Illustrated in Appendix 3)

Land Use	Acres
Agricultural	13
Commercial	39
High Density Residential	130

Land Use	Acres
Medium Density Residential	248
Low Density Residential	1,266
Rural Residential	614
Mixed Use	143
Public/Semi-Public	48
Parks/Open Space	1,380
Open Water	103
Vehicular Right-of-Way	0.2
Total Acres	3,988

Table 4 - Project Magnitude Data – Original Predicted 20 Year Commercial Growth

Neighborhoods	Commercial Acres
Neighborhood 1 - Undeveloped	64
Neighborhood 1 - Developed	0
Neighborhood 2 - Undeveloped	62.5
Neighborhood 2 - Developed	23.5
Total Project Area	150

The original development scenario was derived with input from a group of area residents on a Community Advisory Team, City Advisory Commissions, and from two workshop meetings of the City Council and Planning Commission held in the spring and summer of 2004. The development scenario utilized the East Ravine's existing topographic features, transportation corridors, greenways, and development patterns to establish a plan for new neighborhood areas, distinct to Cottage Grove, interconnected by a network of parks, trails, and storm water drainage features.

As a part of the 2040 Cottage Grove Comprehensive Plan, a Market and Development Context Report was prepared in 2016. This report is included in the Appendix 1 for reference. In 2024, the City completed a Comprehensive Housing Needs Analysis. While this study includes all of the city, a significant amount of housing needs will be fulfilled within the East Ravine Area. The summary and full report may be found here: Comprehensive Housing Needs Analysis | Cottage Grove, MN

The original development scenario is illustrated in Figure 4 and consists of the following components:

Housing - Large areas of predominantly Single Family residential housing are interspersed with a combination of medium and higher density attached residences to provide a balance of housing opportunities and meet the lifecycle housing needs and desires of the community. Housing types include single family detached, villas, multi-family attached (townhomes, rowhouses, twin homes) and multi-family stacked (condominiums and apartments). Housing densities would range from lower density single family neighborhoods between 2-4 units per acre to higher density "village" type neighborhoods such as at Keats Avenue and 70th Street ranging from 5 to 30 units per acre. Higher density residential uses would be located in the Cottage View and Cedarhurst areas with densities in the 5 to 30 unit per acre range, and in the new mixed use land use districts, which would allow for a density of up to 40 units

per acre for select projects. Development to date of housing within the AUAR area is as follows and well under the original AUAR estimate of 4.38 units/acre overall, with most development occurring to be low density residential:

Table 5 – Development Growth

Time Period / Year	Development Name	Neighborhood	Total Lots / Units	Total Acreage	Gross Density (units/acre)
Through 2019	19 Developments (total)	Neighborhood 1	747 lots	310 acres	2.40
2021	Rolling Meadows	Neighborhood 1	41	17.58	2.3
2024	Summer Valley	Neighborhood 1	71	24.48	2.9
2021	Cardinal Reserve	Neighborhood 1	59	22.18	2.7
2022	Glacial Valley	Neighborhood 1	100	18.94	5.3
2025	Lochridge 1st Addition	Neighborhood 1	102	53.27	1.9
2025	Northwick Park	Neighborhood 1	71	26.79	2.6
2025	Ravine Crossing	Neighborhood 1	79	28.19	2.8
Total through 2025	7 Developments	Neighborhood 1	523	191.43	2.73

Table 6 – Residential Acres Developed (2025)

Residential Acres Developed (2025)	
Original Planned Developed Residential	1,644 acres*
Developed through 2019	310 acres
Developed through 2025	191 acres
Yet to be Developed	1,143 acres
Total	3,288 acres

* Does not include rural residential or mixed used

Commercial – The development scenario identifies two commercial areas or "nodes." The node in the Cedarhurst area at 70th Street and Keats Avenue would have a smaller scale, integrated neighborhood commercial emphasis. This pattern of commercial use would typically include smaller building footprints on smaller parcels. The Cottage View area node in the south near Highway 10/61 is more oriented toward larger scale community commercial uses including larger “big box” type commercial uses with intensive parking needs. Larger parcels are required for this type of use. Floor area ratios (square feet of gross leasable area to gross site acreage) for commercial uses would range from 0.2 for the larger scale community commercial to .5 for the more village oriented commercial uses.

Since the adoption of the AUAR in 2006, commercial development has progressed in the Cottage View area of Neighborhood One South, including the approval of a 180,000-square-foot Walmart store. This development is situated on 23.5 acres of land designated for commercial use, consistent with the area's long-term planning guidance. Additional traffic studies were completed in conjunction with the development review process for this project. The recommendations found in the traffic studies were incorporated into the approval of the Walmart project. Construction for this project was completed in the first quarter of 2014. This project is within the scope of the original development scenario. The Traffic Study is included as Appendix 2. No additional commercial activity has occurred in the East Ravine planning area since the adoption of the original AUAR in 2006.

Commercial Land Use (2025)

Developed as of 2025	23.5 acres
Yet to be Developed	15.5 acres
Total Planned Commercial	39 acres

Transportation - One of the primary goals of the planning process is to design an efficient, safe, and interconnected system of local and collector streets. One of the major features to meet that goal that emerged from the process is the East Ravine Parkway which essentially runs through both neighborhoods and provides a connecting link for the entire East Ravine community. The parkway will provide both a transportation corridor and a major design feature for the project. As a new collector street, the parkway will traverse the entire project area beginning in the northwest and meandering east and south towards Highway 10/61. Portions of the parkway will include natural landscaped areas, trailways, ponds, and wetlands. Other portions will appear more like Summit Avenue in St. Paul with large green boulevard and median areas. Along the parkway, local residential subdivision entrance outlots and buffers, such as Jamaica to Keats, will continue to create neighborhood focal points and amenities out of green island areas. Sidewalks and trails linking area homes to the parkway, will allow safe and convenient movement throughout the eastern portion of Cottage Grove and connect to the remainder of the community.

Since the adoption of this AUAR, the East Ravine Parkway was formally named as Ravine Parkway South by the Cottage Grove City Council. Two segments of this roadway have been completed to date in conjunction with the construction of the Washington County South Service Center and the Cottage Grove City Hall and Public Safety facility. The City worked with Washington County to identify controlled access points within Upper Ravine Neighborhood One North, which included segments of the Ravine Parkway. The City also coordinated with Washington County on the realignment of the intersection of 70th Street and Keats Avenue in accordance with the City’s 2030 Comprehensive Plan. This realignment project was completed in the spring of 2015. These roadway projects were analyzed in the original AUAR and adopted Comprehensive Plan. Portions of the 70th Street realignment were incorporated into the South Washington Watershed District’s (SWWD) regional storm sewer extension project. This portion of the project was included in a separate AUAR that was prepared by the SWWD. In 2018 and 2019, three additional segments of the parkway were constructed between Keats Avenue and Hinton Avenue. Since

the 2020 update to the AUAR, Washington County has adopted a county access management plan that was supported by Cottage Grove.

Transportation planning also includes the proposal to realign portions of Military Road to correct system design inefficiencies. The proposal would use a realigned portion of existing Jamaica Avenue to connect southward to 70th Street. Given the historic role of Military Road, the character and location of the former road alignment will be reflected in a new system of local streets and trails.

Green Corridors - Major roadways and streets including 70th Street, 80th Street, Jamaica, Ravine Parkway, and Keats Avenue (County Road 19) will be established as green corridors throughout the project area. Expanded right-of-way and easement areas will create larger scale open spaces that will provide buffers to adjacent land uses and a continuation of the community's open space heritage. These green corridors will include trails and landscaping treatments that will vary in form and style depending on the specific location in the project area. Park and recreation features will also be included in these green corridors or will be connected to them via trails and sidewalks.

All new developments along the major roadways within the district are required to have a landscape buffer component that averages 30 feet, with a minimum of 50 feet, and is protected by easements and covenants. The design criteria within this dedicated buffer area are expected to be consistent from subdivision to subdivision along the major roadways. The required buffer area was successfully implemented in the design approval for the single family residential subdivisions recently approved along Ravine Parkway, 70th Street, and Jamaica Avenue. This action has been implemented as development occurs adjacent to the major roads in the planning area.

As a component of the 70th Street realignment project and in conjunction with the concept review of several new residential developments in Neighborhood One that have occurred recently, the City has begun to implement the Historic Military Road Trail Corridor from Keats Avenue to Ravine Parkway. The corridor will be extended and refined upon the new intersection geometrics for Military Road and Jamaica Avenue at the Cottage Grove and Woodbury boundary. Completion of this realignment project is expected in 2028 depending on development activity. Portions of Military Road have been permanently closed as a result of adjacent residential development. The new historic trail segments include landscaping, architectural benches, interpretive signage, and prairie restorations. The Jamaica Avenue upgrade and realignment have yet to occur.

Surface Water Management - The City is utilizing current management practices and policies to plan for surface water management in the planned East Ravine neighborhoods. The term surface water is used broadly to refer to:

- Wetlands
- Lakes and ponds, either natural or artificial
- The overland runoff resulting from rainfall or snow melt events
- Streams and other natural channels
- The Mississippi River
- Features constructed to temporarily or permanently store runoff such as infiltration areas
- Infrastructure designed and constructed to collect, convey, store, treat, control and protect surface water resources.

The Cottage Grove Surface Water Management Plan (SWMP) serves as a comprehensive planning document to guide the City in conserving, protecting, and managing its surface water resources. The SWMP is periodically updated to meet the requirements established in Minnesota Rules 8410, Metropolitan Council's SWMP Guidelines, and the rules and standards of the South Washington Watershed District. The SWMP outlines the goals and policies for surface water and storm water

management. The plan outlines guidance for stormwater infrastructure including storm drains, ponds, infiltration/filtration basins, and other features. The MPCA Stormwater Manual is the standard reference for stormwater best management practices.

Development Staging/Phasing – Development staging for the project is for Upper Ravine Neighborhood 1 to be served first followed by Neighborhood 2. As of 2025, Neighborhood 1 is nearly fully developed. Neighborhood 2 is anticipated to be provided with infrastructure facilities when Neighborhood 1 has become substantially developed. The original phasing plan is included as Figure 5. Due to market factors (2008-2010) recession and Covid-19 Pandemic (2020-2022) development is occurring 10-15 years behind schedule. Phase 1 is nearly complete as of 2025.

The following table (Table 7) provides a breakdown of 2040 Future Land Use by acreage according to Neighborhood 1 and Neighborhood 2 and the total project area. A figure depicting Planned Land Use is located in Appendix 3.

A portion of the planned trunk sanitary sewer for the Upper Ravine District was installed by the City in 2007 in order to serve the first two residential subdivisions located west of Jamaica Avenue and south of Lake Robert. This trunk sewer then benefitted 17 other surrounding developments surrounding Ravine Parkway to develop from 2007 to 2025. Additionally, the sewer staged development for trunk sewer extension to the west. Infiltration has continued to be utilized in development areas where allowed by the City's Wellhead Protection Plan.

Since the adoption of the AUAR in 2006, the SWWD has completed all five phases of the Central Draw Overflow and Storage Project.

When fully developed, the East Ravine will contain the following mix of land uses:

Table 7 - Development Scenario – Future Land Use Acreages (Updated 2025)

Land Use Category	Acres
Commercial	39
High Density Residential	130
Low Density Residential	1,267
Medium Density Residential	249
Mixed Use	143
Open Water	103
Parks and Open Space	1,381
Public/Semi Public	48
Right-of-Way	13
Rural Residential	615

7. Climate Adaptation and Resilience

A. Describe the climate trends in the general location of the project (see guidance: *Climate*

***Adaptation and Resilience*) and how climate change is anticipated to affect that location during the life of the project.**

According to the Minnesota Department of Natural Resources, Climate Trends, "Minnesota's climate already is changing rapidly and will continue to do so for the foreseeable future. Temperatures are increasing, especially in winter, and larger, more frequent extreme precipitation events are occurring. Substantial warming during winter and at night, increased precipitation, and heavier downpours already have affected our natural resources, and how we interact with and use them. The decades ahead will bring even warmer winters and nights, and even larger rainfalls, along with the likelihood of increased summer heat and the potential for longer dry spells." Climate trends for Washington County parallel the statewide overall trends for temperature and precipitation, indicating Minnesota's climate is becoming warmer and wetter. Exhibit 1 and Exhibit 2, below, generated from the *Minnesota Climate Explorer*[1] in July 2025, show the average annual temperatures and precipitation for Washington County, Minnesota from 1895 to 2025. From 1985 to 2025, Washington County experienced an average increase of 0.21 degrees Fahrenheit per decade, and an average precipitation increase of 0.34 inches per decade.

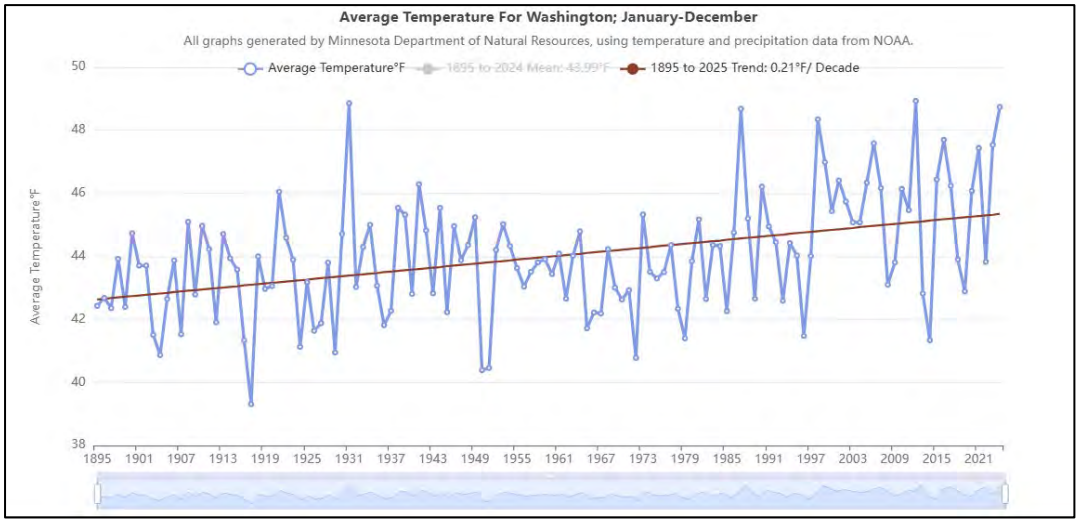


Exhibit 1 - Average Temperature for Washington County, January-December 1895-2025
Minnesota Climate Explorer. August 2025.
Source: Minnesota Department of Natural Resources.
https://climate-explorer.dnr.state.mn.us/main/historical

[1] https://climate-explorer.dnr.state.mn.us/main/historical

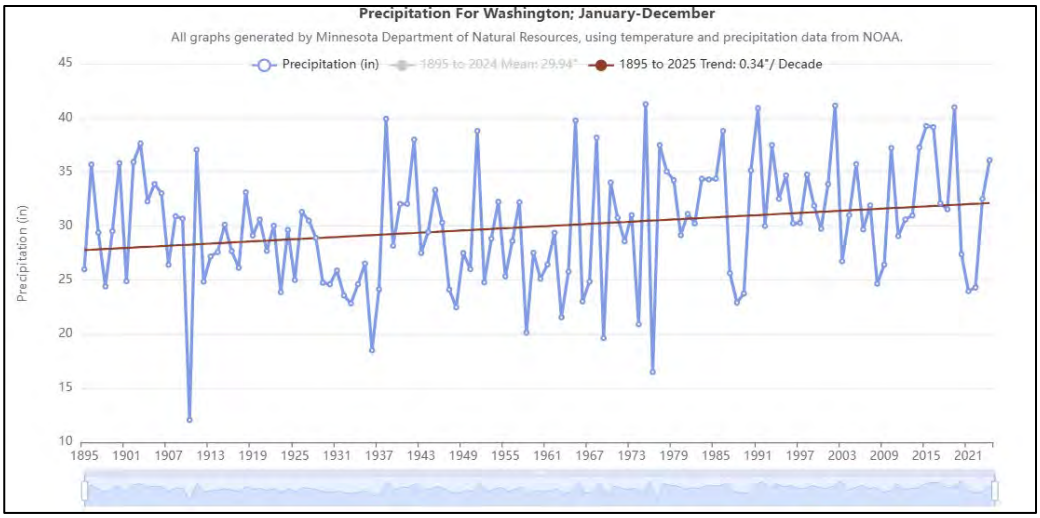


Exhibit 2 - Precipitation for Washington County, January-December 1895-2025
Minnesota Climate Explorer. July 2025.August 2025.
Source: Minnesota Department of Natural Resources.
https://climate-explorer.dnr.state.mn.us/main/historical

The Palmer Drought Severity Index (PDSI)[2] utilizes temperature and precipitation data to estimate relative soil moisture conditions and serve as an indicator of long-term drought conditions. The index ranges from -5 to +5 indicating dry and wet conditions, respectively. PDSI values are reported on a monthly basis. Exhibit 3. shows historic PDSI values for the month of July from 1895 to 2025 for Washington County, which indicates an increase of 0.18 per decade. Generally, the PSDI historical data indicates that the region is experiencing a wetter climate.

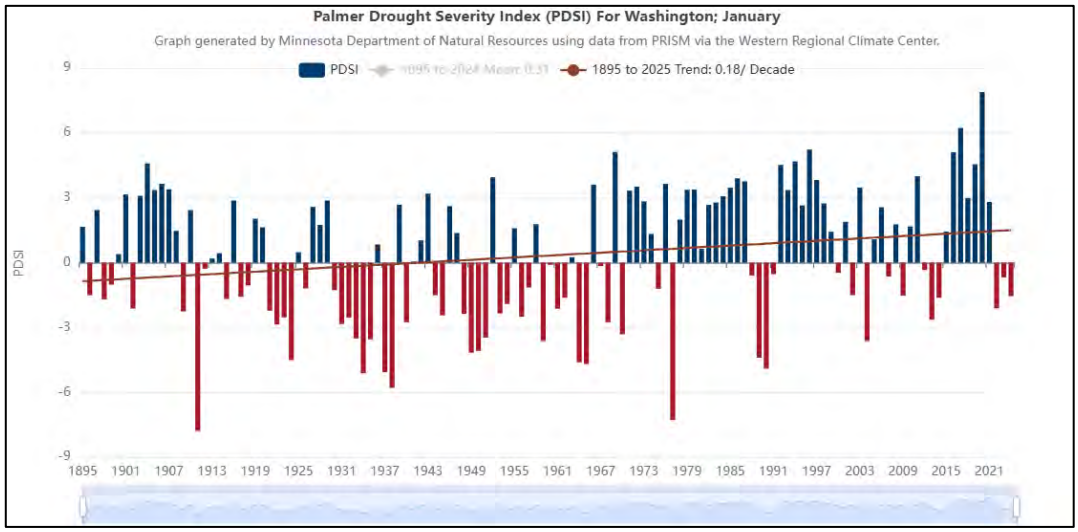


Exhibit 3 - Historical PDSI Values for Washington County, June 1895-2025
Minnesota Climate Explorer. August 2025.
Source: Minnesota Department of Natural Resources.
https://climate-explorer.dnr.state.mn.us/main/historical

[2] https://climate-explorer.dnr.state.mn.us/main/historical

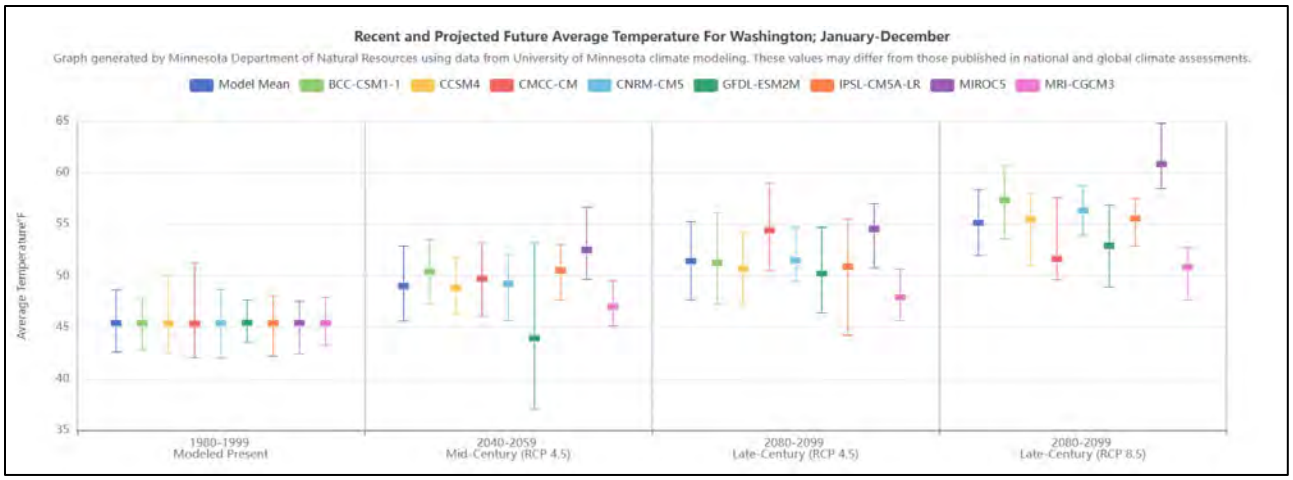


Exhibit 4 - Projected Temperatures in Washington County
Minnesota Climate Explorer. July 2025.
Source: Minnesota Department of Natural Resources.
https://climate-explorer.dnr.state.mn.us/main/historical

Projected climate trends[3] indicate that temperatures within the County will continue to increase. Exhibit 4 illustrates projected temperatures for the County. Several climate models are shown in the projected temperature analysis. The model mean, shown in blue, illustrates the average of all models included in the analysis. Exhibit 4. shows the modeled present condition, mid-century (2040-2059) at Representative concentration Pathway (RCP) 4.5, late-century (2080-2099) at RCP 4.5, and late-century (2080-2099) at RCP 8.5. RCP is a greenhouse gas concentration scenario used by the Intergovernmental Panel on Climate Change in the fifth assessment report. RCP 4.5 is an intermediate scenario in which emissions decline after peaking around 2040 and RCP 8.5 represents a worst-case scenario in which emissions continue rising through the 21st century. Under the RCP 4.5 scenario, the annual temperature is anticipated to increase within the County from a modeled present mean of 45.42°F (1980-1999) to a mid-century (2040-2059) model mean of 49.03°F and a late-century (2080-2099) model mean of 51.44°F. Under the RCP 8.5 worst-case scenario, the County would experience a late-century (2080-2099) model mean temperature of 55.14°F. Projected climate trends indicate that temperatures within the County will continue to increase.

[3] https://climate-explorer.dnr.state.mn.us/main/historical

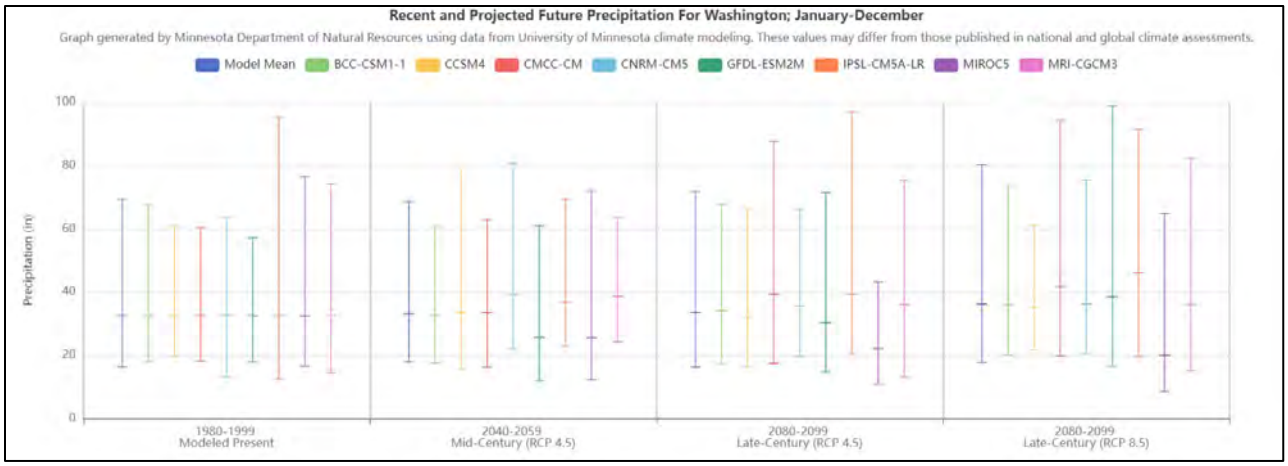


Exhibit 5 - Projected Precipitation in Washington County
Minnesota Climate Explorer. July 2025.
Source: Minnesota Department of Natural Resources.
https://climate-explorer.dnr.state.mn.us/main/historical

Exhibit 5 presents projected average annual precipitation[4] for Washington County. Under the RCP 4.5 scenario, the annual precipitation is anticipated to increase within the County from a modeled present mean of 32.59 inches (1980-1999) to a mid-century (2040-2059) model mean of 33.2 inches and a late-century (2080-2099) model mean of 33.61 inches. Under the RCP 8.5 worst-case scenario, the County would experience a late-century (2080-2099) model mean precipitation of 36.22 inches.

According to the Federal Emergency Management Agency (FEMA) *National Risk Index for Natural Hazards,* which illustrates the U.S. communities most at risk for 18 types of natural hazards, overall, Washington County, Minnesota is rated relatively moderate compared to the rest of the U.S. This rating is based on a relatively moderate expected annual loss rating, a very low social vulnerability rating, and a very high community resilience rating.

Thirteen of eighteen hazard types contribute to the expected annual loss for Washington County, Minnesota. Two hazard types are rated very high risk (strong wind, ice storm); four hazard types are rated relatively high risk (cold wave, lightning, heat wave, tornado); three hazard types are rated relatively moderate risk (winter weather, hail, landslide); two hazard types are rated relatively low risk (riverine flooding, wildfire); and two hazard types are rated very low risk (drought, earthquake).

The Social Vulnerability for each type of hazard is rated very low, which means social groups in Washington County, Minnesota have a very low susceptibility to the adverse impacts of natural hazards when compared to the rest of the U.S. The Community Resilience for each type of hazard is rated very high, which means communities in Washington County, Minnesota have a very high ability to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions compared to the rest of the U.S. The expected loss each year due to natural hazards in Washington County, Minnesota is relatively moderate. FEMA National Risk Index[5] and supporting documents are located in Appendix 4.

[4] https://climate-explorer.dnr.state.mn.us/main/historical
[5] https://hazards.fema.gov/nri/map

B. For each resource category in the table below, describe the project's proposed activities and how the project's design will interact with those climate trends. Describe proposed adaptations to address the project effects identified.

Table 8 - Climate Considerations and Adaptions

Resource Category	Climate Considerations	Project Information	
		Climate Change Risks and Vulnerabilities	Adaptations
Project Design	The design and material choices in building architecture, along with site planning, can influence the surrounding environment. This includes altering climate zones, affecting temperature patterns, and increasing the likelihood of prolonged heat waves.	Climate change risks and vulnerabilities identified include higher rainfall events which may result in more localized flooding due to planned impervious surface; certain building construction materials such as dark roofing materials, as well as increased impervious surfaces, absorb heat during the day and radiate it at night, which increases the urban heat island effect and amplifies the warming temperatures of climate change.	• Promote increasing vegetation by planting trees and creating green spaces. Encourage the use of light colored roofing materials and pavement to minimize heat absorption. • Promote enhancing building design for energy efficiency and green roofs for insulation and heat reduction.
Land Use	No critical facilities are proposed, including those essential for public health and safety, those storing hazardous materials, or those housing occupants with limited mobility.	Climate change risks and vulnerabilities identified include: higher rainfall events which may result in more localized flooding due to planned impervious surfaces.	• Encourage the design of stormwater BMPs to meet city requirements and use effective drainage systems. • Promote the use of permeable materials for paving to reduce

Resource Category	Climate Considerations	Project Information	
		Climate Change Risks and Vulnerabilities	Adaptations
			runoff. • Encourage the development of green infrastructure like green roofs and rain gardens.
Water Resources	Addressed in Item 12	Addressed in Item 12	Addressed in Item 12
Contamination/ Hazardous Materials/ Wastes	Current climate trends in Minnesota and anticipated climate changes in the project's vicinity may affect the environmental impact of generating, using, and storing hazardous waste and materials.	No hazardous waste is anticipated to be generated, used, or stored throughout the life of the project as currently proposed. Any waste generated during construction will be stored in marked containers in accordance with applicable laws and disposed of at licensed facilities. Should future commercial uses be introduced—such as fuel stations, medical facilities, or other industries—additional review and compliance measures would be undertaken to address any potential hazardous waste considerations.	N/A
Fish, wildlife, plant communities, and sensitive ecological resources (rare features)	Addressed in Item 14	Address in Item 14	Addressed in Item 14

8. Cover Types

AUAR Guidance: The following information should be provided:

- *A cover type map, at least at the scale of a USGS topographic map, depicting:*
    - *Wetlands (identified by Circular 39 type)*
    - *Watercourses (rivers, streams, creeks, ditches)*
    - *Lakes (identify public waters status and shoreland management classification)*
    - *Woodlands (break down by classes where possible)*
    - *Grassland (identify native and old field)*
    - *Cropland*
    - *Current development*
- *An overlay map showing anticipated development in relation to the cover types. This map should also depict any "protection areas," existing or proposed, that will preserve sensitive cover types. Separate maps for each major development scenario should be generally provided.*

Cover Type Map

Figure 6 shows natural resources such as threatened and endangered species and cover types such as cropland, basswood forest, brushland, coniferous plantation, dry oak forest, dry oak savanna, dry prairie, lowland hardwood forest/wet meadow, lowland hardwood forest, maple-basswood forest, mesic oak forest, mixed hardwood forest, oak woodland-brushland, old field, and wetland/open water marshes. Figure 8 presents mapping of watercourses, wetlands, lakes, and floodplains.

Current Minnesota Land Cover Classification System Cover Type designations for the AUAR area are presented in Table 9. The future level of impact cannot be predicted at this time since specific development plans are not in place. Appendix 5 shows the updated Minnesota Land Cover Classification System Cover Types.

Table 9 – 2025 Minnesota Land Cover Classification System Cover Types

Land Classification	Existing Acres	Land Classification	Existing Acres
Forest	789.3	Short Grasses	14.7
Wetland Open Water	4.4	76-100% Impervious	97.1
Tall Grasses	274.6	Agricultural Land	1486
Open Water	102.8	Dry Tall Grasses	20.6
Wetland Forest	20.2	Wetland Emergent Vegetation	10.4
26-50% Impervious	726.0	11-25% Impervious	174.7
51-75% Impervious	25.8	5-10% Impervious	241.4
		Total	3,988

Table 10 – Estimated future cover types based on MLCCS and planned land use

Land Classification	Existing Acres	Land Classification	Existing Acres
Forest	666	Short Grasses	32.1
Wetland Open Water	4.4	76-100% Impervious	165
Tall Grasses	488.9	Agricultural Land	35.2
Open Water	140.4	Dry Tall Grasses	18
Wetland Forest	4.9	Wetland Emergent Vegetation	10.4
26-50% Impervious	1,791	11-25% Impervious	176.9
51-75% Impervious	85.3	5-10% Impervious	369.9
Total			3,988

Overlay

Figure 9 presents existing land use and Figure 4 presents the development scenario representing future land use that can be viewed in conjunction with Figures 10.1 Natural Resources and 10.2 Water Features. Cottage Grove has a commitment to natural resources and has prepared a Natural Resource Inventory completed by BRAA in 1998. Community woodlands and wetlands are also regulated by the City's Tree Preservation Ordinance and the Wetlands Conservation Act. Figure 10 presents a Natural Resources Overlay identifying Environmentally Sensitive Features as identified in the City's Comprehensive Plan.

With urban development, the face of the existing landscape is inevitably and irreparably modified. The City recognizes that the areas identified for growth on the approved 2030 and 2040 land use plans will shift the ratios of the different land classifications identified in table 9. In utilizing the City's Park and Open Space Plan and the Tree Preservation Ordinance, the natural communities that have a significant local value have and will be preserved. The current development review process does not break out the land use classification changes to the level of detail identified initially in Table 9 and is not a component of review for development of the East Ravine Planning Area.

9. Permits and Approvals

AUAR Guidance: A listing of major approvals (including any comprehensive plan amendments and zoning amendments) and public financial assistance and infrastructure likely to be required by the anticipated types of development projects should be given for each major development scenario. This list will help orient reviewers to the framework that will protect environmental resources. The list can also serve as a starting point for the development of the implementation aspects of the mitigation plan to be developed as part of the AUAR.

Table 11 - Permits and Approvals

Unit of Government	Type of Application/Permit	Regulatory Citation (as may be noted)	Status
City of Cottage Grove	Subdivision Approval	City Code Title 10	As needed.
	Planned Unit Development Approval	City Code Title 11, Chapter 12	As needed.
	Rezoning Text and/or Map Amendments	City Code Title 11, Chapter 2, Section 6	As needed.

Unit of Government	Type of Application/Permit	Regulatory Citation (as may be noted)	Status
		Text and map amendments	
	Flood Fringe and Floodway Overlay	City Code Title 11, Chapter 10 FLOODPLAIN MANAGEMENT DISTRICT	As needed.
	Conditional Use Permit Approval	City Code Title 11, Chapter 2, Section 8 CONDITIONAL USE PERMITS	As needed.
	Grading Permit/Drainage and Excavating	City Code Title 9, Chapter 7, Section 1 GRADING, FILLING AND EXCAVATING	As needed.
	Site Plan Review Approval	City Code Title 11, Chapter 2, Section 4 SITE PLAN REVIEW	As needed.
	Comprehensive Plan Amendments	MN Statutes §473.864 PLANS; ADOPTION; AMENDMENT.	As needed.
	Sewer, water, storm water permit	City Code Title 8, Chapter 1, Section 3	As needed.
	Variance	City Code Title 11, Chapter 2, Section 5 VARIANCES	As needed.
Washington County	Roadway Access Permit		As needed.
	Utilities in Right-of-Way Permit		As needed.
Minnesota Department of Natural Resources	Utility Crossings Permit	MN Statute 103G, MN Rules 6115.0810	As needed.
	Natural Heritage Program Coordination	MN Statutes Chapter 84.0895; MN Rules Chapter 6134	As needed.
	Public Waters Work Permit	MN Statute 103 G, MN Rules 6115.0150	As needed.
Minnesota Department of Health	Water Main Plan Review	MN Rules 4720	As needed.
Minnesota Pollution Control Agency	NPDES Permit	MN Statute 115, MN Rules 7002	As needed.
	Sanitary Sewer Extension Permit		As needed.
	401 Water Quality Certificate	Clean Water Act Section 401 (40 CFR Parts 121, 122, and 124)	As needed.
	Surface Water Discharge Permit		As needed.
	Wastewater Permit		As needed.
	Indirect Source Permit (ISP)		As needed.

Unit of Government	Type of Application/Permit	Regulatory Citation (as may be noted)	Status
South Washington County Watershed District	Grading/Drainage/Storm sewer Permit		As needed.
	WCA Wetland Permit	MN Rule 8420	As needed.
Metropolitan Council Environmental Services	Wastewater Extension		As needed.
Minnesota State Historic Preservation Office	Cultural Resource Coordination	Section 106 of the Historic Preservation Act, Protection of Historic Properties" (36 CFR Part 800), MN Field Archaeology Act, MN Statutes 138.31-.42, MN Historic Sites Act – MN Statutes 138.661-6691, MN Private Cemeteries Act- MN Statute 307.08	As needed.
Minnesota Department of Transportation	Utilities in Right-of-Way Permit		As needed.
	Access Permit		As needed.
Minnesota Environmental Quality Board (EQB)	Environmental Assessments (AUAR)	Minnesota Rules 4410	As needed.
U.S. Army Corps of Engineers	Clean Water Act Section 404/10 Wetland Permits	Section 404 Of The Clean Water Act Title 33CFR26 - Water Pollution Prevention and Control Subchapter IV - Permits and Licenses	As needed.
US Fish and Wildlife Service	Endangered Species Act Coordination	Federal Endangered Species Preservation Act of 1973, as amended in 1978, 1982, and 1988;	As needed.

10. Land Use

A. Describe:

1. Existing land use of the site as well as areas adjacent to and near the site, including parks, trails, and prime or unique farmlands.

Previous and current land uses within the original project area are primarily agricultural, forested greenways, and wetland areas. The project area contains existing farmsteads which generally consist of residential structures and outbuildings such as barns, sheds, or silos. Most of neighborhood 1 has developed as residential and some commercial. Other existing land uses within the project area include large lot residential development on individual septic systems and private wells. This type of use is primarily situated along the eastern edge of the project area in what is commonly known as Old Cottage Grove. Figure 9 illustrates 2006 land use in the project area. Mapped 2025 existing land use is found in Appendix 3.

Ongoing development in the East Ravine is constantly shifting the existing land use acreage as properties develop in accordance with the East Ravine Master Plan and

adopted comprehensive plans. The current build out of Neighborhood 1 closely aligns with the original development vision and planning framework.

Table 12 – 2006 and 2025* Existing Land Use

2006 Land Use Category	2006 Acres	2025 Land Use Category	2025 Acres
Agricultural Use	2,439	Agricultural	1,264
Commercial	61	Retail and Other Commercial	32
Park/Open Space	568	Park, Recreational, or Preserve	891
Public / Semi Public	53	Institutional	69
Road Right of Way	70	Major Highway	3
Rural Residential	738	Single Family Attached	73
Urban Residential	69	Mixed Use Residential	9
		Single Family Detached	770
		Farmstead	65
		Industrial or Utility	2
		Extractive	23
		Open Water	66
		Undeveloped	721
Grand Total	3,998**	Grand Total	3,988

* 2025 Data source is the 2020 Met Council data spot checked with 2025 aerials.
** Acreage totals from the 2006 AUAR may be 5–10 acres lower than the 2025 GIS totals due to improved mapping technology and alignment with parcel boundaries.

Adjacent land uses consist of a combination of urban land uses to the west of the project area (predominantly a single family, low density residential use) and rural land uses to the east of the project area (farm fields). Highway 61 is located to the south of the project area. The City of Woodbury is located to the north. In the city of Woodbury, near the project area, land uses are predominantly residential.

A site owned by 3M Corporation is located at the northern boundary of Cottage Grove, east of County Road 19. The site has extensively been monitored by both 3M Corporation and the Minnesota Pollution Control Agency. Additional documentation as to the status of this site is available through the City of Cottage Grove or through the MPCA.

Prime or unique farmland

It is not anticipated that existing farmlands will be protected through special programs, deed restrictions, conservation easements, or other means. As anticipated in both the City's and County's Comprehensive Plans, it is expected that the East Ravine project area will be developed over time. The Project Area does not contain land that is projected as part of the Agricultural Preserve Program.

Designated parks, recreation areas or trails

A major feature of the project area is the Cottage Grove Ravine Regional Park. This regional park provides an abundance of passive natural areas, picnic areas and trail corridors. The development scenario for the East Ravine project includes the addition of a number of park and open space features that provide connections to Cottage Grove Ravine Regional Park. The park features include a variety of community and neighborhood parks with active and passive play areas.

The 2014 East Ravine residential development, the 2013 East Point Douglas Road improvement project, and the construction of the Ravine Parkway Civic Campus provided a key link in the local and regional trailway system of south Washington County with the Cottage Grove Ravine Regional Park. Since the adoption of the original AUAR, the Mississippi River Trail[6] (USBR #45) was established and also provides a connection to the region, state, and nation. The County trail connecting Lake Elmo Park to Cottage Grove Ravine Regional Park was also completed, further enhancing regional connectivity. With the new residential developments within the East Ravine, the City created several neighborhood parks developed that conform to the East Ravine Park Master Plan.

In 2017, a major park infrastructure and amenity improvement project was completed in the Cottage Grove Ravine Regional Park by Washington County and the South Washington Watershed District. Also in 2017, the Cottage Grove Ravine Regional Park Master Plan was completed. The updated Development Master Plan builds upon previous planning efforts to preserve and protect the abundance and diversity of natural resource amenities, while improving the regional park's usability and accessibility in response to new development challenges. Park improvements were proposed at three key locations within the park: the trailhead site on the east side of Ravine Lake, the south end of Ravine Lake where a new outflow structure will be installed, and a new park entrance with an upper picnic area. Updates to the trail network are also included in the master plan. Cross-country ski trail intersections and segments affected by potential flooding will be relocated, ski trails will be reorganized into sequential loops, and trail lighting will be installed to support after-dark skiing.

Table 13 - Open Space/Green Land Uses in the Development Scenario (Updated 2025)

Open Space/Green Land Use	Acres
Civic Campus	49
Community Park	205
Existing Conservation Easement	164
Water/Ponds	103
Neighborhood Park	50
Proposed Conservation Easement	356
Regional Green Corridors	136
Regional Park	420
Total	1,483 (Parks/Open Space + Open Water)

The park and open space development that has occurred to date is in significant conformance with the green space identified in Table 13 and the correlating areas found on the 2030 and 2040 Land Use Plans, the future park and open space plan, and Figure 4 of this document.

[6] http://www.mississippirivertrail.org/index.html

2. Planned land use as identified in comprehensive plans (if available) and any other applicable plan for land use, water, or resource management by a local, regional, state, or federal agency.

Proposed Development

Land uses in the Cottage Grove 2040 Comprehensive Plan[7] include:

Agricultural - Commercial agricultural uses are the principal land use of the property. May also contain a residence and other associated outbuildings at a minimum net density of one unit per 40 acres.

Low Density Residential - Residential development within the MUSA at net densities of 2 to 4 units per acre. Additional density—up to 20%—may be achieved if a residential project supports the public policy goal of providing affordable housing. See figure 7 for the 2006 Municipal Urban Service Area (MUSA) and 2020 MUSA Expansion.

Medium Density Residential - Residential development within the MUSA at net densities of 5 to 13 units per acre. Additional density—up to 20%—may be achieved if a residential project supports the public policy goal of providing affordable housing.

High Density Residential - Residential development within the MUSA at net densities of 14 to 30 units per acre. Additional density—up to 20%—may be achieved if a residential project supports the public policy goal of providing affordable housing.

Rural Residential - Residential development outside the MUSA boundary at net densities of 0.1 to 0.3 units per acre, with lots served by private wells and on-site sewer systems. Cluster development is encouraged to preserve open space and natural amenities.

Commercial - Commercial development including retail, service, and office uses. With few exceptions, commercial areas are located within the MUSA. Commercial land uses are estimated to provide an average of 25 employees per acre—10 retail and 15 non-retail.

Industrial - Industrial development including research, manufacturing, distribution, assembly, and office uses. Agricultural preserve uses are allowed as interim land uses. Except for the 3M Cottage Grove facility, industrial development will occur within the MUSA. Industrial land uses are estimated to provide an average of 2 non-retail employees per acre.

Public/Semi-Public - Public and semi-public institutional uses including schools, places of worship, government buildings, and similar uses. These uses are estimated to provide an average of 10 non-retail employees per acre.

Mixed Use - Areas designated as Mixed Use are intended to provide flexibility for complementary uses within a district. A mixed use land use pattern generally includes any combination of higher-density residential, commercial services, employment opportunities, and transit access.

Park and Private Open Space - Public parks and private lands designated for preservation as open space.

Right-of-Way - Public or private vehicular and railroad rights-of-way.

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[7] https://www.cottagegrovemn.gov/DocumentCenter/View/2973/Chapter-2-Land-Use

Transitional Planning Area - Areas designated as Transitional Planning Area require additional planning before future land use designations are established.

Golf Course - Areas used for public or private golf courses.

Open Water - Permanently flooded open water, rivers, and streams—not including wetlands or periodically flooded areas.

Agricultural Preservation Land Use - While not an official future land use designation, the future of several properties in Cottage Grove is influenced by their inclusion in the Metropolitan Agricultural Preservation Program. Established by the Minnesota Legislature in 1980, this program protects farmland in the Twin Cities region. Local governments identify long-term agricultural lands and apply protective zoning. Landowners may opt into the program through restrictive covenants that limit land use to agriculture or forestry for at least eight years.

The proposed land uses for the East Ravine Master include agricultural, commercial, high density residential, medium density residential, low density residential, rural residential, mixed use, public/semi-public, parks/open space, open water, and vehicular right of way. The Planned Land Use map is found in Appendix 3. This map shows the following acreages:

Agricultural -	13 acres
Commercial -	39 acres
High Density Residential -	130 acres
Medium Density Residential -	248 acres
Low Density Residential -	1,266 acres
Rural Residential -	614 acres
Mixed Use -	143 acres
Public/Semi-Public -	48 acres
Parks/Open Space -	1,380 acres
Open Water -	103 acres
Total -	3,988 acres

The proposed development pattern seeks to preserve a significant portion of the project area as park or open space area. Approximately 1,380 acres or approximately 35% of the project area is in some form of green space as itemized in Table 13.

Subdivisions that have been approved since 2006 are consistent with the East Ravine Master Plan. In addition, the City worked with Washington County in the expansion of the Ravine Regional Park along Kimbro Avenue. The acquisition financing of the new parkland was a component of the negotiated agreement relating to the offset of regional parkland utilized for the Civic Campus. Consistent with the modifications in land use and land cover through development, the preservation of open space within the East Ravine is not actively quantified due to a lack of purpose as development occurs within the scope of approved land use plans within the planning district.

3. Zoning, including special districts or overlays such as shoreland, floodplain, wild and scenic rivers, critical area, agricultural preserves, etc.

AUAR Guidance: Water-related land use management districts should be delineated on

appropriate maps, and the land use restrictions applicable in those districts should be described. If any variances or deviations from these restrictions within the AUAR area are envisioned, this should be discussed.

A Water-Related Land Use Management figure is in Appendix 3. This figure shows the 100 Year Flood Zones.

Existing Zoning

According to the Cottage Grove Interactive Zoning Map, accessed July 2025 (Appendix 6), the existing AUAR area includes the following zoning districts:

- AG-1, Agricultural Preservation
  - Intended to preserve areas of high-quality soils or highly productive agricultural capability to maintain and enhance the use of the land for long-term or permanent agricultural use and preserve the rural character of outlying areas of the City and agriculturally related uses in areas of the City not served by public sewer.

- AG-2, Agricultural
  - Represents areas which are suitable for agricultural uses, but because of their proximity to public sewer and water, they may be appropriate for development in the future. These areas are not considered to be land suited to long-term agricultural use. It is the purpose of this District to preserve these lands in agricultural uses until such time as streets, sewers, water supply and other community facilities and services are provided or scheduled, so as to ensure orderly and beneficial conversion of such lands to nonagricultural use, and to prevent their premature conversion.
- R-1, Rural Residential
  - Represents areas without public utilities that are suitable for residential development. These areas are designated as rural residential in the City's comprehensive plan. It is the intent that low densities be maintained in order to permit efficient re-subdivision of lots to urban densities at such future time that public utilities become available.

- R-3, Single Family
  - Intended to preserve the character of existing single-family neighborhoods and provide for additional development of single-family detached residential neighborhoods.

- R-4, Transitional zoned areas
  - Provides transitional areas that will allow a mixing of single-family detached and single family attached dwellings on smaller lots where property is adjacent to a minor or major collector street and/or where property is adjacent to higher intensity development or land use. Directly related, complementary uses are also appropriate. A full range of public services and facilities shall be available to R-4 areas.

- R-5, Medium Density
  - Promote the development of higher density, primarily attached housing and directly related, complementary uses. Densities will help the City meet its multiple family density goals. A full range of public services and facilities shall be available to R-5 areas.

- B-2, Retail Business
  - Encourages retail sales and services while minimizing the negative impact to the surrounding residential neighborhoods.

Zoning Amendments have been identified as necessary in the permits section.

AG-1, Agricultural Preservation; R-1, Rural Residential; AG-2, Agricultural; R-3, Single Family; B-2, Retail Business; R-5, Medium Density; R-4, Transitional zoned areas. Zoning Amendments have been identified as necessary in the permits section

FEMA National Flood Hazard

FEMA identifies Zone A flood zones around the identified wetlands in the project area. NFIP Panels 0410E and 0417E are found in Appendix 7. All development associated with the proposed project will occur in compliance with existing local, state, and federal regulations related to development within floodplains.

Other Special Districts and Zoning Overlays

There are no other special districts or zoning overlays identified within the AUAR Study Area.

4. **If any critical facilities (i.e., facilities necessary for public health and safety, those storing hazardous materials, or those housing occupants who may be insufficiently mobile) are proposed in floodplain areas and other areas identified as at risk for localized flooding, describe the risk potential considering changing precipitation and event intensity.**

   No critical facilities are proposed as part of the project.

B. Discuss the project's compatibility with nearby land uses, zoning, and plans listed in Item 9a above, concentrating on implications for environmental effects.

AUAR Guidance: The extent of conversion of existing farmlands anticipated in the AUAR should be described. If any farmland will be preserved by special protection programs, this should be discussed.

The City of Cottage Grove completed a comprehensive plan update in October 2000. This plan update identified the East Ravine area as a future development phase (or MUSA expansion area) that was dependent upon completion of the South Washington County Interceptor. The plan established a strategy for detailed master planning of the East Ravine as an implementation initiative. The East Ravine AUAR implements that initiative. The 2000 Comprehensive Plan update included the necessary components to comply with the requirements set out in 4410.3610, subpart 1.

In March of 2011, the City adopted the 2030 Comprehensive Plan which succeeded the 2000 plan that implemented the East Ravine master planning process. The 2030 Comprehensive Plan reflected development scenarios within the East Ravine. The City continued to work with the City of Woodbury as land use and transportation changes related to development occur or are planned.

The 2040 Comprehensive Plan adopted in 2020 retained most of the neighborhood, transportation, and infrastructure guidance established in the 2030 plan and AUAR. Following its adoption, a plan amendment modified the land use in the quadrant located at 70th Street and Keats Avenue and in the Cottage View Site. Commercial districts were changed to Mixed Use and the Low, Medium, and High density districts were reconfigured.

The City's 2040 Comprehensive Plan identifies the East Ravine Master Plan and project area, as described in this AUAR Update, as a location that is open for future land use development. The 2040 Comprehensive Plan identifies the following guiding principles for development within the project area:

- Preservation of the natural features in the area as open spaces, notably the East Ravine landform itself.
- Create a system of green corridors in the East Ravine for walking and biking.
- Maintain the unique and historic character of Old Cottage Grove and Cedarhurst Mansion.

- While allowing for a range of housing densities in the East Ravine, most land in the area will be designated for low-density residential development.
- Balance the supply of housing in Cottage Grove and provide expanded opportunities for move-up housing in the East Ravine.

The proposed development of the East Ravine area is aligned with the City's existing 2040 Comprehensive Plan and takes into account compatibility with nearby land uses. To the east of the East Ravine area is primarily undeveloped/agricultural lands within the city limits. To the south and southwest is State Highway 61, with industrial/open space land on the other side. To the west is fully developed mix of uses (primarily residential). To the north is the City of Woodbury with existing land uses of agricultural/open space. The city also has regulation though Zoning, Subdivision, Stormwater Management, Tree Preservation, Flood plain and Shoreland Management that are intended to provide protections and minimize environmental effects of development.

C. Identify measures incorporated into the proposed project to mitigate any potential incompatibility as discussed in Item 9b above.

The proposed development scenarios are anticipated to be compatible with planned future land uses within and adjacent to the AUAR Study Area.

11. Geology, Soils, and Topography/Landforms

A. Geology – Describe the geology underlying the project area and identify and map any susceptible geologic features such as sinkholes, shallow limestone formations, unconfined/shallow aquifers, or karst conditions. Discuss any limitations of these features for the project and any effects the project could have on these features. Identify any project designs or mitigation measures to address effects to geologic features.

AUAR Guidance: A map should be included to show any groundwater hazards identified.

According to the University of Minnesota's Geologic Atlas of Washington County[8], the bedrock beneath the area includes formations such as the Shakopee, Platteville and Glenwood, St. Peter Sandstone, St. Lawrence, and Jordan Sandstone. These formations vary in composition and thickness, with characteristics that may influence development.

For example, the friable nature of the St. Peter and Jordan Sandstones could present challenges for foundation stability, while features in the Shakopee Formation may affect groundwater movement. These geologic conditions are important to consider during planning and design, as they may impact excavation, stormwater management, and infrastructure placement. Additional geotechnical evaluation may be needed to ensure safe and sustainable development.

According to the University of Minnesota's Geologic Atlas of Washington County (C-39, Plate 3[9]), the surficial geology in the area includes a mix of sand, gravel, clay, silt, and exposed bedrock. These materials were deposited by glacial activity and river systems and vary in thickness and distribution across the landscape.

[8] https://conservancy.umn.edu/bitstreams/bde71cad-4215-44af-9cda-18c45d5cde6e/download
[9] https://conservancy.umn.edu/bitstreams/dc058a75-d416-42d9-81ae-9ad9b8ea066a/download

This information is important for understanding development potential and limitations. Thick sand and gravel deposits may offer good drainage but could require stabilization for construction. Shallow bedrock or bedrock outcrops may restrict excavation and utility placement, while clay and silt-rich areas, especially near rivers and wetlands, may be more prone to erosion, settlement, or water retention issues.

Most of the project area is located in a groundwater recharge area due to the predominantly sandy soils, underlain by gravel and rock, which allows rapid percolation of water into the aquifer. Groundwater depth ranges from a shallow depth of 40 feet to upwards of 300 feet in places. The Prairie du Chien aquifer is located close to the surface and is accessed by a limited number of rural homes for private well water. The Jordan aquifer is much deeper ranging in depth from 150 to 300 feet and is the principal source of water of the City's wells.

The bulk of the project area's geologic formation is classified as "outwash (Superior)" with some areas of shallow bedrock. The areas of shallow bedrock are located on the western edge of Neighborhood 1 and in the central portion of Neighborhood 2. Areas of shallow bedrock are most prominent east of Keats Avenue, and east of the project area. Figure 11 illustrates a soils map of the area. Figure 12 illustrates the general depth to bedrock. Depth to bedrock for Washington County can also be found at the University of Minnesota's C-39, Geologic Atlas of Washington County, Minnesota; Plate 6, Bedrock Topography and Depth to Bedrock[10] figure. Figure 13 illustrates surficial geology.

Sensitivity to Pollution: The Geologic Atlas (MGS 1989) maps the sensitivity to pollution of the water table aquifer. The water table aquifer in the area is within the glacial material that consists of glacial till or outwash. The map indicating the aquifer's sensitivity is based on several assumptions and is to be used as a general gauge of the overall susceptibility to pollution based on the travel time of pollutants from a surface source to the water table aquifer. A shorter anticipated time of travel translates into a higher sensitivity rating for the aquifer. The majority of the East Ravine (and the entire City of Cottage Grove) has a high susceptibility of groundwater to pollution. Given this vulnerability, mitigation measures should be considered to protect water quality. These may include enhanced stormwater management practices, land use controls to limit hazardous materials, vegetative buffers, groundwater monitoring systems, and public education initiatives. Such strategies can help reduce the risk of contamination and support long-term sustainability of the aquifer.

A standard soils map is included as Figure 11. Soils are predominantly of a sandy loam nature, highly permeable with relatively good agricultural suitability.

B. Soils and Topography – Describe the soils on the site, giving NRCS (SCS) classifications and descriptions, including limitations of soils. Describe topography, any special site conditions relating to erosion potential, soil stability, or other soil limitations, such as steep slopes or highly permeable soils. Provide estimated volume and acreage of soil excavation and/or grading. Discuss impacts from project activities (distinguish between construction and operational activities) related to soils and topography. Identify measures during and after project construction to address soil limitations including stabilization, soil corrections, or other measures. Erosion/sedimentation control related to stormwater runoff should be addressed in response to Item 11.b.ii.

AUAR Guidance: The number of acres to be graded and number of cubic yards of soil to be moved need not be given; instead, a general discussion of the likely earthmoving needs for development of the area should be given, with an emphasis on unusual or problem areas. In discussing mitigation

[10] https://conservancy.umn.edu/server/api/core/bitstreams/c1979540-bb81-4b02-a1e4-7213ca7d277f/content

measures, both the standard requirements of the local ordinances and any special measures that would be added for AUAR purposes should be included. A standard soils map for the area should be included.

Erosion and sedimentation

Normal grading practices associated with urban development will be associated with future development in the Cottage Grove East Ravine. Certain areas where topographic relief is dramatic have been placed in an open space or green land use pattern to minimize potential for erosion and sedimentation problems. Best management practices will be applied to all construction projects in the area to prevent erosion and sedimentation during construction projects. Section 7.2.1 of the Surface Water Management Plan (SWMP) (Appendix 8) describes the City's erosion and sediment control responsibilities as required by the NPDES MS4 Permit.

According to the Web Soil Survey, soils in the area are predominantly comprised of Antigo silt loam, Ostrander silt loam, and Mahtomedi loamy sand. Web Soil Survey report is attached in Appendix 9.

Table 14 - Soil Types Within the Study Areas*

Map Unit Symbol	Map Unit Name	Parent Material	Hydrologic Soil Group	Acres of Study Area	Percent of Study Area
2	Ostrander silt loam, 0 to 2 percent slopes	Loess over till	B	50.4	1.3%
2B	Ostrander silt loam, 2 to 6 percent slopes	Loess over till	B	259.4	6.5%
2C	Ostrander silt loam, 6 to 12 percent slopes	Loess over till	B	13.4	0.3%
7B	Hubbard loamy sand, 1 to 6 percent slopes	Outwash	A	1.9	0.0%
7C	Hubbard loamy sand, 6 to 12 percent slopes	Outwash	A	4.8	0.1%
7D	Hubbard loamy sand, 12 to 18 percent slopes	Outwash	A	44.5	1.1%
8	Sparta loamy sand, 0 to 2 percent slopes	sandy glaciofluvial deposits	A	3.8	0.1%
8B	Sparta loamy sand, 2 to 6 percent slopes	sandy glaciofluvial deposits	A	60.0	1.5%
8C	Sparta loamy sand, 6 to 15 percent slopes	sandy glaciofluvial deposits	A	21.2	0.5%
49	Antigo silt loam, 0 to 2 percent slopes	loess and/or silty glaciofluvial deposits over loamy glaciofluvial deposits over stratified sandy and gravelly outwash	B	834.9	20.8%
49B	Antigo silt loam, 2 to 6 percent slopes	loess and/or silty glaciofluvial deposits over loamy glaciofluvial deposits over stratified sandy and gravelly outwash	B	966.7	24.1%
49C	Antigo silt loam, 6 to 15 percent slopes	loess and/or silty glaciofluvial deposits over loamy glaciofluvial deposits over stratified sandy and gravelly outwash	B	296.7	7.4%
49D	Antigo silt loam, 15 to 35 percent slopes	loess and/or silty glaciofluvial deposits over loamy glaciofluvial deposits over stratified sandy and gravelly outwash	B	54.1	1.3%
120	Brill silt loam	Loess over outwash	C	29.1	0.7%

Map Unit Symbol	Map Unit Name	Parent Material	Hydrologic Soil Group	Acres of Study Area	Percent of Study Area
153C	Santiago silt loam, 6 to 15 percent slopes	Loess over till	B	0.7	0.0%
155D	Chetek sandy loam, 12 to 25 percent slopes	loamy glaciofluvial deposits over stratified sandy and gravelly outwash	A	23.1	0.6%
189	Auburndale silt loam, 0 to 2 percent slopes	loess and/or silty alluvium over dense loamy till	B/D	8.5	0.2%
266	Freer silt loam	Loess over till	C/D	7.1	0.2%
298	Richwood silt loam, 0 to 2 percent slopes	Loess over outwash	B	78.9	2.0%
298B	Richwood silt loam, 2 to 6 percent slopes	Loess over outwash	B	75.0	1.9%
301B	Lindstrom silt loam, glaciated, 2 to 4 percent slopes	silty slope alluvium	B	185.9	4.6%
327	Dickman sandy loam, 0 to 2 percent slopes	Outwash	A	29.4	0.7%
327B	Dickman sandy loam, 2 to 6 percent slopes	Outwash	A	2.6	0.1%
411	Waukegan silt loam, 0 to 2 percent slopes	Glaciofluvial sediments over outwash	B	12.9	0.3%
411B	Waukegan silt loam, 2 to 6 percent slopes	Glaciofluvial sediments over outwash	B	12.8	0.3%
449	Crystal Lake silt loam, 0 to 3 percent slopes	silty lacustrine deposits	C	13.2	0.3%
452	Comstock silt loam, 0 to 3 percent slopes	silty lacustrine deposits	B/D	17.4	0.4%
454B	Mahtomedi loamy sand, 0 to 6 percent slopes	Outwash	A	21.5	0.5%
454C	Mahtomedi loamy sand, 6 to 12 percent slopes	Outwash	A	56.1	1.4%
454D	Mahtomedi loamy sand, 12 to 25 percent slopes	Outwash	A	248.5	6.2%
454F	Mahtomedi loamy sand, 25 to 40 percent slopes	Outwash	A	235.7	5.9%
488F	Brodale flaggy loam, 20 to 50 percent slopes	Colluvium over limestone bedrock	B	21.2	0.5%
507	Poskin silt loam	Alluvium over outwash	B/D	1.2	0.0%
529B	Ripon silt loam, 2 to 6 percent slopes	Loess over limestone bedrock	C	9.3	0.2%
529C	Ripon silt loam, 6 to 12 percent slopes	Loess over limestone bedrock	C	146.5	3.6%
541	Rifle muck	Organic material	A/D	3.8	0.1%
543	Markey muck	Organic material over outwash	A/D	15.2	0.4%
857C	Urban land-Waukegan complex, 3 to 15 percent slopes	-		12.2	0.3%
1013	Pits,quarry	-		2.6	0.1%
1040	Udorthents	-		13.6	0.3%
1847	Barronett silt loam, sandy substratum	Alluvium over outwash	B/D	94.8	2.4%

Map Unit Symbol	Map Unit Name	Parent Material	Hydrologic Soil Group	Acres of Study Area	Percent of Study Area
W	Water	-		24.6	0.6%
Totals for Area of Interest				4,015.0	100.0%

*Based on data provided by Web Soil Survey.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils have a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission. The majority of the soil in the project is in this group.

Group B. Soils have a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils have a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils have a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high-water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Development of the study area will require extensive earthmoving activities, including clearing vegetation, stripping topsoil, grading, and excavation for infrastructure such as roads, utilities, and building foundations. The scale and complexity of these operations will vary depending on the topography and soil characteristics across the site. A significant portion of the area is underlain by Antigo silt loam soils (Map Units 49, 49B, and 49C), which together account for over 50% of the study area. These soils are generally well-drained and moderately sloped, making them suitable for development, though areas with steeper slopes (such as 49C and 49D) may require additional erosion control measures.

Other prevalent soils include Mahtomedi loamy sands (Units 454D and 454F), which are excessively drained and found on steep slopes. These conditions increase the risk of erosion and may complicate vegetation establishment and stormwater management. Similarly, Ostrander silt loams (Units 2B and 2C) and Lindstrom silt loam (301B) are moderately sloped and well-drained, but still require attention to erosion during construction. Areas with steep slopes, such as those in Units 454F, 49D, and 155D, will require special grading techniques, such as terracing or retaining walls, and may be subject to grading limits to minimize soil loss and slope instability.

Problematic soils include those with poor drainage or low structural stability. Organic soils like Rifle muck (541) and Markey muck (543) are unsuitable for structural development due to their low bearing capacity and high compressibility. These areas may require complete removal and

replacement with engineered fill or the use of deep foundation systems. Soils in hydrologic groups C, D, or C/D—such as Brill silt loam (120), Freer silt loam (266), and Comstock silt loam (452)—have slow infiltration rates and may contribute to surface ponding and runoff. These areas will benefit from engineered stormwater solutions, such as subsurface drainage systems or enhanced infiltration basins.

Standard mitigation measures required by local ordinances include erosion and sediment control plans, stormwater management systems compliant with MS4 permits, and grading permits with detailed site-specific plans. For AUAR purposes, additional measures should be considered, such as phased grading to limit exposed soil, stabilization of soil stockpiles, and the use of erosion control blankets or geotextiles on steep slopes. Soil amendments may be necessary in sandy or excessively drained areas to improve water retention and support vegetation. Where feasible, development should avoid areas with highly erodible or organic soils to reduce long-term maintenance and environmental impacts.

12. Water Resources

AUAR Guidance: The information called for on the EAW form should be supplied for any of the infrastructure associated with the AUAR development scenarios, and for any development expected to physically impact any water resources. Where it is uncertain whether water resources will be impacted depending on the exact design of future development, the AUAR should cover the possible impacts through a "worst case scenario" or else prevent impacts through the provisions of the mitigation plan.

A. Describe surface water and groundwater features on or near the site below.

1. Surface Water – lakes, streams, wetlands, intermittent channels, and county/judicial ditches. Include any special designations such as public waters, trout stream/lake, wildlife lakes, migratory waterfowl feeding/resting lake, and outstanding resource value water. Include water quality impairments or special designations listed on the current MPCA 303d Impaired Waters List that are within one mile of the project. Include DNR Public Waters Inventory number(s), if any.

Wetlands

Level 2 wetland delineations will be required for identified areas prior to development, ensuring accurate assessment and compliance with regulatory standards. Wetland delineations in Minnesota are valid for five years; therefore, any delineations completed prior to that timeframe will need to be updated.

There are approximately 105 acres of wetlands within the project area. Wetlands were identified using National Wetland Inventory (NWI) Maps, the *Cottage Grove Natural Resources Inventory* (Cottage Grove Natural Resource Inventory 1998), MnDNR Public Water Inventory (PWI) Maps, and the Minnesota Land Cover and Classification System (MLCCS). There are four MnDNR public water wetlands located in the project area (82W-Gables Lake, 83W-Unnamed wetland, 84W-Unnamed wetland, and 87W-Regional Park Lake). The wetlands that are present within the project area are depicted on Figure 8. These wetlands provide habitat for numerous waterfowl, amphibians, reptiles, and upland wildlife species. Several species of migratory birds (ducks, geese, and cranes) commonly use wetlands.

Only one of the residential subdivisions that developed since the adoption of the AUAR had a wetland identified during the required wetland delineation reports that were completed as a part of the development process. That project was The Waters at Michael's Pointe, which is adjacent to a deep,

open water marsh that is one of the few natural wetlands in Cottage Grove that is of a considerable size. This designated wetland (now named Lake Robert) was protected during construction in accordance with the requirements of Minnesota DNR and the South Washington Watershed District (SWWD). The Lochridge development now surrounds the Lake Robers area with a buffer, trail, park, and open space. The SWWD has assigned this wetland's management class as Protect, which requires a 100-foot-wide average wetland buffer and to maintain water quality and quantity. There were no other non-residential developments that had a wetland identified or impacted.

Subsequent projects with wetlands have been delineated and impacts have been avoided or mitigated as required by the South Washington Watershed District, who is also the LGU.

Watercourses

The City of Cottage Grove, MLCCS, MCBS, Metropolitan Council, and MnDNR information was used to classify and map watercourses. Cottage Grove Ravine Creek is a watercourse that runs through the project area and a portion of it is a MnDNR public water (PWI ID 82012a). The portion that is a MnDNR public water starts just north of 80th Street and flows south through Neighborhood 2. The creek is listed as an EPA Cateogry 5 impaired water due to un-ionized ammonia, which impacts aquatic life. There are approximately 143,000 linear feet of watercourses within the project area. In general, watercourse corridors provide habitat for upland wildlife and migratory birds. Migratory birds, amphibians, reptiles, and waterfowl are common types of species found along creeks.

The reported watercourse has a single documented impact, which involved the acquisition of additional public drainage and utility easements over a portion of the creek in Section 23, as a part of a minor subdivision associated with Washington County's parkland acquisition. In 2017, the SWWD completed a streambed stabilization project within the Cottage Grove Regional Park, in conjunction with the stormwater overflow outlet construction.

Lakes

The City of Cottage Grove, MLCCS, MCBS, Metropolitan Council, and MnDNR information was used to classify and map lake areas. Gables Lake and Regional Park Lake are both located within the project area and are both identified by the MnDNR PWI map as public water wetlands (82W and 87W, respectively). Gables Lake and Regional Park Lake account for the approximately 26 acres of lakes within the project area. Lakes provide habitat for migratory birds, fish, waterfowl, amphibians, and reptiles.

Gables Lake is upstream of all development that occurred in the East Ravine. The Regional Park Lake is downstream from the Washington County Government Center and the Cottage Grove City Hall, which was constructed in 2012 following the approval of the AUAR. This water body was not compromised by these two projects as the sites were developed with surface water rate and quality controls that were constructed in accordance with the South Washington Watershed Districts standards and requirements and the City's surface water management plan.

2. **Groundwater – aquifers, springs, and seeps. Include 1) depth to groundwater; 2) if project is within a MDH well protection area; and 3) identification of any onsite and/or nearby wells, including unique numbers and well logs, if available. If there are no wells known on site or nearby, explain the methodology used to determine this.**

   According to the Minnesota Department of Health's Minnesota Well Index, the AUAR Study Area contains 285 wells, shown in Table 15. Please note that there may be a lag in data updates; this is the most current information available from the Minnesota

Department of Health's Minnesota Well Index. The AUAR Study Area is located within the Cottage Grove Wellhead Protection Area (WHPA) and the Cottage Grove Drinking Water Supply Management Area (DWSMA), and the DWSMA is listed as high vulnerability. The DWSMA and WHPA are mapped in Appendix 7. Depth to water table in the AUAR Study Area varies from 10 feet to over 50 feet, according to the Natural Resources Research Institute's Minnesota Natural Resource Atlas[11]. The AUAR will discuss any potential impacts to the Cottage Grove DWSMA.

Table 15 - Minnesota Well Index Wells within AUAR Study Area

Unique Well ID	Well Name	Elevation	Depth Drilled	Depth to Bedrock	Status
00257225	ABELSON, JOLENE	931	0	0	-
00257308	ADAMS, LORRIE	913	0	0	-
00257483	ALME, ALLEN AND MICHELLE	913	0	0	-
00607474	ANDERSON, CHRISTOPHER	830	220	136	Active
00106258	ANDERSON, EVERETT	910	175	40	Active
00134786	ANDERSON, EVERETT	908	155	40	Active
00257323	ANDERSON, JOHN AND KAREN	921	0	0	-
00257223	ANDERSON, MICHAEL AND ANN	920	0	0	-
00493161	ANGELL, JOHN & TINA	924	205	75	Active
00110402	AUGUST, GEROLD C.	925	141	12	Active
00233142	BAHE WELL	945	270	80	Sealed
00545604	BAILEY LAKE MW-3	906	86	0	Active
00194194	BARNEY	934	185	80	Active
00623885	BEALLES, MARYAN	894	300	74	Active
00426921	BEDMAREKS, JERRY	922	160	45	Active
00162952	BENSON, NEAL	969	185	6	Active
00686615	BENSON, RICK	889	295	0	Active
00257216	BERNDT, DON M AND SUSAN	949	0	0	-
00257234	BERTRAM, MARK	940	0	0	-
00617651	BERTRAM, MIKE & NITA	914	290	71	Active
00431223	BESKAR, ROBERT	923	235	35	Active
00475351	BEST, TOM	906	203	13	Active
00257228	BISCOE, DONALD AND KATHERINE	933	0	0	-
00170797	BISCOE, J.L.	914	200	0	Active
00162902	BISCOE, LYLE	923	141	70	Active
00257805	BISCOE, LYLE AND EMILY	921	0	0	-
00519091	BISCOE, ROBB	915	235	50	Active
00257778	BISCOE, ROBERT	914	0	0	-
00257615	BLANKENSHIP, KELLY	897	0	0	-
00257218	BLITZ, MICHAEL AND JUDITH	934	0	0	-
00257881	BLOOMQUIST, AXEL AND JEAN	932	0	0	Sealed
00257309	BLOOMQUIST, LAURIE ANN	917	0	0	-
00256776	BOONDOCKS CAFE	912	282	236	Sealed
00544381	BORST, GARY	923	305	180	Active
00279438	BOTHE, ROGER	997	280	40	Sealed
00257789	BOURGOIN, WILLIAM AND ROSALIE	918	0	0	-
00419840	BRICK, RAY	895	230	70	Active
00257233	BRIER, GEORGE D AND ELLIE	927	0	0	-

[11] https://mnatlas.org/gis-tool/

Unique Well ID	Well Name	Elevation	Depth Drilled	Depth to Bedrock	Status
00418672	BROTZLER, HAROLD	905	280	50	Active
00257617	BROWN, ANGELINE	901	0	0	-
00185997	BROWN, GLEN	902	245	50	Active
00257485	BROWN, GLEN AND LORRAINE	904	0	0	-
00608238	BRUFLODT, STEVE	900	280	67	Active
00257329	BRUNELL, TODD	921	0	0	-
00257238	BURANDT, PAUL	922	0	0	-
00257312	BUTT, WAYNE	912	92	0	Sealed
00779057	CHRISTIANSEN, CLINT	922	380	52	Active
1000023966	CLARK, HOWARD & SHERYLL	984.63	0	0	Active
00418637	COKLEY, BOB	924	340	75	Active
00257307	CONLEY, JULIE	917	0	0	-
00257497	COOMER, SCOTT AND BOBBI JO	885.2	0	0	-
00272278	COTTAGE GROVE DRIVE INN	861	135	65	Sealed
00447211	D.O.H. LANDSCAPING	910	158	70	Active
00257819	DAHLKE, KEVIN	920	0	0	-
00257316	DALLY, WAYNE AND PATRICIA	912	0	0	-
00257794	DETVILER, RICHARD AND SUSAN	924	0	0	-
00427043	DEUTSCH, GARY & DOREEN	909	160	105	Active
00257480	DICK, DAVID AND ANITA	920	0	0	-
00425289	DINGLE, JEFF	929	280	43	Active
00613418	DOLAN, DAN	902	270	40	Active
00679298	DORNIDEN, MICHAEL	901	280	79	Active
00257214	DROPIK, RICHARD A AND DIANNE	951	0	0	-
00257808	EBERSPACHER, MARGARET	916	0	0	-
00257227	EDMUND J MONTBRIAND AND KATHLEEN F SKOW	923	0	0	-
00257812	EDWARDS, ANNA	920	0	0	-
00257882	EHLERT, NANCY	969	0	0	-
00257224	ENGER, KEVIN	919	0	0	-
00748731	ERICKSON, LEE	958	380	15	Active
00112269	EVERIE, CLIFFORD	920	155	86	Active
00471485	FARMER, JOE	932	320	60	-
00142581	FEIOCK, RICHARD	967	220	25	Active
00257807	FIEDLER, DORIS	916	0	0	-
00107312	FISHER, CODY	920	180	50	Active
00257217	FOX, ROBERT	940	0	0	-
00257237	FREISCHEL, MICHAEL R AND JULIE	906	0	0	-
00257320	FRITZE, WALTON K AND KAREN	915	0	0	-
00257614	FURLONG, PATTY LEE	919	0	0	-
00257222	GAALSWYK, RICHARD AND SHEILA	912	0	0	-
00156431	GAUSSMAN, RUSS	902	148	60	Active
00412369	GERLACH, LARRY	922	175	40	Active
00493216	GERLACH, RANDY	928	185	36	Active
00257318	GERLACH, RANDY	914	0	0	-
00257319	GERLACH, RANDY	914	0	0	-
00257828	GERLACH, SCOTT	920	0	0	-
1000021229	GETTY, JEFF & DEBRA	917.43	0	0	Active
00257829	GETTY, JEFF AND DEBRA	920	0	0	-

Unique Well ID	Well Name	Elevation	Depth Drilled	Depth to Bedrock	Status
00408185	GOEBEL, AUGUST	953	350	142	Active
00257206	GOEBEL, JOHN	971	0	0	-
00112436	GOEBEL, MIKE	915	172	50	Active
00408186	GOEBEL, TOM	938	375	157	Active
00194229	GOEBEL, TOM	937	350	60	Active
00257226	GROSS, LAWRENCE D AND BEVERLY	923	0	0	-
00257315	HACKL, DANIEL AND PATRICIA	913	0	0	-
00633209	HANNON, JOHN	842	245	33	Active
00156419	HAYDEN, KEN	920	155	40	Active
00257625	HELDMAN-TRUST, BARRY AND MARY	781	0	0	-
00564198	HENDRICKSON, GERRY	902	247	128	Active
00257781	HENDRICKSON, JEFFREY	920	0	0	-
00257824	HIESERICH, DAVID AND ARDIS	919	0	0	-
00637428	HILLYER, PERRY	922	210	28	Active
00842126	HILLYER, TOM	915.4	260	0	Active
00170830	HOLZ, WILBUR	917	320	15	Active
00641476	HOLZ, WILMAR	916	320	178	Active
00257495	HORNER, BEN & ERICA	907	196	0	Active
1000025194	HORTON, D. R.	942	155	0	Inactive
00257211	HOUSE, DIRK A. JR. AND CHARLETTE	979	0	0	-
00257324	HUGHES, ELDON AND KAREN	918	0	0	-
00257765	JANSEN, JAMES AND HELEN	913	0	0	-
00257325	JARAMILLO, ALEJANDRO AND LISA	917	0	0	-
00257785	JAWORSKI, DANIEL AND FAYE	922	0	0	-
00257496	JENSEN, REBECCA	900	0	0	-
00698214	JENSON, BOB	939	380	30	Active
00121080	JOHNSON, BLAINE	903	190	0	Active
1000021159	JOHNSON, DARREL	942.13	0	0	Active
00257622	JOHNSON, KENT	965	0	0	-
00641494	JSCOBSON, RANDY	903	275	74	Active
00257826	JUNKERT, KERMIT AND LEAH	920	0	0	-
00257879	KAISER, KENNETH AND AMY	927	0	0	Sealed
00257795	KAPAUN, RICHARD AND JOYCE	926	0	0	-
00579648	KEYLINE CONSTRUCTION	902	280	80	Active
00257838	KICKHAFER, DWIGHT AND RENEE	920	0	0	-
00503286	KING, RICHARD	899	250	100	Active
00109707	KINSEY, JAMES	925	160	40	Active
00257788	KISBY, DAVID AND JILL	920	0	0	-
00408189	KNUDSON, JEROME	935	220	135	Active
00257839	KOLBECK, TIMOTHY AND SUSAN	920	0	0	-
00257878	KOTNOUR, PAUL AND PATRICIA	925	259	114	Sealed
00437945	KRIENKE, RON	929	360	20	Active
00257212	KRIENKE, RONALD AND KAREN	921	0	0	-
00185947	KROPELNICKI CONST.	908.8	200	45	Active
00104106	KROPELNICKI, BILL	935	170	40	Active
00402556	KROPELNICKLE, BILL	923	175	30	Active

Unique Well ID	Well Name	Elevation	Depth Drilled	Depth to Bedrock	Status
00104238	KROPENIKIE, BILL	933	220	52	Active
00531443	KROPILNICKI, WILLIAM	934	240	55	Active
00257627	KUEHL, KENNETH	805.2	0	0	-
00185279	KUKACKA, RON J.	903	275	105	Active
00257314	LACHAPELLE, STEVEN AND DAWN	912	0	0	-
00257235	LAHTI, MATT AND KIMBERLY	923	0	0	-
00257230	LANKOW, LARRY J AND SANDRA	946	0	0	-
00412487	LARSON, DON	927	150	130	Active
00156418	LARSON, EARL	925	141	25	Active
00633207	LEMONS, JIM	846	243	30	Active
00402552	LIESER, DAVID	923	220	70	Active
00471471	LINDRIDGE, IAN	972	290	80	Sealed
00257219	LONG JR, THOMAS AND NANCY	929	0	0	-
1000020430	LORENTZ, DEREK & STENSGAARD, TAYLOR	915.4	0	0	-
00617687	LOWE, GREG	812	220	132	Active
00408277	MADSEN, LARRY & DIANE	933	170	116	Active
00617673	MAHIGAN, TOM	900	280	72	Active
00257820	MANKE, CARL	921.9	0	0	-
00761630	MANN, TRACY	931	440	105	Active
00182954	MARKGREN, JOHN	921	163	35	Active
00257779	MARTY, BRIAN AND BREEANA	912	0	0	-
00257793	MARTY, EDGAR AND MEGAN	923	0	0	-
00402592	MARTY, JOHN	932	125	0	Active
00257791	MARTY, JOSEPH	917	0	0	-
00412371	MARTY, LINDON	931	145	117	Active
00579617	MASCIOTPINTO, CHRIS	894	285	67	Active
00104297	MATHISON, O.T.	936	140	25	Active
00257835	MATTHEW LINDEMAN AND MELINDA KELLEY	920	0	0	-
00404807	MAYER, PETE	911	280	50	Active
00257204	MAYLONE, HARRY AND REGINA	931	0	0	-
00133508	MAYNARD, VIRGIL	925	151	65	Active
1000026051	MCHATTIE FARMS INC.	974	0	0	Active
00257310	MILLER, GARY AND EFFIE	914	0	0	-
00257783	MILLER, MICHAEL AND JANNA	921	0	0	-
00424141	MODDER, HARM	914	313	245	Active
00257837	MOES, JOHN	920	0	0	-
00686423	MOST, AL	905	280	85	Active
00112276	MURPHY, JOSEPH	930	203	74	Active
00658489	MURR, JOE & DEIDRA	833	220	34	Active
00806161	MW	910	330	180	Active
00806162	MW	910	95	0	Active
00806163	MW	896	85	0	Active
00806164	MW	855	67	0	Active
00748212	MW S01 PC	912	145	95	Active
00792092	MW S-10-DR	915	290	0	Active
00792093	MW S-10-JS	914	330	287	Active
00533494	MW-12	916	205	180	Active
00827903	MW-23	900	380	109	Active
00520036	MW-6	917	178	0	Active

Unique Well ID	Well Name	Elevation	Depth Drilled	Depth to Bedrock	Status
00520037	MW-6L	918	322	178	Active
00748211	MW-S01 JS	912	335	95	Active
00751326	MW-S02 DR	877	60	0	Active
00748209	MW-S02 JS	877	297	67	Active
00748213	MW-S03 JS	932	335	132	Active
00748214	MW-S03 PC	932	175	132	Active
00748210	MW-SO2 PC	877	240	67	Active
00199517	MYERS, GORDEN	921	175	97	Active
00745867	MYHRE, KRIS	906	340	17	Active
00257811	NELSON, DAVID AND THERESA	920	0	0	-
00257817	NELSON, ERNEST AND BRENDA	921.9	0	0	-
00162915	NEUENFELDT, JIM & KATHY	938	155	35	Active
00110426	NICHOLS, TERRY L.	970	205	6	Active
00257830	NIELSEN, JACKIE	915.4	0	0	-
00257792	NIEMAN, BURTON AND DORIS	922	0	0	-
00257229	OBID O HOFLAND JR AND MARGO V MARKS	987	0	0	-
00257231	OLSON, TIMOTHY L AND ELAINE	951	0	0	-
00670782	PARR, CHAD	943	362	25	Active
00596080	PAULSON, GREG	898	297	55	Active
00579647	PAULSON, GREG & BONNIE	896	280	60	Active
00618393	PAULSON, GREGG	896	300	80	Active
00257623	PEDERSON, JOHN	864	0	0	-
00257306	PERKINS, LEONA	917	0	0	-
00257818	PETERSON, LEON AND CHERYL	918.6	0	0	-
00460152	PHILLIPS, DEAN	932	275	240	Active
00257624	POMMERENING, RUTH	840	0	0	-
00257822	PRUESER, VICTOR AND SANDRA	919	0	0	-
00825994	PYLKAS, BRUCE	892.4	280	0	Active
00257321	R R AND D R CRAMPTON TRUSTEES	914	0	0	-
00457718	RABE, MARLIN	918	179	63	Active
00447262	RAMEY, MICHAEL & DIANE	909	219	38	Active
00257815	REED, SHANNON	918.6	0	0	-
00257484	REIN, TAMARA AND DANIEL	922	0	0	-
00460174	RHIEN, DON O.	925	280	45	Active
00257327	RICE, JAMES AND ANGEL	917	0	0	-
00623873	RICHARDS, DENNIS	903	280	80	Active
00406171	RITTER, DAVE	897	130	100	Active
00257804	ROBOLE, RANDALL AND NANCY	936	0	0	-
00412354	ROLLAND, RON	903	240	28	Active
00257313	ROLLOFF, AARON AND PEGGY	912	0	0	-
00257326	RONEY, RAMONA	920	0	0	-
00579641	ROTH, JIM	838	320	36	Active
00633201	RUMPCA, ERIC	824	230	120	Active
00162918	RUNNING, TOM	918	141	85	Active
00636351	RYAN, RICHARD & DONNA	896	280	60	Active
00257213	SCHMIDT, MARY	977	0	0	-
00656716	SCHWARTZ, RON	894	280	58	Active

Unique Well ID	Well Name	Elevation	Depth Drilled	Depth to Bedrock	Status
00257311	SHAWN PETERSON AND CHRISTINE O'NEIL	916	0	0	-
00257628	SIEWERT, GARY AND SANDRA	837	0	0	-
00503300	SOCKNESS, JAY	930	178	38	Active
00607454	SPEEDLING, WAYNE & CAROL	906	320	290	Active
00257221	SPICER, WARREN AND LUCILLE	920	0	0	-
00257836	SPILLMAN, ALLEN AND PAULETTE	920	0	0	-
00257796	STAKER - TRS, GISELA	921.9	0	0	-
00257322	STANTON, JOHN AND CAROL	920	0	0	-
00519090	STECHCON, JON	921	320	90	Active
00503315	STECHON	921	288	91	Sealed
00575698	STEWART, AL & CHRIS	938	320	11	Sealed
00170893	STEWERT	923	190	50	Active
00710136	STULC, ED	922	220	80	Active
00257784	STULC, EDWARD J AND RUTH	921	0	0	-
00257825	SUAVE, BEATRICE	920	0	0	-
00641472	SWEENEY, PAULA & MIENERT	936	340	75	Active
00257236	SWIFT, CARTER	926	0	0	-
00502140	TANK, DON	935	415	50	Active
00257301	TANK, EILEEN	930	0	0	-
00185999	TANK, GORDON	941	365	64	Active
00514399	TANK, MYRON	925	370	165	Active
00733025	TAYLOR, ROBERT	937	340	40	Active
00607485	TERENCE, SPANIER	818	180	122	Active
00257232	THAO, XOUA AND SEE VANG	930	0	0	-
00257494	TORSETH, LOWELL AND NONNA	921	0	0	-
00257853	TULLY, MICHAEL AND ROSEMARY	922	0	0	-
00257880	UTTECH, ART	932	0	0	-
00107119	WARD, NICK	975	245	0	Active
00133475	WEEKS, OLIVIA	912	160	76	Active
00109738	WHEELER, GEROLD	935	145	62	Active
00590072	WIERSUM, DANIEL D.	896	267	58	Active
00257823	WILLIAM ROTH AND MEGAN FREDERICK	920	0	0	-
00426924	WIRTH, K.	915	240	50	Active
00109708	WOLF, HARRY	930	156	47	Active
00544438	WOLF, HEIDI	934	320	52	Active
00257328	WOLKENHAUER, LARRY AND MARY	921	0	0	-
00231876	WOODBURY BARRIER WELL 2	922	315	293	Active
00257834	YOUNGQUIST, MICHELLE	920	0	0	-
1000021157	ZELLMER, DOUGLAS & ANNA	920.38	0	0	Active
00426927		926	205	0	Active
00104199		913	260	170	Active
00412480		932	180	92	Active
00408198		932	225	88	Active
00426920		913	240	45	Active
00257790		918	0	0	-
00257810		916	0	0	-
00257813		920	0	0	-
00257816		920	0	0	-

Unique Well ID	Well Name	Elevation	Depth Drilled	Depth to Bedrock	Status
00257821		920	0	0	-
00257827		920	0	0	-
00257831		920	0	0	-
00257832		920	0	0	-
00257833		920	0	0	-
00257883		954	0	0	-
00257786		922	0	0	-
00257787		922	0	0	-
1000026050		974	34	0	Sealed

B. Describe effects from project activities on water resources and measures to minimize or mitigate the effects below.

1. Wastewater – For each of the following, describe the sources, quantities, and composition of all sanitary, municipal/domestic, and industrial wastewaters projected or treated at the site.

AUAR Guidance: Observe the following points of guidance in an AUAR:

- *Only domestic wastewater should be considered in an AUAR—industrial wastewater would be coming from industrial uses that are excluded from review through an AUAR process*
- *Wastewater flows should be estimated by land use subareas of the AUAR area; the basis of flow estimates should be explained*
- *The major sewer system features should be shown on a map and the expected flows should be identified*
- *If not explained under Item 6, the expected staging of the sewer system construction should be described*
- *The relationship of the sewer system extension to the RGU's comprehensive sewer plan and (for metro area AUARs) to Metropolitan Council regional systems plans, including MUSA expansions, should be discussed. For non-metro area AUARs, the AUAR must discuss the capacity of the RGU's wastewater treatment system compared to the flows from the AUAR area; any necessary improvements should be described.*
- *If on-site systems will serve part of the AUAR, the guidance in the February 2000 edition of the EAW Guidelines on page 16 regarding item 18b under Residential development should be followed.*

a) If the wastewater discharge is to a publicly owned treatment facility, identify any pretreatment measures and the ability of the facility to handle the added water and waste loadings, including any effects on, or required expansion of, municipal wastewater infrastructure.

A detailed analysis of sanitary sewer infrastructure systems and wastewater generation was conducted for this project. The analysis is included as Appendix 10, a Technical Memorandum from Howard R. Green Company titled Cottage Grove East Ravine Planning Study: Sanitary Sewer dated February of 2005.

The City of Cottage Grove has a Comprehensive Sewer Policy Plan that was completed in May of 1992 (1996 Cost and Rate Update) by Bonestroo, Rosene, Anderlik & Associates (now Stantec). The purpose of the Comprehensive Sewer Policy Plan was to provide the City with an inventory of existing facilities and a guide for the expansion of Cottage Grove's trunk sanitary sewer system to serve its saturation population. The report served as the sewer element of the public facilities plan for the Metropolitan Council and the Comprehensive Sewer Policy Plan (CSPP) for the Metropolitan Waste Control Commission (MWCC). The City's 2000 Comprehensive Plan Update included an updated inventory of the sanitary sewer systems and projections for wastewater flows based on the updated future land use plan. This update provided the data to assist the Metropolitan Council Environmental Services (MCES) in planning for the now constructed Eagles Point Plant and the South Washington County Interceptor Sewer which will provide trunk sanitary sewer facilities to the East Ravine area. This background data served as a starting point for the East Ravine sanitary sewer analysis.

There are eight major sanitary sewer districts in the city of Cottage Grove, each defining the limits of service for a separate trunk system. The East Ravine is in the Cottage Grove Ravine District (6,501 acres). This area is served by the South Washington County Interceptor which services Cottage Grove, portions of Woodbury, and possibly other communities to the north in Washington County.

The treatment and disposal of wastewater occurs at the Cottage Grove Treatment Plant which is under the jurisdiction of the MCES.

This preliminary sanitary sewer design for the East Ravine area (as detailed in Appendix 10) was accomplished in accordance with Metropolitan Council Environmental Service (MCES) and Ten State Standards guidelines. Construction plans for South Washington County Gravity Interceptor Phase 1 and South Washington County Gravity Interceptor Phase 2 were used to determine the existing location of the trunk interceptor running along Keats Avenue (CSAH 19). Existing sanitary stubs as indicated on the interceptor plans were utilized where possible. However, in order to provide an efficient design some new connections to the interceptor are included in this preliminary plan. The study area is primarily divided into two sections, Neighborhood 1 located west of Keats Avenue and Neighborhood 2 located east of Keats Avenue. Design characteristics for each neighborhood are presented within Appendix 10.

Table 7-6 in Appendix 11 shows design flows for the ultimate system for sewer districts west of the MCES line. Looking at the flows coming through and from the East Ravine area, Table 16 shows design flows based on the 2040 land uses for everything within the Cottage Grove Ravine Sewer District that flows into the MCES line. This includes flows that originate outside of the East Ravine Area. Figure 14 displays the East Ravine boundary, sewer districts, and nodes.

The City's 2040 Comprehensive Plan (amended in 2023) included an updated inventory of the sanitary sewer systems and projections for wastewater flows based on the updated future land use plan and the South Washington Interceptor (the South Washington Interceptor was not yet constructed when the original AUAR was prepared). This document is included in Appendix 12.

The Comprehensive Sanitary Sewer Plan was updated in January of 2023 by Bolton and Menk, Inc. The document applied updated 2040 Land Use and ultimate Land Use estimations to project wastewater flows within the Cottage Grove Ravine District, South District, and Langdon Districts. The updates adjusted the Flow Rates for several Land Uses to reflect updated code and zoning regulations. In April of 2024 the Comprehensive Sanitary Sewer Plan was updated to break out intermediate Metropolitan Council connection points.

Table 16 - Design Flows (MGD) for 2040 Land Use

East Ravine Design Flows (MGD) for 2040 Land Use						
From Node	To Node	Add Subdistricts[1]	Average Flow (MGD)	Total Ave Flow (MGD)	Peak Flow Factor (PFF)	Design Flow (MGD)
CGR-4A.1	MCES.1C	CGR-4A	0.038	0.038	4.0	0.153
CGR-3C.1	MCES.1C	CGR-3C	0.013	0.013	4.0	0.053
CGR-4B.1	MCES.1B	CGR-4B	0.031	0.031	4.0	0.124
CGR-4E.1	CGR-4E.2	CGR-4E	0.049	0.049	4.0	0.194
CGR-4E.2	CGR-4D.1		0.000	0.049	4.0	0.194
CGR-4D.1	CGR-4C.1	CGR-4D	0.096	0.144	3.9	0.563
CGR-4C.1	MCES.1A	CGR-4C	0.088	0.232	3.8	0.882
CGR-1.1	CGR-1.2	CGR-1	0.034	034	4.0	0.134
WBRY.01	CGR-1.2	WBRY.01	0.044	0.044	4.0	0.175
CGR-1.2	CGR-2.1		0.000	0.077	4.0	0.310
C-2.1	CGR-2.2	CGR-2	0.098	0.176	3.9	0.686
CGR-3A.1	CGR-2.2	CGR-3A	0.076	0.076	4.0	0.302
CGR-2.2	MCES.1	CGR-2/3B	0.124	0.375	3.6	1.352
CGR-5A.1	CGR-5A.2	CGR-5A	0.125	0.125	3.9	0.487
CGR-5A.2	WBRY.03		0.000	0.125	3.9	0.487
CGR-5B.1	CGR-5B.2	CGR-5B	0.149	0.149	3.9	0.579
CGR-5B.2	WBRY.04		0.000	0.149	3.9	0.579
CGR-7A.1	MCES.1	CGR-7A1	0.031	0.031	4.0	0.125
CGR-7A.2	MCES.2C	CGR-7A.2	0.052	0.052	4.0	0.210
CGR-8A.1	CGR-7B.1	CGR-8A	0.065	0.065	4.0	0.262
CGR-7B.1	CGR-7B.2	CGR-7B.2	0.109	0.174	3.9	0.679
CGR-8B.1	CGR-7B.2	CGR-8B	0.012	0.012	4.0	0.046
CGR-7B.2	CGR-7B.4		0.000	0.186	3.9	0.723
CGR-7B.3	CGR-7B.4	CGR-7B.1	0.162	0.162	3.9	0.631

East Ravine Design Flows (MGD) for 2040 Land Use						
From Node	To Node	Add Subdistricts[1]	Average Flow (MGD)	Total Ave Flow (MGD)	Peak Flow Factor (PFF)	Design Flow (MGD)
CGR-7B.4	MCES.2B		0.000	0.347	3.6	1.250
CGR-10A.1	MCES.2A	CGR-10A	0.56	0.056	4.0	0.222
CGR-6A.1	CGR-6A.3	CGR-6A.2	0.161	0.161	3.9	0.627
CGR-6A.2	CGR-6A.3	CGR-6A.1	0.129	0.129	3.9	0.503
CGR-6A.3	CGR-6B.3		0.000	0.290	3.7	1.072
CGR-6B.1	CGR-6B.3	CGR-6B.2	0.091	0.091	4.0	0.366
CGR-6B.LS.1	CGR-6B.3	CGR-3B	0.033	0.033	4.0	0.133
CGR-6B.LS	CGR-6B.2		0.000	0.033	4.0	0.133
CGR-6B.2	CGR-6B.3	CGR-6B.1	0.038	0.072	4.0	0.286
CGR-6B.3	CGR-9A.1		0.000	0.453	3.5	1.584
CGR-9A.1	CGR-9A.2	CGR-9A	0.124	0.577	3.4	1.961
CGR-9A.2	CGR-9C.1		0.000	0.577	3.4	1.961
CGR-9B.1	CGR-9C.1	CGR-9B	0.027	0.027	4.0	0.110
CGR-9C.1	CGR-9C.3		0.000	0.604	3.4	2.054
CGR-9D.1	CGE-9D.2	CGR-9D.2	0.153	0.153	3.9	0.597
CGR-14B.1	CGR-11D.1	CGE-14B	0.1318	0.1318	3.9	0.514
CGR-11D.1	CGR-11B.1	CGR-11D	0.113	0.245	3.7	0.905
CGR-11B.1	CGR-9D.2	CGR-11B	0.051	0.296	3.7	1.095
CGR-9D.2	CGR-9C.2	CGR-9D.1	0.061	0.500	3.5	1.749
CGR-9C.2	CGR-9C.3	CGR-9C	0.097	0.597	3.4	2.029
CGR-9C.3	CGR-11A.1		0.000	1.201	3.0	3.602
CGR-11C.1	CGR-11A.1	CGR-11C	0.161	0.161	3.9	0.628
CGR-11A.1	CGR-11A.2	CGR-11A	0.073	1.435	3.0	4.306
CGR-11A.2	CGR-13B.1	CGR-13A	0.045	1.451	3.0	4.442
CGR-14A.1	CGR-14A.2	CGR-14A	0.165	0.165	3.9	0.644
CGR-14A.2	CGR-13C.2	CGR-13C	0.113	0.278	3.7	1.028

East Ravine Design Flows (MGD) for 2040 Land Use						
From Node	To Node	Add Subdistricts[1]	Average Flow (MGD)	Total Ave Flow (MGD)	Peak Flow Factor (PFF)	Design Flow (MGD)
CGR-13C.2	CGR-13B.1	CGR-13B	0.084	0.362	3.6	1.303
CGR-13B.1	CGR-10B.1		0.000	1.842	2.9	5.3427
CGR-10B.1	MCES.2	CGR-10B	0.134	1.976	2.8	5.533
CGR-12A	MCES.3C	CGR-12A	0.010	0.010	4.0	0.040
CGR-12B.1	MCES.3B	CGR-12B	0.052	0.052	4.0	0.209
CGR-15A.1	MCES.3A	CGR-15A	0.205	0.205	3.8	0.780
CGR-18A.1	CGR-18A.2	CGR-18A	0.065	0.065	4.0	0.259
CGR-18A.2	CGR-18B.1	CGR-18B	0.106	0.171	3.9	0.667
CGR-16B.1	CGR-16B.2	CGR-16B	0.188	0.188	3.9	0.732
CGR-16B.2	CGR-18B.1	CGR-16A	0.061	0.248	3.7	0.919
CGR-18B.1	SE-1A.1		0.000	0.419	3.5	1.467
CGR-19B.1	CGR-19B.2	CGR-19B	0.216	0.216	3.8	0.821
CGR-19B.2	SE-1A.1	CGR-19A	0.037	0.253	3.7	0.935
Total Design Flow						14.401

NOTE:
Sewer Districts were split according to flow areas and neighborhoods.

Future domestic wastewater flows were estimated for the East Ravine area based on a series of sub areas established for Neighborhoods 1 and 2. Table 17 displays the land uses within the East Ravine area based on acreage, for sewer districts only within the boundary, as displayed in Figure 14. Table 18 shows flow rates based on land use that are used to estimate flows. These rates are applied to the acreage of each district to calculate average flows per land use by district, as displayed in Table 19. These average flows are then multiplied by a Met Council Peak Flow Factor to determine the design flow per district. These design flows, specifically within the East Ravine Area, are shown in Table 20, separated by neighborhood.

Table 17 – East Ravine Area Future Land Use by District

East Ravine Area Land Use				
		Undevelopable/Unsewered	Platted/	Existing and Future

District Number	Total Acreage					Planned								
		Wetland / Undevelopable (Acres)	Parks / Open Space (Acres)	Rural Estate (Acres)	Major ROW & River (Acres)	Low Density Residential (Acres)	Medium Density Residential (Acres)	High Density Residential (Acres)	Industrial (Acres)	Institution (Acres)	Mixed Use/Village Center (Acres)	Urban Reserve (Acres)	Commercial (Acres)	Golf (Acres)
CGR-1	260.74	26.35	82.96	0.00	0.00	151.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CGR-2	339.60	77.71	55.08	0.00	0.00	186.06	0.02	0.00	0.00	10.71	10.10	0.00	0.00	0.00
CGR-3	282.25	15.82	80.31	0.00	0.00	126.96	59.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CGR-4	468.80	15.72	198.74	0.00	0.00	150.27	69.88	20.27	0.00	0.00	13.91	0.00	0.00	0.00
CGR-5	327.69	2.21	0.00	0.00	0.00	325.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CGR-6	418.49	1.37	03	0.00	0.00	252.68	121.39	0.00	0.00	2.27	40.74	0.00	0.00	0.00
CGR-7	270.05	15.82	8.72	0.00	14.26	95.12	43.51	49.58	0.00	0.00	43.04	0.00	0.00	0.00
CGR-8	331.74	8.49	222.70	0.00	11.15	88.44	0.00	0.96	0.00	0.00	0.00	0.00	0.00	0.00
CGR-9	479.75	15.36	29.49	0.00	0.00	268.62	120.99	0.00	0.00	0.00	40.45	0.00	4.85	0.00
CGR-10	335	10.94	109.28	0.00	0.00	180.52	26.05	0.00	0.00	8.20	0.00	0.00	0.00	0.00
CGR-11	497.35	1.54	0.01	0.00	0.00	495.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CGR-12	266.99	13.84	145.54	0.00	0.00	75.58	0.00	0.00	0.00	32.04	0.00	0.00	0.00	0.00
CGR-13	294.69	12.14	0.04	0.00	0.00	218.27	64.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CGR-15	396.10	13.62	180.70	0.00	0.00	21.52	23.33	56.68	0.41	0.00	62.14	0.00	37.70	0.00
CGR-17	289.32	18.24	270.31	0.00	0.00	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CGR-18	291.39	7.49	11.34	0.00	0.00	272.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 18 – Flow Rates

Land Use	Rate (Gal/Ac/Day)
Low Density Residential	840
Medium Density Residential	1490
High Density Residential	2700
Commercial	1500
Industrial	1500
Institutional	250
Mixed Use/Village Center	1750
Urban Reserve	630

Table 19 – East Ravine Area Average Flows

East Ravine Area Average Flows									
District Number	Platted/ Planned			Existing and Future					
	Low Density Residential (MGD)	Medium Density Residential (MGD)	High Density Residential (MGD)	Industrial (MGD)	Institutional (MGD)	Mixed Use (MGD)	Urban Reserve (MGD)	Commercial (MGD)	TOTAL (MGD)
CGR-1	0.024	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.034
CGR-2	0.127	0.000	0.000	0.000	0.003	0.018	0.000	0.000	0.148
CGR-3	0.089	0.075	0.000	0.000	0.000	0.000	0.000	0.000	0.164

CGR-4	0.121	0.104	0.052	0.000	0.000	0.024	0.000	0.000	0.301
CGR-5	0.273	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.273
CGR-6	0.200	0.181	0.000	0.000	0.001	0.071	0.000	0.000	0.453
CGR-7	0.080	0.065	0.134	0.000	0.000	0.075	0.000	0.004	0.354
CGR-8	0.074	0.000	0.003	0.000	0.000	0.000	0.000	0.003	0.077
CGR-9	0.194	0.180	0.000	0.000	0.000	0.071	0.000	0.007	0.452
CGR-10	0.148	0.039	0.000	0.000	0.002	0.000	0.000	0.000	0.189
CGR-11	0.398	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.398
CGR-12	0.060	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.062
CGR-13	0.146	0.096	0.000	0.000	0.000	0.000	0.000	0.000	0.242
CGR-15	0.018	0.035	0.153	0.001	0.000	0.109	0.000	0.057	0.371
CGR-17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CGR-18	0.171	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.171

Table 20 – East Ravine Area Design Flows

	East Ravine Area Design Flow			
	Districts	Average Flow (MGD)	PFF	Design Flow (MGD)
Neighborhood 1	CGR-1	0.034	4.0	0.134
	CGR-2	0.148	4.0	0.592
	CGR-3	0.150	4.0	0.600
	CGR-12[1]	0.051	4.0	0.204
	CGR-15[1]	0.371	3.6	1.336
			Sub-Total Neighborhood 1	2.902
Neighborhood 2	CGR-4	0.301	3.6	1.084
	CGR-6[2]	0.074	4.0	0.296
	CGR-7	0.354	3.6	1.274
	CGR-8	0.077	4.0	0.308
	CGR-9[2]	0.049	4.0	0.196
	CGR-10[2]	0.162	3.9	0.632
	CGR-11[2]	0.043	4.0	0.172
	CGR-12[1, 2]	0.002	4.0	0.008
	CGR-13[2]	0.039	4.0	0.156
			Sub-Total Neighborhood 2	4.126
			Total East Ravine Flows	7.028

NOTES:
1.Districts CGR-12 and CGR-15 are divided between Neighborhood 1 and 2. Land use areas and flow rates were divided by acreage within each neighborhood.
2.Average Flow does not account for flows outside of East Ravine Boundary.
3.Sewer Districts CGR-5, CGR-6, CGR-9, CGR-11, CGR-13, and CGR-18 are within the East Ravine Boundary, Neighborhood 2 but the flows flow outside of the boundary and therefore are not included in this table.
4.Sewer Districts CGR-14, CGR-16, and CGR-19 are within the East Ravine Sewer district but outside of the AUAR and flow.

Based on the design flow calculations shown in Table 16 and Table 7-6 (in Appendix 10), the connections to the MCES system were evaluated for any future upgrades to the City or MCES collection system for the development of the East Ravine area. Based on the record plans from the MCES Interceptor project that was completed in 2002, the capacities of each pipe segment connecting the City's system to the MCES system was evaluated. By comparing the capacities with the information in Table 20 and Table 7-6, and as shown in Table 21, the development of the East Ravine area does not require any upgrades to the existing MCES system. The City's sewer system in the East Ravine area will be analyzed per the capacities and built as development occurs.

Table 21 – Capacity of MCES Connections

Subdistricts	MCES Connection	Size (in)	Slope (%)	Capacity (MGD)	Design Flow (MGD)
CGR-3C, 4A	1C	12	0.22	1.08	0.21
CGR-4B	1B	8	0.40	0.64	0.12
CGR-4C thru 4E	1A	15	0.15	2.11	0.88
CGR-1, 2, 3A, 3B, 7A.1	1	18	0.17	3.31	1.48
CGR-7A.2	2C	8	0.40	0.64	0.21
CGR-7B.1, 7B.2, 8	2B	15	0.15	2.11	1.25
CGR-10A	2A	15	0.18	2.31	0.22
CGR-6, 9, 10B, 11, 13, 14,	2	30	0.06	8.46	5.53
CGR-12A	3C	8	0.40	0.64	0.04
CGR-12B	3B	12	0.25	1.25	0.21
CGR-15A	3A	12	0.08	0.85	0.78
CGR-15B, 15 (2), 16 thru 18 & SE-1 thru 6	#3	30	0.08	9.77	6.67

No new on-site systems are proposed to serve the East Ravine area.

Water Use

Based on information obtained from existing water supply studies and consultation with City engineering consultants at Bonestroo Rosene Anderlik and Associates (now Stantec), the existing water supply and treatment for the East Ravine area will be provided off site. In addition, the existing well field is felt to be adequate for the needs that will be generated by the development scenario envisioned for the East Ravine area. The proposed East Ravine plan would increase the water demand by approximately 13.0 Million Gallons per Day. Appendix 13 contains a technical memorandum titled *Cottage Grove East Ravine Planning Study: Watermain* prepared by Howard R. Green Company in February of 2005. This memo provides the methodology and details concerning impacts on future water usage for the project area. Figures illustrating the water systems are included in Appendix 13.

The City's Water Supply and Distribution Plan was subsequently updated in 2024 and includes proposed trunk watermain improvements within the East Ravine. This plan continues to be used as a guide for new development and is included in Appendix 14. Figures illustrating the water systems are also included in Appendix 14.

b) If the wastewater discharge is to a subsurface sewage treatment system (SSTS), describe the system used, the design flow, and suitability of site conditions for such a system.

Not applicable.

c) If the wastewater discharge is to surface water, identify the wastewater treatment methods, discharge points, and proposed effluent limitations to mitigation impacts. Discuss any effects to surface or groundwater from wastewater discharges.

Not applicable.

2. Stormwater – Describe changes in surface hydrology resulting from change of land cover. Describe the routes and receiving water bodies for runoff from the project site (major downstream water bodies as well as the immediate receiving waters). Discuss environmental effects from stormwater discharges on receiving waters post-construction, including how the project will affect runoff volume, discharge rate, and change in pollutants. Consider the effects of current Minnesota climate trends and anticipated changes in rainfall frequency, intensity, and amount with this discussion. For projects requiring NPDES/SDS Construction Stormwater permit coverage, state the total number of acres that will be disturbed by the project and describe the stormwater pollution prevention plan (SWPPP), including specific best management practices to address soil erosion and sedimentation during and after project construction. Discuss permanent stormwater management plans, including methods of achieving volume reduction to restore or maintain the natural hydrology of the site using green infrastructure practices or other stormwater management practices. Identify any receiving waters that have construction-related water impairments or are classified as special as defined in the Construction Stormwater permit. Describe additional requirements for special and/or impaired waters.

AUAR Guidance: For an AUAR the following additional guidance should be followed in addition to that in EAW Guidelines:

- *It is expected that an AUAR will have a detailed analysis of stormwater issues*
- *A map of the proposed stormwater management system and of the water bodies that will receive stormwater should be provided*

- *The description of the stormwater systems would identify on-site and "regional" detention ponding and also indicate whether the various ponds will be new water bodies or converted existing ponds or wetlands. Where on-site ponds will be used but have not yet been designed, the discussion should indicate the design standards that will be followed.*
- *If present in or adjoining the AUAR area, the following types of water bodies must be given special analyses:*
    - *Lakes: Within the Twin Cities metro area, a nutrient budget analysis must be prepared for any "priority lake" identified by the Metropolitan Council. Outside of the metro area, lakes needing a nutrient budget analysis must be determined by consultation with the MPCA and DNR staffs.*
    - *Trout streams: If stormwater discharges will enter or affect a trout stream, an evaluation of the impacts on the chemical composition and temperature regime of the stream and the consequent impacts on the trout population (and other species of concern) must be included.*

Water Quality-stormwater runoff

Stormwater management was studied at depth for the Cottage Grove East Ravine project. A detailed analysis of stormwater issues and plans is provided as Appendix 15 to this AUAR. The report analyzes existing stormwater systems and drainage patterns as well as site characteristics that would promote environmentally friendly storm water management practices. Figure 15 illustrates the existing storm water management system which uses a series of existing small swales and depressions. The area is favorable to infiltration due to the sandy soils and significant depth to groundwater or bedrock.

The stormwater management goal for this project is to utilize the natural drainage and infiltration capabilities of the existing land. Stormwater management areas along planned parkways (as illustrated in Figures 6.1 and 17.2 will be utilized to collect, infiltrate and direct overflow of runoff from adjacent neighborhoods. Overflow from the parkway stormwater basins will be directed to larger natural infiltration basins which have the capacity to infiltrate all the runoff from a 100-year storm event. Emergency overflow from the larger infiltration basins for events greater in intensity than a 100-year event could be provided either through the existing Cottage Grove drainage system and/or through the future regional stormwater conveyance system being planned by the South Washington Watershed District. The future stormwater management system is illustrated in Appendix 8, "Regional Surface Water Drainage" figure.

Stormwater runoff transports pollutants such as bacteria (from pet and wildlife waste), sediments (from erosion and construction), nutrients (from fertilizers and organic debris), and thermal pollution (from heated paved surfaces). These contaminants contribute to water quality impairments, including high levels of bacteria, increased turbidity, low dissolved oxygen, and temperature stress—especially harmful to the Vermillion's trout habitat. Urban runoff may also introduce trace metals, oils, and road salt, further affecting aquatic life and stream health.

Incorporating low-salt design solutions in the AUAR Study Area can further protect water quality and lower maintenance costs. Low-salt design strategies may include the use of permeable pavement to avoid melt water surface pooling, strategic roadway design to avoid low spots where vehicles frequently brake (reducing salt accumulation and application), and orienting roads to take advantage of wind and sun exposure, which helps naturally reduce roadway icing. These measures collectively decrease the need for deicing salt and support overall stormwater and environmental management goals.

Updated storm water system information is provided in Appendix 8, 2019 Surface Water Management Plan (SWMP). The "Regional Surface Water Drainage" figure within the 2019 SWMP depicts both the existing and future stormwater management systems.

Impervious Surfaces

The City of Cottage Grove, MLCCS, MCBS, Metropolitan Council, and MnDNR information was used to classify and map impervious surface areas. Impervious surface areas comprise approximately 220 acres of the project area, primarily roadways, parking areas, and buildings associated with development.

For residential developments in the East Ravine, it is estimated that approximately 33 percent of developed areas will be impervious surfaces. The proposed land use contains approximately 369.9 acres with 5–10% impervious surfaces, 176.9 acres with 11–25% impervious surfaces, 1,791 acres with 26–50% impervious surfaces, and 85.3 acres with 51–75% impervious surfaces. The surface water management plan for each project specifies a tailored strategy for the capture and treatment of surface water impacted by housing construction and associated impervious land cover.

3. Water Appropriation – Describe if the project proposes to appropriate surface or groundwater (including dewatering). Describe the source, quantity, duration, use, and purpose of the water use and if a DNR water appropriation permit is required. Describe any well abandonment. If connecting to an existing municipal water supply, identify the wells to be used as a water source and any effects on, or required expansion of, municipal water infrastructure. Discuss environmental effects from water appropriation, including an assessment of the water resources available for appropriation. Discuss how the proposed water use is resilient in the event of changes in total precipitation, large precipitation events, drought, increased temperatures, variable surface water flows and elevations, and longer growing seasons. Identify any measures to avoid, minimize, or mitigate environmental effects from the water appropriation. Describe contingency plans should the appropriation volume increase beyond infrastructure capacity or water supply for the project diminish in quantity or quality, such as reuse of water, connections with another water source, or emergency connections.

AUAR Guidance: If the area requires new water supply wells, specific information about that appropriation and its potential impacts on groundwater levels should be given; if groundwater levels would be affected, any impacts resulting on other resources should be addressed.

The project does not propose to appropriate surface or groundwater for direct use or dewatering. Instead, it connects to the existing municipal water supply system. As part of recent infrastructure improvements, wells #12 and #13 were added. No well abandonment is proposed at this time.

4. Surface Waters

a) Wetlands – Describe any anticipated physical effects or alterations to wetland features, such as draining, filling, permanent inundation, dredging, and vegetative removal. Discuss direct and indirect environmental effects from physical modification of wetlands, including the anticipated effects that any proposed wetland alterations may have to the host watershed, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. Identify measures to avoid (e.g., available alternatives that were considered),

minimize, or mitigate environmental effects to wetlands. Discuss whether any required compensatory wetland mitigation for unavoidable wetland impacts will occur in the same minor or major watershed and identify those probable locations.

Approximately 105 acres of wetlands are located within the project area, identified through various sources including NWI maps, the Cottage Grove Natural Resources Inventory, MnDNR Public Water Inventory, and MLCCS. These wetlands, including four MnDNR public water wetlands (Gables Lake, Regional Park Lake, and two unnamed wetlands), provide valuable habitat for waterfowl, amphibians, reptiles, and migratory birds. Since the adoption of the AUAR, only one residential subdivision—The Waters at Michael's Pointe—has involved a delineated wetland, adjacent to a deep, open water marsh now named Lake Robert. This wetland was protected during development in accordance with Minnesota DNR and South Washington Watershed District (SWWD) standards, including a 100-foot average buffer as required under its Protect 1 designation. All subsequent projects have followed SWWD requirements to avoid or mitigate wetland impacts, with no non-residential developments affecting wetlands. Given Minnesota's changing climate and increased precipitation trends, protecting these wetlands remains critical to maintaining watershed health. Continued adherence to SWWD standards, including avoidance of direct impacts and implementation of compensatory mitigation within the same watershed when necessary, will help preserve wetland functions and ecological integrity.

b) Other surface waters – Describe any anticipated physical effects or alterations to surface water features (lakes, streams, ponds, intermittent channels, county/judicial ditches) such as draining, filling, permanent inundation, dredging, diking, stream diversion, impoundment, aquatic plant removal, and riparian alteration. Discuss direct and indirect environmental effects from physical modification of water features, taking into consideration how current Minnesota climate trends and anticipated climate change in the general location of the project may influence the effects. Identify measures to avoid, minimize, or mitigate environmental effects to surface water features, including in-water Best Management Practices that are proposed to avoid or minimize turbidity/sedimentation while physically altering the water features. Discuss how the project will change the number or type of watercraft on any water body, including current and projected watercraft usage.

AUAR Guidance: Water surface use need only be addressed if the AUAR area would include or adjoin recreational water bodies.

Physical impacts on water resources

There will be no physical impacts on water resources within the project area. Section 2 of the Surface Water Management Plan (SWMP) describes the water resources within the City, discussing the watersheds, land uses, groundwater, and key water resources.

Water-related Land Use Management Districts

There are no water related land use management districts that are impacted by the project. The Surface Water Management Plan (SWMP) has been included as Appendix 8

and describes land and water resources for the City of Cottage Grove, including wetlands and districts within the East Ravine area.

Water surface use

There are no recreational water bodies in the project area. Section 2.5 of the Surface Water Management Plan (SWMP) describes the key water resources within the City including the wetlands, lakes, draws, ravines, streams, and the Mississippi River, and is included as Appendix 8.

No alterations to other surface waters are anticipated as part of the proposed development scenario.

13. Contamination/Hazardous Materials/Wastes

A. Pre-Project Site Conditions – Describe existing contamination or potential environmental hazards on or in close proximity to the project site, such as soil or groundwater contamination, abandoned dumps, closed landfills, existing or abandoned storage tanks, and hazardous liquid or gas pipelines. Discuss any potential environmental effects from pre-project site conditions that would be caused or exacerbated by project construction and operation. Identify measures to avoid, minimize, or mitigate adverse effects from existing contamination or potential environmental hazards. Include development of a Contingency Plan or Response Action Plan.

The proposed project is anticipated to be implemented in accordance with all local, state, and federal regulations and best practices with regard to potentially contaminated and/or hazardous materials. According to the MPCA's What's In My Neighborhood database, there are 55 active permit sites in proximity to or within the study area. These sites are shown on a map in Appendix 16. These sites are detailed in Table 22. It is not expected that the AUAR will exacerbate existing conditions. Specific projects will need to give due consideration to these previously permitted activities. The current contingency plan is to follow MPCA, Washington County, and City Regulations for hazard mitigation.

Table 22 - MPCA What's In My Neighborhood Permitted Activities

Name	Activities	MPCA ID(s)	Active	Distance from AUAR Study Area	Will conditions be exacerbated by the project
11911 - CSAH 19 Indian Blvd LTL	Construction Stormwater	C00061158	Yes	Within	No
70th Street (CSAH 22) and Jamaica Avenue Improvements	Construction Stormwater	C00042831	Yes	Within	No
Almar Farm	Construction Stormwater	C00001563	Yes	Within	No
Apache Site - Cottage Grove	Construction Stormwater	C00027938	Yes	Within	No
Bothe Farm	Brownfields, Petroleum Brownfield;	BF0000869; LS0015950; LS0019893	Yes	Within	No

Name	Activities	MPCA ID(s)	Active	Distance from AUAR Study Area	Will conditions be exacerbated by the project
	Petroleum Remediation, Leak Site				
Calarosa East	Construction Stormwater	C00055793; SUB0058636; SUB0060313	Yes	Within	No
Cardinal Reserve	Construction Stormwater	C00061023	Yes	Within	No
Central Draw Overflow - Phase V	Construction Stormwater	C00055869	Yes	Within	No
CLA-M450B Farmington to North Branch Pressure Test Sites 2 and 3	Construction Stormwater	C00069614	Yes	Within	No
CLA-M450B Farmington to North Branch Pressure Test- Site 4	Construction Stormwater	C00069615	Yes	Within	No
Cottage Grove city of	MS4; Superfund	MS400082; SF-gen	Yes	Within	No
CSAH 19 Trail	Construction Stormwater	C00045721	Yes	Within	No
CSAH 19/TH 61 Roundabout, Ravine Park, and Ravine Stabilization Improvement Projects	Construction Stormwater	C00046282	Yes	Within	No
Donald Biscoe Farm	Feedlots; Hazardous Waste; Underground Tanks	163-61810; MND102276011; TS0021079	Yes	Within	No
Eastridge Woods	Construction Stormwater	C00036088	Yes	Within	No
Former Otis Property	Hazardous Waste	MNS000192989	Yes	Within	No
Gerlach Service Inc Cottage Grove	Hazardous Waste, Very small quantity generator	MND022750632	Yes	Within	No
Glacial Valley Estates	Construction Stormwater	C00060320	Yes	Within	No
Glacial Valley Park - Phase 1	Construction Stormwater	C00063988	Yes	Within	No
Gordon Tank Farm	Feedlots	163-50011	Yes	Within	No
Hero Center	Construction Stormwater; Hazardous Waste, Very small quantity generator	C00052858; MNS000336480	Yes	Within	No

Name	Activities	MPCA ID(s)	Active	Distance from AUAR Study Area	Will conditions be exacerbated by the project
Kingston Fields	Construction Stormwater	C00049364	Yes	Within	No
Lochridge	Construction Stormwater	C00072331	Yes	Within	No
Myron Tank Farm	Feedlots	163-60561	Yes	Within	No
Northern Natural Gas - M450C AC Mitigation Project	Construction Stormwater	C00065023	Yes	Within	No
Northern Natural Gas - MNB61402-8"-I-Dig21 Black River Falls 2nd	Construction Stormwater	C00064775	Yes	Within	No
Northwick Park	Construction Stormwater	C00057343	Yes	Within	No
Parkview Pointe	Construction Stormwater	C00053822; SUB0055633; SUB0055690; SUB0055691; SUB0055692; SUB0058678; SUB0058681; SUB0058682; SUB0058683; SUB0058692; SUB0058693; SUB0058694; SUB0058695; SUB0058697; SUB0058698; SUB0058711; SUB005871	Yes	Within	No
Parkview Pointe - 2019	Construction Stormwater	C00053850	Yes	Within	No
Ravine Crossing	Construction Stormwater	C00067110; SUB0068496; SUB0068571; SUB0069025; SUB0069900; SUB0070597; SUB0071142; SUB0071548	Yes	Within	No
Ravine Meadows	Construction Stormwater; Underground Tanks	C00055142; TS0130663	Yes	Within	No
Ravine Park Drainage Improvements Project	Construction Stormwater	C00070220	Yes	Within	No
RAVINE PARKWAY STREET & UTILITY	Construction Stormwater	C00050312	Yes	Within	No

Name	Activities	MPCA ID(s)	Active	Distance from AUAR Study Area	Will conditions be exacerbated by the project
Red Nails	Hazardous Waste, Minimal quantity generator	MNS000307904	Yes	Within	No
Rolling Meadows	Construction Stormwater	C00061392	Yes	Within	No
Shepard Farm	Construction Stormwater	C00053455	Yes	Within	No
South Washington Watershed District	MS4	MS400196	Yes	Within	No
Summer Valley	Construction Stormwater	C00069820; SUB0071101	Yes	Within	No
The Waters at Michael's Pointe	Construction Stormwater	C00031603	Yes	Within	No
Walmart Store #2448-00	Brownfields, Voluntary Investigation and Cleanup	VP29180	Yes	Within	No
Walmart Supercenter 2448	Hazardous Waste, Small quantity generator	MNS000197855	Yes	Within	No
Washington County Cottage Grove Service Center	Hazardous Waste, Very small quantity generator	MNS000160416	Yes	Within	No
Washington County Lower Landing Trailhead Building	Construction Stormwater	C00056550	Yes	Within	No
Washington County Trail Construction	Construction Stormwater	C00047023	Yes	Within	No
Wedding and Event Center	Construction Stormwater	C00041098	Yes	Within	No
Woodward Ponds	Construction Stormwater	C00055743; SUB0062597	Yes	Within	No
Cottage Grove Middle School WQ Improve	Construction Stormwater	C00036359	Yes	70.6 ft	No
Kath Fuel Oil Service	Underground Tanks	TS0124313	Yes	204 ft	No
Young Farmstead	Brownfields, Petroleum Brownfield; Petroleum Remediation, Leak Site	BF0001239; LS0020921	Yes	180 ft	No
Kingston Grove	Construction Stormwater	C00041469	Yes	161 ft	No
Young Addition	Construction Stormwater	C00054617	Yes	131 ft	No

Name	Activities	MPCA ID(s)	Active	Distance from AUAR Study Area	Will conditions be exacerbated by the project
Glacial Valley Trail	Construction Stormwater	C00070583	Yes	0.18 miles	No
3M Woodbury Disposal Site	Hazardous Waste; Industrial Stormwater; Wastewater, Industrial NPDES/SDS Permit	MN0003948; MNR000014142; MNRNE33RN; MNRNE39RV	Yes	0.15 miles	No
Nash	Construction Stormwater	C00062286	Yes	0.13 miles	No
Crossroad Evangelical Church	Construction Stormwater	C00024079	Yes	0.12 miles	No

According to MPCA's Leak site search database, there are two active leaks in Cottage Grove. Both sites are over a mile away from the AUAR Study area and are not expected to impact or be impacted by the AUAR development scenario. The sites include the South Washington County Schools Transit (LS0022421) and the Zieba and Morgan Residence (LS0021190). See Appendix 16 for contamination information.

The East Ravine area of Cottage Grove has been found to be affected by the 3M PFAS contamination. The primary concern with the contamination is the affect to the drinking water supply. An action plan was developed and is currently being implemented and coordination with the State of Minnesota is ongoing for drinking water and recreational improvements to mitigate the affects of the contamination.

B. Project Related Generation/Storage of Solid Wastes – Describe solid wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from solid waste handling, storage, and disposal. Identify measures to avoid, minimize, or mitigate adverse effects from the generation/storage of solid waste including source reduction and recycling.

AUAR Guidance: Generally, only the estimated total quantity of municipal solid waste generated and information about any recycling or source separation programs of the RGU need to be included.

The development scenario includes a mixture of residential and commercial uses. There will also be typical construction material waste during construction periods. These uses will generate additional municipal solid waste (MSW) and recycling products. Additional waste is anticipated to comply with local, county, state, and federal requirements for solid waste management and typically be disposed of with curbside residential or commercial pick-up and hauled to appropriate and regulated facility. According to the Washington County Solid Waste Management Plan (2024–2040)[12], the county managed approximately 97,000 tons of municipal solid waste (MSW) in 2022. Of this total, 5% was landfilled, 21% was organics, 32% was recycled, and 40% was processed further. The data reflects a combined recycling and organics rate of 53.3% in 2022, including a notable increase in organic waste

[12] https://www.washingtoncountymn.gov/DocumentCenter/View/17869/Washington-County-Solid-Waste-Management-Plan-PDF

recovery to 20.91%. Additionally, the amount of waste sent directly to landfills decreased from 13,000 tons in 2021 to 11,000 tons in 2022.

Table 23 - Summary of Future Residential Waste Generation (from previous AUAR estimates)

Residential Waste Generation Rates	Current estimate of Waste Generation in tons	Future Households	Future Estimates of Waste Per Year (in Tons)
MSW/household/year	0.606	6,700	4060.2
Tons of Recycled Product /household/year	0.036	6,700	241.2

Table 24 - Summary of Future Non-Residential Waste Generation (from previous AUAR estimates)

Non Residential Waste Generation Rates	Current Estimate of Waste Generation in tons	Future Employees	Future Estimates of Waste Per Year (in Tons)
MSW/Employee/year	1.407	1,700	2391.9
Tons of Recycled Product / employee/ year	0.847	1,700	1439.9

* Employment estimates based on project magnitude data of 850,000 square feet of commercial space at one employee per 500 square feet of space.

C. Project Related Use/Storage of Hazardous Materials – Describe chemicals/hazardous materials used/stored during construction and/or operation of the project including method of storage. Indicate the number, location, and size of any above or below ground tanks to store petroleum or other materials. Discuss potential environmental effects from accidental spills or releases of hazardous materials. Identify measures to avoid, minimize, or mitigate adverse effects from the use/storage of chemicals/hazardous materials including source reduction and recycling. Include development of a spill prevention plan.

AUAR Guidance: Not required for an AUAR. Potential locations of storage tanks associated with commercial uses in the AUAR should be identified (e.g., gasoline tanks at service stations).

There are 194 storage tanks in the city of Cottage Grove, MN. Five sites are within 0.5 miles of the project area, see table 25.

Table 25 - Tanks within 0.5 miles of the AUAR Study Area

ID	Activity Name	Actual Tanks	Distance (miles)	Above or underground	Location (lat/long)
TS0021079	Biscoe Trucking Inc	Out of Service	Within	Underground	44.83296,-92.89342

TS0124142	Keith Mchattie	0	Within	Underground	44.8592543,-92.9199493
TS0124313	Kath Fuel Oil Service	4	209 ft	Underground	44.8474511,-92.9053029
TS0055390	Cogentrix Ls Power-plant	16	0.48	Aboveground	44.7973899,-92.9124459
TS0123913	Holiday Stationstore #3512	5	0.48	Underground	44.8496722,-92.9502192

There are no anticipated future storage tanks in the AUAR area at this time.

D. Project Related Generation/Storage of Hazardous Wastes – Describe hazardous wastes generated/stored during construction and/or operation of the project. Indicate method of disposal. Discuss potential environmental effects from hazardous waste handling, storage, and disposal. Identify measures to avoid, minimize, or mitigate adverse effects from the generation/storage of hazardous wastes including source reduction and recycling.

AUAR Guidance: Not required for an AUAR.

Not applicable.

14. Fish, Wildlife, Plant Communities, and Sensitive Ecological Resources (Rare Features)

A. Describe fish and wildlife resources as well as habitats and vegetation on or near the site.

AUAR Guidance: The description of fish and wildlife resources should be related to the habitat types depicted on the cover types map. Any differences in impacts between development scenarios should be highlighted in the discussion.

There is a variety of wildlife in the AUAR study area due to the diverse types of habitat available. Wetlands, woodlands, grasslands, and croplands found in the area provide good cover and habitat for many common species found in the upper Midwest. Development will result in an overall loss of habitat quantity and quality in the area. In the short term, animals will be displaced by construction activities, moving into other areas where they will be forced to compete for resources and typically experience higher rates of mortality than resident wildlife. In the long term, the ability of the area to support wildlife will be diminished. The frequency of conflicts between humans and wildlife will increase in the form of nuisance wildlife complaints.

Woodland areas comprise approximately 27 percent of the total project area, accounting for an estimated 1,094 acres. Several forest stands are found throughout the project area while others align the Cottage Grove Ravine Creek corridor. Similar to agricultural/open lands, the woodlands provide habitat areas to numerous wildlife species described above.

The City of Cottage Grove, MLCCS, MCBS, Metropolitan Council, and MnDNR information was used to classify and map woodland areas. The forest cover classifications within the project area are depicted on Figure 10, Natural Resources. The majority of the woodlands were classified as oak forest and oak woodland/brushland. The City of Cottage Grove had a natural resource inventory completed for the city in 1998 and the information is summarized below for the project area.

The residential and commercial developments that occurred in the East Ravine since the adoption of the AUAR were subject to the submission and review of tree preservation inventories. In instances when tree removal related to development consistent with the 2030 and 2040 Land Use Plans was in excess of ordinance criteria, the projects were subject to tree replacement or cash mitigation approval conditions.

The Minnesota Department of Natural Resources (MnDNR) Conservation Planner was consulted in July 2025. The following Minnesota Department of Natural Resources (DNR) Native Plant Communities (NPCs) were identified within the study area: Cottage Grove 4 (FDs37a – Oak (Red Maple) Woodland, S4, 1 community); Cottage Grove 22 (UPs13b – Dry Sand–Gravel Prairie [Southern], S2, 1 community); Cottage Grove Drive-In Theater (UPs13b – Dry Sand–Gravel Prairie [Southern], S2, 1 community); and Cottage Grove Ravine Regional Park, which includes three distinct NPCs: FDs37a (Oak (Red Maple) Woodland, S4, 1 community), MRn93 (Northern Bulrush–Spikerush Marsh, S2/S3, 1 community), and UPs13b (Dry Sand–Gravel Prairie [Southern], S2, 2 communities). The conservation planning report is found in Appendix 17.

The conservation planner also identified that the Mississippi River Twin Cities Important Bird Area is within the study area. Lastly, it was identified that the USFWS Regulatory Species, Rusty Patched Bumble Bee High Potential Zone is found within the study area.

Neighborhood 1 (North) Natural Communities

Neighborhood 1 (north) is located north of 70th Street South and south of Military Road. Just north of 70th Street South is a fairly large (117 acre) oak forest. This area has been logged in recent years. Oaks are the dominant tree species, but a much greater proportion of the canopy is made up of other tree species such as aspen (Populus tremuloides), butternut (Juglans cinerea), black cherry (Prunus serotina), hackberry (Celtis occidentalis), and bitternut hickory (Carya cordiformis). The shrub layer is dominated by buckthorn (Rhamnus cathartica). Just north of this large oak forest is a mature oak forest. According to Constance Otis, this area was last logged during the late 1800s. Since then, the canopy has recovered and today is dominated by white oak (Quercus alba) and bur oak (Quercus macrocarpa) with a good diversity of other species in the subcanopy including bitternut hickory, butternut, basswood (Tilia americana), red oak (Quercus rubra), and hackberry. There are also scattered sugar maple (Acer saccharum) and red maple (Acer rubrum) in this community. The shrub layer is fairly diverse containing elderberry (Sambucus canadensis), chokecherry (Prunus virginiana), and several species of currant and pagoda dogwood (Cornus alternifolia). The ground cover is very diverse containing such species as jack-in-the-pulpit (Arisaema triphyllum), enchanter's nightshade (Circaea lutetiana), bloodroot (Sanguinaria canadensis.), and several species of ferns including sensitive and maidenhair fern (Adiantum). Unfortunately, buckthorn has invaded this community and will likely become dominant in the future.

A wetland is located west of this mature oak forest. The majority of this wetland consists of a deep, open water marsh. Along the edges of the wetland, species such as sedge, cattail, rice cutgrass (Leersia oryzoides), river bulrush (Schoenoplectus fluviatilis), and blue flag iris (Iris versicolor), dominate. Within shallow areas along the wetland edge, there are numerous mudflats containing plantain, cow parsnip (Heracleum lanatum), broad-leaved arrowhead (Sagittaria latifolia), and marsh fern (Thelypteris palustris). These same species, along with cattail, are also present on several floating bog mats. Submergent plants and floating leaf species such as yellow water lily (Nuphar lutea) and duckweed (Lemna minor) are present in many open water areas of the wetland. Invasion by reed canary grass (Phalaris arundinacea) and buckthorn has occurred along much of the wetland margin. However, these species have not moved much beyond the wetland edges. Just west of this large wetland is a small, shallow, open water/emergent marsh, containing many of the same species found in the large wetland. Some of the common species include lake sedge (Carex lacustris), blue flag iris, plantain (Plantago

major), and broadleaf arrowhead. At the time of the original survey, this wetland contained only a small pool of water in its center. Buckthorn has encroached into the wetland margin.

A degraded wet meadow dominated by reed canary grass is located east of the large wetland. This area appears to have been farmed at one time. The rest of Neighborhood 1 (north) consists of farm/agriculture land except for two small areas on the north side of Military Road. One area is a conifer plantation dominated by scotch pine (Pinus sylvestris) with boxelder (Acer negundo) and trembling aspen mixed along the plantation edges. West of this conifer plantation is an old field dominated by introduced grasses such as smooth brome (Bromus ciliatus), bristly foxtail (Setaria spp.), and Kentucky bluegrass (Poa pratensis).

The residential development that occurred in Neighborhood 1 did not impact the Dodge Nature Center Property which is protected by a land conservation easement or any of the identified wetlands.

As of 2025, Neighborhood 1 is nearly fully developed, with natural areas thoughtfully preserved where feasible.

Neighborhood 1 (South) Natural Communities

Neighborhood 1 (South) is located north of Highway 61 and west of County State Aid Highway (CSAH) 19. This area contains low to moderate quality, dry, sand gravel prairie and some old fields now grown over with trees, shrubs, and grasses. Wildlife values for this area were rated as low due to the lack of natural community diversity and poor connectivity to other natural areas.

The few communities that exist in this area are all located near the intersection of Highway 61 and CSAH 19A. One community is an old field dominated by introduced graminoids (grasses) and weedy forbs. Common graminoids include smooth brome and Kentucky bluegrass. Common forbes include common milkweed *(Asclepias L.)*, daisy fleabane *(Erigeron strigosus)*, spotted knapweed *(Centaurea maculosa)*, and goatsbeard *(Tragopogon pratensis)*. This field was probably cultivated in the recent past.

East of the old field is a young mixed hardwood forest dominated by boxelder, green ash *(Fraximus pennsylvanica),* and Chinese elm *(Ulmus parvifolia).* Both the shrub and ground cover layer contain mostly exotic and/or weedy shrubs and herbaceous plants. The shrub layer is dominated by buckthorn, the ground layer by wood nettle *(Laportea Canadensis)* and Virginian stickseed *(Lappula redowskii)*.

East of the drive-in movie theatre is a dry prairie occurring on a very droughty site with numerous areas of exposed fine sand. In general, Kentucky bluegrass and smooth brome dominate this site. Where the site contains exposed sand, small patches of little bluestem *(Andropogon scoparius)* along with a fair diversity of dry prairie forbs occur. Some of the more common forbs include whorled milkweed, daisy fleabane, common milkweed, flowering spurge *(Euphorbia corollata)*, sulfer cinquefoil *(Potentilla recta),* and thimbleweed *(Anemone patens)*.

A poor-quality dry prairie almost completely overgrown by woody vegetation and leafy spurge is located east of the dry prairie.

A mixed hardwood forest that contains mostly non-native and/or weedy tree species and shrub and ground cover species is located south of the drive-in movie theater.

The rest of the Neighborhood 1 (south) consists of farm/agriculture land.

The 23.5-acre Walmart development is located in the Cottage View area west of the former drive-in theatre site. As a component of that project, there was tree removal and grading of the Walmart site and the western half of the former drive-in site now referenced as the Apache Parcel. A tree inventory and mitigation plan were completed in accordance with the City's Tree Preservation Ordinance for this project. The City Forester reviewed the plan for accuracy and conformance. Tree mitigation fee of $148,000 was required as per the ordinance and collected with the building permit for Walmart. This fee

was placed in the City's Public Landscaping Initiative Fund, which is designated for landscape improvements in major transportation corridors, trailway corridors, and park and open space areas. The remaining portion of the former drive-in site is currently being mined for gravel and sand under an Interim Conditional Use Permit, with the intent to prepare the site for future development when a suitable project is identified.

Neighborhood 2 Natural Communities

Neighborhood 2 is located north of Highway 61 and east of CSAH 19. As a whole the natural resources in the area consists mainly of dry oak forest, mesic oak forests, and conifer plantations. Historic items such as the historic Dr. William Furber House and St. Mathew's Church Cemetery are located in this area. The house is valued for its eclectic period architecture, and the cemetery is important for its artistic tombstones in association with Cottage Grove's 19th Century German immigrants.

The northern area of Neighborhood 2 consists of woodland-brushland, dry oak savanna, mesic oak forest, basswood forest, and maple forest. In addition, this area also contains a small lake and a wetland. The diversity of different natural communities is high.

Oak forests along with a variety of other community types including conifer plantation and lowland hardwood forest dominate the central area of Neighborhood 2.

The southern area of Neighborhood 2 consists mainly of mesic and dry oak forests. This area also includes several small dry, sand gravel prairies, a wet meadow/fen wetland, and a number of conifer plantations.

The only development activity that occurred in Neighborhood 2 was the construction of the Washington County South Service Center and the Cottage Grove City Hall/Public Safety facility, and the realignment of 70th Street (CSAH 20) which Washington County completed. This realignment project only impacted the built environment along the corridor and active agricultural fields. The government campus projects contain rain gardens, native plantings, prairie, and Oak Savannah restorations. The end of 2019 brought the completion of the HERO Center, which is a public safety training facility located on 85th Street in the northern portion of the civic campus identified in the East Ravine Planning Area.

Grassland/Shrubland and Lawn/Landscaping

The City of Cottage Grove, MLCCS, MCBS, Metropolitan Council, and MnDNR information was used to classify and map grassland/shrubland and lawn/landscaping areas. Grassland/shrubland and lawn/landscaping comprise approximately 13 percent of the total project area, accounting for 513 acres. Grassland/shrubland and lawns/landscaping within the project area are depicted in Figures 10.3A and 10.3B, respectively. Similar to agricultural/open lands, the grassland/shrubland and lawn/landscaping areas provide habitat to numerous wildlife species described above.

No areas of grassland/shrubland were disturbed beyond the areas identified as development area within the original approved East Ravine Master Plan. Areas developed as residential will have lawn and landscaping areas established as they develop. In addition to front boulevard trees and corner trees, the City requires two deciduous trees, two coniferous trees, and ten shrubs to be planted at every home constructed on a lot in the East Ravine Planning Area as well as citywide.

Agricultural/Other Transitional Land

The City of Cottage Grove, MLCCS, MCBS, Metropolitan Council, and MnDNR information was used to classify and map agricultural land. Agricultural/other transitional land comprises the largest portion of

the entire project area, accounting for 2,076 acres, approximately 52 percent of the project area. The agricultural/other transitional is defined as agricultural land, undeveloped land, and land that was not classified during the biological inventory of the area and is not differentiated from cropland. Some overlapping of other land types already described are included in this area.

The agricultural/other transitional areas provide nesting habitat, cover, and food for wildlife. There are numerous small and medium sized mammals that utilize these lands including white-tailed deer, raccoons, red and gray fox, woodchuck, squirrel, and other small mammals. Song and game birds may also be present throughout the project area and include a variety of edge, open, and woodland species.

No areas of Agricultural or Transitional lands were disturbed or are anticipated to be disturbed beyond the areas identified as development areas within the original approved East Ravine Master Plan.

B. Describe rare features such as state-listed (endangered, threatened, or special concern) species, native plant communities, Minnesota County Biological Survey Sites of Biodiversity Significance, and other sensitive ecological resources on or within close proximity to the site. Provide the license agreement number and/or correspondence number (ERDB) from which the data were obtained and attach the Natural Heritage letter from the DNR. Indicate if any additional habitat or species survey work has been conducted within the site and describe results.

AUAR Guidance: For an AUAR, prior consultation with the DNR Division of Ecological Resources for information about reports of rare plant and animal species in the vicinity is required. Include the reference numbers called for on the EAW form in the AUAR and include the DNR's response letter. If such consultation indicates the need, an on-site habitat survey for rare species in the appropriate portions of the AUAR area is required. Areas of on-site surveys should be depicted on a map, as should any "protection zones" established as a result.

1. State-Listed Species

Natural Heritage Program

The natural communities and the species referenced in this section were not impacted by the development that occurred since the adoption of the AUAR. The Minnesota Department of Natural Resources (MnDNR) Conservation Planner was consulted in July 2025. The Conservation Planning Report identified four MBS sites of Biodiversity Significance in the study area. The sites include Cottage Grove 4 and Cottage Grove Drive-In Theater, both rated as having "Below" biodiversity significance, and Cottage Grove 22 and Cottage Grove Ravine Regional Park, both rated as "Moderate." All sites have a status marked as "final."

In July 2025, Minnesota Department of Natural Resources (DNR) Division of Ecological & Water Resources reviewed data contained in the Natural Heritage Information System (MCE #: 2025-00621). The review was referred to DNR staff for additional review. When the 2025 MNDNR letter is received, it will be followed as mitigations to the AUAR. The MNDNR information currently in this section is from the previous letter in 2020.

Letters can be found in Appendix 17.

In the original AUAR, Minnesota Department of Natural Resources (DNR) Division of Ecological & Water Resources reviewed data contained in the Natural Heritage Information System (NHIS; ERDB 20210043). The review identified ecologically significant areas, providing recommendations to avoid or minimize impacts to the areas of concern. The review also identified state and federally listed species and specified measures that must be taken prior to and during construction. These comments are

summarized in the paragraphs below, included in full in Appendix 18 and supplemented by Figure 6, depicting future land use and areas of concern.

Threatened & Endangered Species

Rusty Patched Bumble Bee (Bombus affinis)

The rusty patched bumble bee (RPBB) is a federally listed endangered species. The U.S. Fish & Wildlife Service (FWS) maps the RPBB as having high potential to occur within most of the project area. The DNR's NHIS indicates the RPBB was historically present within the township. Most development related to the AUAR would convert agricultural areas, which historically degraded RPBB habitat. In existing agricultural areas, future land conversion may provide cultural vegetation for RPBB foraging.

Limited conversion of woodland may take place northwest of 70th Street and Jamaica Avenue. This woodland likely represents suitable habitat (e.g. wintering and spring foraging) within the AUAR study area. Given the FWS probability mapping, a non-federal project does not require consultation pursuant to federal regulations. If development becomes federalized, then consultation will be needed. In absence of a federal trigger, the City may, at its discretion and after publication of revised Voluntary Guidance for Incidental Take Permits of the RPBB, enter into voluntary consultation.

Loggerhead Shrike (Lanius ludovicianus)

Loggerhead shrike is a state-listed endangered species known to occur near the AUAR study area. This species may occur in a variety of natural and cultural settings. The DNR advises avoiding clearing trees and shrubs from April through July. If clearing takes place within that window, the DNR may require a nest survey prior to construction.

Kitten-tails (Besseya bullii)

Kitten-tails is a state-listed endangered species documented within areas designated for future park/open space which will not be converted. Small portions of suitable habitat within Sections 11 and 22 of the AUAR study area (e.g. savanna, prairie, and woodland) may be converted. If future improvements propose to convert this land, then additional coordination will need to take place.

Blanding's Turtle (Emydoidea blandingii)

Blanding's turtle is a state-listed threatened species documented within the AUAR study area. DNR requires avoidance measures contained in full within Appendix 18, and summarized below:

- Avoid certain wetland and stream impacts between October 15 and April 15
- Provide Blanding's turtle information flyer to all contractors
- Erosion control blankets shall only consist of bio-netting or natural netting, and not plastic-containing products
- Avoid mulch and revegetation products augmented with synthetics
- Monitor for turtles during construction and report sightings to DNR
- Move any turtles from harm's way by hand and otherwise do not disturb individuals

Species of Concern

Lark sparrow (*Chondestes grammacus*) and Bell's vireo (*Vireo bellii*) are state-listed species of concern. These species are not afforded formal protection under the law; however, the City understands the avoidance measures recommended for Loggerhead shrike to limit potential incidental disturbance to these species.

Ecological Areas

Multiple native vegetation communities and areas with biodiversity significance rated as moderate significance or below significance are present within the AUAR study area. The area of biodiversity significance and native habitat community located northwest of 70th Street and Jamaica Avenue (see 11.a.1.4.1) may be converted in part by the development scenario. The Local Government Unit considering wetland impacts, if applicable, may need to consider the status of these lands in deciding whether a project subject to the Wetlands Conservation Act will permanently adversely affect a rare natural community and, therefore, if ~~a~~ wetland impacts must not be permitted.

Blanding's Turtle

The Blanding's turtle *(Emydoidea blandingii)* is a state-listed threatened species associated with sandy soils and a variety of wetland types. The species is ranked as threatened, if the species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Threatened species are protected under Minnesota Statutes Chapter 84.0895; Minnesota Rules Chapter 6134.

The preferred habitat of the Blanding's turtle includes calm, shallow water, rich, aquatic vegetation and sandy uplands for nesting. Studies by Congdon *et.al.* (1983) in Michigan and by Linck in Massachusetts have shown that nesting females may travel considerable distances (200 to 400 meters) to a nesting area, passing enroute what appears to be suitable nesting habitat immediately adjacent to the marsh in which they reside (Coffin and Pfannmuller 1988).

Blanding's turtles need both wetland and upland habitats to complete their life cycle. The loss of wetland habitat through drainage or flooding to convert wetlands into ponds or lakes, loss of upland habitat through development or conversion to agriculture, human disturbance (including collection for pet trade, road kills during seasonal movements), and increases in predator populations (skunks, raccoons, etc.) that prey on nests and young all contribute to a decline in this species.

In long-lived species, protecting the adults is critical to any conservation strategy. A female turtle may produce as many as 500 eggs during her life. Losing many of these long-lived females, through habitat loss or direct mortality, would seriously jeopardize the ability of a population to maintain itself. One of the potential threats is mortality while crossing roadways. Roadway design and large culverts or tunnels may provide an alternative route for turtles but requires further evaluation to refine design and effectiveness (Lang 2000).

Kitten-Tails

The Kitten-tail (*Synthyris bullii*, formerly *Besseya bullii*) is a state-listed threatened plant species. A species is ranked as threatened, if the species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. State threatened species are protected under Minnesota Statutes Chapter 84.0895; Minnesota Rules Chapter 6134.

The Minnesota Kitten-tail populations are largely restricted to the bluffs and terraces of the St. Croix, Mississippi, and Minnesota River valleys, specifically where the three rivers converge in the Twin Cities area. The plants prefer gravelly soil in dry prairies, savannas, and open woods (Coffin and Pfannmuller, 1988).

The Kitten-tail (*Synthyris bullii*, formerly *Besseya bullii)* is a distinctive plant with no close resemblance to other species found in Minnesota. It produces a basal rosette of large, broadly ovate, velvety, and heavily veined leaves. In late April or May, each mature plant sends up one to several unbranched stems, 6–16 inches tall, topped with a dense spike of small yellowish flowers. These flowers feature two long, exerted stamens. The stem leaves are small, alternate, and partially clasp the stem. While the plant flowers early in spring, the spike and basal leaves remain visible throughout most of the summer (MNDNR, 2021).

2. Federally-Listed Species

U.S. Fish and Wildlife Service (USFWS) resources indicate that the bald eagle (Haliaeetus Leucocephalus), Leedy's roseroot (Sedum integrifolim spp. Leedyi), and prairie bush clover (Lespedeza leptostachya) are listed as federally threatened in Minnesota and documented to occur in Washington County. However, there are no records indicating that these species occur within the project area. Given the location and type of activity proposed, the USFWS determined that the project is not likely to adversely affect any federally listed or proposed federally threatened or endangered species or adversely modify their critical habitat. This precludes the need for further action on this project as required under Section 7 of the Endangered Species Act of 1973.

The U.S. Fish and Wildlife (USFWS) Service Information for Planning and Conservation (IPaC) tool was used in July 2025 (Appendix 17) to identify federally-listed species within or near the AUAR Study Area. The following species were identified by IPaC as potentially occurring at the site:

- Higgins Eye (*Lampsilis higginsii*) –Endangered
- Salamander Mussel (*Simpsonaias ambigua)* – Proposed Endangered
- Whooping Crane (*Grus americana*) – Experimental Population, Non-Essential
- Monarch Butterfly (*Danaus plexippus*) – Proposed Threatened
- Rusty Patched Bumble Bee (*Bombus affinis*) – Endangered
- Western Regal Fritillary (*Argynnis idalia occidentalis*) – Proposed Threatened

Additionally, the IPaC tool identified critical habitat for the Rusty Patched Bumble Bee within the Project Area. Further coordination with the USFWS will be required to determine impacts to the Rusty Patched Bumble Bee.

The U.S. Fish and Wildlife (USFWS) Service Information for Planning and Conservation (IPaC) tool identified that Bald Eagles are in the project area. The tool also identified the following migratory bird species:

- Bald Eagle
- Black-billed Cuckoo
- Bobolink
- Canada Warbler
- Chimney Swift
- Eastern Whip-poor-will
- Golden-winged Warbler
- Grasshopper Sparrow
- Henslow's Sparrow
- Long-eared Owl
- Pectoral Sandpiper
- Prairie Loggerhead Shrike
- Prothonotary Warbler
- Red-headed Woodpecker
- Ruddy Turnstone
- Rusty Blackbird
- Semipalmated Sandpiper
- Upland Sandpiper

C. Discuss how the identified fish, wildlife, plant communities, rare features, and ecosystems may be affected by the project. Include a discussion on introduction and spread of invasive species from the project construction and operation. Separately discuss effects to known threatened and endangered species.

1. Invasive Species

Invasive species are a major cause of biodiversity loss and are considered biological pollutants by MnDNR. Invasive species can travel on construction equipment, landscaping equipment, and other debris. Contractors will be encouraged to use best

management practices to prevent the introduction and spread of invasive species during construction and operation.

2. Stormwater

Potential Habitat Impacts

The conversion of open land, agricultural land, woodland, grassland, shrub land, and wetlands to urban types of development will disturb the habitat and feeding areas and affect current wildlife species. Increased runoff volumes during construction and from developed areas will drain to wetlands and creeks in the area (see the response to Questions 16 and 17). Presently, development and infrastructure design plans are largely unknown for properties within the project area. Due to the unknown nature of future development within the project area, the extent of impacts on wildlife and natural resources is not fully known. Alternative site design to help to maintain areas for natural habitat are supported by the subdivision design policies as identified in the City of Cottage Grove's existing plans and ordinances help to maintain areas for natural habitat.

3. Impacts to protected species and habitats

Protective measures will be taken to protect threatened and endangered species and their habitat. All requirements set forth by the DNR and USFWS during consultation will be implemented in the project area. This may include avoidance of certain areas during different times of the year, erosion control measures, or others. If any threatened or endangered species or designated critical habitat are believed to be in jeopardy, permits to take and mitigation will be determined through agency coordination.

D. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects to fish, wildlife, plant communities, and sensitive ecological resources.

Avoidance is the primary and most effective strategy for conserving fish, wildlife, native plant communities, and other sensitive ecological resources. This may involve physically steering clear of specific areas or timing activities to avoid critical periods for species or habitats.

Minimization follows as the next step to reduce unavoidable impacts. Efforts should focus on limiting habitat disturbance, as well as minimizing noise and light pollution. Impacts to aquatic resources and water quality will be reduced to the greatest extent practicable.

Mitigation measures may be implemented to offset residual impacts. These could include financial contributions to conservation funds, habitat restoration or creation, species translocation, or a combination of these approaches.

15. Historic Properties

A. Describe any historic structures, archeological sites, and/or traditional cultural properties on or in close proximity to the site. Include 1) historic designations; 2) known artifact areas; and 3) architectural features. Attach letter received from the Minnesota State Historic Preservation Office (SHPO). Discuss any anticipated effects to historic properties during project construction and operation. Identify measures that will be taken to avoid, minimize, or mitigate adverse effects

to historic properties.

AUAR Guidance: For an AUAR, contact with the State Historic Preservation Office and State Archeologist is required to determine whether there are areas of potential impacts to these resources. If any exist, an appropriate site survey of high probability areas is needed to address the issue in more detail. The mitigation plan must include mitigation for any impacts identified.

A combination of existing resources and inventory reports were used to assess the impacts on sensitive resources in the East Ravine Area. These resources included the Old Cottage Grove Historic District Preservation Planning Report (Vogel 2002), Preservation Planning Report: Documentation Supporting the Nomination of the Military Road Heritage Corridor to the City Register of Historic Sites and Landmarks (Historic Preservation Division, Department of Community Development, City of Cottage Grove, July 1999), the Comprehensive Plan (City of Cottage Grove, 2000), the Comprehensive Plan (City of Cottage Grove, 2030) the Natural Resource Inventory (BRA, 1998), South Washington Watershed District CD-P86 Natural Resource Management Plan (SWWD and EOR, 2002) and resource information from the State Historic Preservation Office.

Archeological, Historic and Architectural Resources

The most notable resources are the Comprehensive Plan and the Historic Preservation Strategy Report adopted in January 2021.. These reports present documentation emphasizing the City's commitment to historic preservation and supporting nominations of priority list of sites and districts to the City Register of Historic Sites and Landmarks. The intent of historic district and site designation is to provide a guide for future community development decision making that acknowledges need for change while providing protection for historically significant buildings and sites. The report also contains a comprehensive inventory of all the heritage resources within the 0.5 mile of the study area .

Old Cottage Grove is in the NW part of the City and extends roughly from 70th Street (CSAH 22) south along Lamar Ave, including side streets, to 77th. The area is also known as Cottage Grove Village and East Cottage Grove. Most of the land and buildings in the area are private property. Lamar Ball fields, Old Grove Community Park, and Fire Station No.4 are publicly owned. The district has 9 sites of primary significance which are properties that have been individually listed or eligible for nomination to the City Register of Historic Sites and Landmarks. There are also 42 sites of secondary significance. This category consists of properties more than fifty years old and that contribute to the historic character of the district but lack individual distinction.

The village was platted with a linear plan and a clear distinction between the village and the surrounding countryside. Expansion of the town was constrained by the northern limit of the Cottage Grove Ravine. The original 40-acre plat in 1871 did not allow for a business district or town square, so some of the village's core functions were located outside of the plated area.

The heart of the historic district is Lamar Avenue, which is the old village main street. Traditional streetscape on Lamar Ave includes little or no setback from the street and narrow side yards. Trees were planted to define property edges, and they continue to be one of the defining features of the district.

Today, Old Cottage Grove historic district is a mix of residential, commercial, funerary, religious and agricultural buildings. Several preserved architectural landmarks represent Greek Revival, Italian Villa, Queen Anne, Arts and Crafts, and Colonial Revival building styles. There are also modest homes built in the 19th and 20th Centuries. Architectural features include: 1-2 story facades; low to medium pitch gable roof shapes; formal entrances; and one-story porches. Most of the remaining buildings built prior to 1950 are residences as many of the non-residential buildings have been razed or converted. Wood agricultural outbuildings, detached garages, and sheds also contribute to the district's character.

No archeological surveys have been conducted within the historic district but there are several potentially significant pioneer home, church, and school sites that need to be considered in development planning.

The Military Road Heritage Corridor through Cottage Grove is part of a larger historic military road that connected Point Douglas with Fort Ripley. The Point Douglas and Fort Ripley Military Road resources is designated WA-CGC-186 in the State Historic Preservation Office inventory database.

The Military Road Corridor incorporates all of Lehigh Road and Military Road within the city limits and that part of Lamar Avenue between Lehigh Road and 70th Street; CSAH 22 west of Lamar Avenue; and the abandoned roadway segment west of Old Cottage Grove village in Section 11, Township 27 North, Range 21 West. Military Road was laid out by the Federal government in 1851-1853. In 1914 it became a state aid road. The corridor was a popular place for early settlement (mid to late 1800s) and has long been a major transportation corridor connecting south Washington County to St. Paul and Minneapolis.

The Documentation Supporting the Nomination of the Military Road Heritage Corridor to the City Register of Historic Sites and Landmarks contains a greater account of the historical significance of the corridor and should be referenced for further details on the corridor.

Informational signage regarding the history of the Military Road/Trail Corridor was installed in conjunction with the 2019 Ravine Parkway construction project.

Archaeological Sites Within 1 Mile of Study Area

According to the MN OSA Portal there are 4 previously recorded archaeological sites within 1 mile of the Study Area (Table 26). Further research with the State Archeologist will be recommended. Sites located within the Study Area are further discussed below the table.

Table 26 - Previously Recorded Archaeological Sites Within 1 Mile of Study Area

Site No.	Site Name	Description/Cultural Affiliation*	Distance from Study area	NRHP Eligibility**	Potential Effects
21WA0080	None	Lithic Debitage- Precontact	Redacted	Unevaluated	Yes
21WA0079	None	Lithic- Precontact	Redacted	Unevaluated	Yes
21WA0081	None	Lithic Debitage- Precontact	Redacted	Unevaluated	No
21WA0050	Vantage Point	Lithic Scatter	Redacted	Unevaluated	No

*inferred cultural affiliation based upon site type.
**NRHP status provided by SHPO from their records on 08/04/2025.

21WA0080

Site 21WA0080 was found in 1990 during the Archaeological Reconnaissance Survey of the Cottage Grove Ravine. The site consists of one utilized quartzite flake and one utilized chert flake. These artifacts were found in close proximity to each other within an agricultural field and were determined to be part of one resource procurement site. The phase I survey methodology consisted of pedestrian survey of the agricultural field with no subsurface excavation at this location. The author determined that the site is not eligible for inclusion to the National Register of Historic places however, SHPO has yet to concur with this finding. Further study of the site and SHPO concurrence is recommended before any construction can be completed to identify site boundaries determine if Phase II investigations are necessary.

21WA0079

Site 21WA0079 was found in 1990 during the Archaeological Reconnaissance Survey of the Cottage Grove Ravine. The site consists of a single side notched projectile point attributed to the Archaic period. This artifact was found within an agricultural field and was determined to be part of a resource procurement site. The phase I survey methodology consisted of pedestrian survey of the agricultural field with only soil coring for the soil profiles as subsurface excavation. The author determined that the site is not eligible for inclusion to the National Register of Historic places however, SHPO has yet to concur with this finding. Further study of the site and SHPO concurrence is recommended before any construction can be completed to identify site boundaries determine if Phase II investigations are necessary.

21WA0081

Site 21WA0081 was found in 1994 during the cultural resource investigation of the 90th street pathway corridor. The site is a findspot of a singular flake found in an agricultural field. The find spot was determined to be the extent of the site and was recommended as not eligible for inclusion to the National Register of Historic Places. The 90th street pathway corridor was permitted to proceed. The site was likely destroyed by road construction activities and will not be affected by future construction.

Historical Cemeteries Within 1 Mile of APE

A review of the OSA Portal Historical Cemeteries Study Layer, created on behalf of the Minnesota Cemetery Project (Vermeer and Terrell 2011) shows one Historic cemetery within 1 mile of the APE. The OSA Portal and Findagrave.com listed two active cemeteries within the AUAR (Table 27). A review of project activities to determine impacts to the cemeteries is recommended.

Table 27 - Historical Cemeteries Within 1 Mile of APE

Cemetery Name	Location	Distance from APE	Status*	Potential Effects
Unknown Cemetery	Unknown	Potentially within	Inactive	Unknown
Cottage Grove Cemetery	10999 70th Street S	Within	Active	Yes
United Church of Christ Cemetery	7008 Larmer Ave S	Within	Active	Yes

Unknown Cemetery

According to the 2011 MN Cemetery project, there is a cemetery that is mapped at the section Level within the AUAR. The only location description available came from firsthand accounts from people living in the area in 1978. These accounts say “there was a cemetery with grave markers on the south side of Co Rd 22 in Cottage Grove Twp., 1/2 mile west of junction with Township road”. Further investigation will be needed to narrow down the location of this cemetery.

Cottage Grove Cemetery

According to the 1990 survey of the area by Robert Vogal; the Cottage Grove Cemetery is a new England style cemetery established in 1856. The remnants of the 1852 Cottage Grove Lyceum Hall are found within the cemetery grounds (Vogal 1991). Additional study of the cemetery is recommended if construction occurs in this area.

United Church of Christ

The United Church of Christ was established in the 1870s and is still active to this day. The cemetery is

one acre in size and was merged with St. Mathews church in 1953 (https://www.findagrave.com Accessed on 8/04/2025). Additional study of the cemetery is recommended if construction occurs in this area.

According to the Minnesota Department of Administration's State Historic Preservation Office Public Portal, 152 sites, areas, or roadways have been inventoried within the study area or within a 0.5-mile radius. A figure displaying these points is found in Appendix 24. Two homes within the study area are eligible for listing on the National Register of Historic Places. The John P. Furber House and the Severance Cordenio House (Cedarhurst). There is also a railway that is eligible for listing that is located 0.39 miles away from the AUAR study area.

Table 28 - MnSHIP Previously Inventoried Architecture-History Resources Within 0.5 Miles of Study Areas

SHPO Inventory No.	Property Name	Location	Distance from Study Areas	NRHP Eligibility
WA-CGC-00001	John P. Furber House	7310 Lamar Ave. S.	Within	Yes
WA-CGC-00002	Severance, Cordenio, House (Cedarhurst)	6940 Keats Ave. S.	Within	Yes
XX-RRD-CSP044	St. Paul and Chicago Railway Company/Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company, River Division Railroad Corridor Historic District	RR right-of-way between Union Depot in St. Paul and Mississ. Riv. Crossing near La Crescent	0.39 miles	Yes
WA-CGC-00041	Accacia Lodge	7595 Lamar Ave. S.	Within	No
WA-CGC-00037	Adams House	7220 Lamar Ave. S.	Within	No
WA-CGC-00123	Bahe Barn	8932 Military Rd.	Within	No
WA-CGC-00044	Bahe House	xxx Military Rd.	Within	No
WA-CGC-00146	Bahe House	7258 Laverne Ave. S.	Within	No
WA-CGC-00219	Bedrock Knob	off Military Rd.	Within	No
WA-CGC-00137	Benson House	7243 Langly Ave. S.	Within	No
WA-CGC-00167	Biscoe Barn	10473 80th St. S.	Within	No
WA-CGC-00059	Biscoe-Furber House	7361 Lamar Ave. S.	Within	No
WA-CGC-00150	Bloomer House	9905 Military Rd.	Within	No
WA-CGC-00151	Bloomquist Barn (razed)	9930 Military Rd.	Within	No
WA-CGC-00148	Boondocks Tavern	7402 Lamar Ave. S.	Within	No
WA-CGC-00054	Bothe Barn	8190 65th St. S.	Within	No
WA-CGC-00084	Brown House	11060 70th St. S.	Within	No
WA-CGC-00068	Cedarhurst Gardener's Cottage	9912 70th St. S.	Within	No
WA-CGC-00012	Century Feed	7471 Lamar Ave. S.	Within	No
WA-CGC-00142	Cokely House	7431 Langly Ave. S.	Within	No
WA-CGC-00010	Congregational Parsonage	7245 Lamar Ave. S.	Within	No
WA-CGC-00196	Cottage Grove Cemetery	xxx 70th St.	Within	No
WA-CGC-00033	Cottage Grove Cemetery, Lyceum Hall	SE corner 70th St. S. & Lamar Ave. S.	Within	No
WA-CGC-00038	Cottage Grove Feed Mill-Gary Miller House	7234 Lamar Ave. S.	Within	No

SHPO Inventory No.	Property Name	Location	Distance from Study Areas	NRHP Eligibility
WA-CGC-00008	Cottage Grove Market	74th St. & Lamar Ave.	Within	No
WA-CGC-00209	Cottage Grove Ravine	off U.S. Hwy. 10	Within	No
WA-CGC-00183	Cottage Grove School Site	unknown	Within	No
WA-CGC-00215	Cottage Grove Village	xxx Lamar Ave.	Within	No
WA-CGC-00229 (2023-12-20 02:08:05)	Cottage View Drive-In	9338 Point Douglas Road East	Within	No
WA-CGC-00065	Dally House	7430 Lamar Ave. S.	Within	No
WA-CGC-00030	Dan Miller House	7230 Lamar Ave. S.	Within	No
WA-CGC-00004	Dr. Arthur H. Steen House	7405 Lamar Ave. S.	Within	No
WA-CGC-00140	Dr. Steen's Office (moved)	7363 Langly Ave. S.	Within	No
WA-CGC-00005	Dr. William W. Furber House	7697 Lamar Ave. S.	Within	No
WA-CGC-00143	Eberspacher House	7441 Langly Ave. S.	Within	No
WA-CGC-00166	farmstead (razed)	6219 Keats Ave. S.	Within	No
WA-CGC-00141	Fiedler House	7421 Langly Ave. S.	Within	No
WA-CGC-00003	First Congregational Church	11094 70th St. S.	Within	No
WA-CGC-00122	Foley-Baer House	7227 Lamar Ave. S.	Within	No
WA-CGC-00186	Fort Ripley Military Road: Cottage Grove Segment	Lehigh Rd., Lamar Ave., 70th St., Military Rd.	Within	No
WA-WDC-00009	Fort Ripley Military Road: Woodbury Segment	Military Rd. Cottage Grove, Woodbury	Within	No
WA-CGC-00124	Fritz House	7475 Lamar Ave. S.	Within	No
WA-CGC-00193	Furber, Joseph Warren Site	unknown	Within	No
WA-CGC-00194	Furber, Theodore Site	unknown	Within	No
WA-CGC-00115	Gaalswyck House	7160 Lamar Ave. S.	Within	No
WA-CGC-00048	George Bahls House	7400 Lamar Ave. S.	Within	No
WA-CGC-00131	Goebel-Eckert House	7659 Lamar Ave. S.	Within	No
WA-CGC-00119	Gonsoir House	7204 Lamar Ave. S.	Within	No
WA-CGC-00110	Gordon and lura Mae Myers House	7074 Keats Ave. S.	Within	No
WA-CGC-00224	Grey Cloud, Cottage Grove and Stillwater Road	unknown	Within	No
WA-CGC-00158	Hale Barn	10532 Pt. Douglas Rd.	Within	No
WA-CGC-00117	Hartung House	7173 Lamar Ave. S.	Within	No
WA-CGC-00024	Healy-Hope Glen Farmstead, Mackintosh-Healy House	10276 Pt. Douglas Rd.	Within	No
WA-CGC-00157	Heldman House	10176 Pt. Douglas Rd.	Within	No
WA-CGC-00014	Henry House House	9054 Military Rd.	Within	No
WA-CGC-00028	Henry Nieman-Blatz House	7380 Lamar Ave. S.	Within	No
WA-CGC-00185	Hill, Lewis, Site	unknown	Within	No

SHPO Inventory No.	Property Name	Location	Distance from Study Areas	NRHP Eligibility
WA-CGC-00125	Hillyer House	7545 Lamar Ave. S.	Within	No
WA-CGC-00029	Hoffman House	7201 Lamar Ave. S.	Within	No
WA-CGC-00082	house	10295 70th St. S.	Within	No
WA-CGC-00178	house	7470 Lamar Ave. S.	Within	No
WA-CGC-00064	James Sheridan Barn (razed)	9866 Kimbro Ave. S.	Within	No
WA-CGC-00092	Jansen Barn	9649 90th St. S.	Within	No
WA-CGC-00129	Jaworski House	7613 Lamar Ave. S.	Within	No
WA-CGC-00111	John Bailey Farmstead	7333 Keats Ave. S.	Within	No
WA-CGC-00155 (2023-12-20 01:47:45)	Kemp Farmstead	9430 Point Douglas Road	Within	No
WA-CGC-00120	Kuehn-Eberspacher House	7213 Lamar Ave. S.	Within	No
WA-CGC-00114	Lambrecht Barn	6560 Lamar Ave. S.	Within	No
WA-CGC-00139	Lieser House	7331 Langly Ave. S.	Within	No
WA-CGC-00083	Lorenze-Jackman House	10830 70th St. S.	Within	No
WA-CGC-00112	Ludwig Wolf Barn	9056 Kimbro Ave. S.	Within	No
WA-CGC-00130	Lyle Myers-Kuehn House	7639 Lamar Ave. S.	Within	No
WA-CGC-00040	Marty House	7462 Lamar Ave. S.	Within	No
WA-CGC-00165	McHattie Barn	9165 Military Rd.	Within	No
WA-CGC-00132	Miller House, Nieman House	7737 Lamar Ave. S.	Within	No
WA-CGC-00116	Murphy House	7163 Lamar Ave. S.	Within	No
WA-CGC-00061	N.H. Van Slyke Farmstead	9016 Kimbro Ave. S.	Within	No
WA-CGC-00187	Norris, James S., Site	unknown	Within	No
WA-CGC-00056	O-Keene-Gramse Farmstead	10478 80th St. S.	Within	No
WA-CGC-00156	Pommerening Barn	9826 Pt. Douglas Rd.	Within	No
WA-CGC-00225	Pt. Douglas Road Wayside Rest Area	East Pt. Douglas Rd. .2 mi west of Kimbro Ave.	Within	No
WA-CGC-00179	Rabe Rock	7404 Lamar Ave. S.	Within	No
WA-CGC-00009	Radke Barn	7245 Lamar Ave. S.	Within	No
WA-CGC-00171	Radke Barn	7542 Lamar Ave. S.	Within	No
WA-CGC-00127	Radke-Duane Miller House	7575 Lamar Ave. S.	Within	No
WA-CGC-00126	Rasmussen House	7571 Lamar Ave. S.	Within	No
WA-CGC-00091	Robens House	10701 80th St. S.	Within	No
WA-CGC-00023	Roger B. Shepard Farmstead	8896 70th St. S.	Within	No
WA-CGC-00063	Roger B. Shepard House	8946 70th St. S.	Within	No
WA-CGC-00118	Ruiz House	7175 Lamar Ave. S.	Within	No
WA-CGC-00007	S.F. Furber Store (razed)	74xx Lamar Ave. S.	Within	No
WA-CGC-00213	Shepard's Woods	off Military Rd.	Within	No

SHPO Inventory No.	Property Name	Location	Distance from Study Areas	NRHP Eligibility
WA-CGC-00138	Smith House	7261 Langly Ave. S.	Within	No
WA-CGC-00197	St. Matthew's Cemetery	xxx 70th St.	Within	No
WA-CGC-00006	St. Matthew's Church	11117 75th St. S.	Within	No
WA-CGC-00066	St. Matthew's Parsonage (moved)	7532 Langly Ave. S.	Within	No
WA-CGC-00036	Stockwell House	8901 Military Rd.	Within	No
WA-CGC-00043	Thompson Barn	10768 80th St. S.	Within	No
WA-CGC-00055	Thompson-Tank Farmstead	10052 80th St. S.	Within	No
XX-ROD-00040	Trunk Highway 10	TH 10	Within	No
XX-ROD-00009	U.S./Trunk Highway 61 (formerly State Road/TH 1 and 3)	TH 61 from Hastings to Wyoming	Within	No
XX-ROD-00006	U.S./Trunk Highway 61 (formerly State Road/Trunk Highway 1 and 3)	unknown	Within	No
WA-CGC-00016	UCC Church & Parsonage	7006-08 Lamar Ave. S.	Within	No
WA-CGC-00015	United Church of Christ Cemetery	unknown	Within	No
WA-CGC-00176	Walter Farmstead	8901 Military Rd.	Within	No
WA-CGC-00188	Watson, Robert, Site	farm	Within	No
WA-CGC-00189	Watson, William, Site	south of 70th St.	Within	No
WA-CGC-00113	Wolf House	6110 Lamar Ave. S.	Within	No
WA-CGC-00121	Young House	7024 Lamar Ave. S.	Within	No
WA-CGC-00069	Zelch-Goebel Farmstead	10174-10251 70th St. S.	Within	No
WA-CGC-00159	Eckdahl House	10581 Pt. Douglas Rd.	4.65 ft	No
WA-CGC-00227	Lamar Avenue Larch Trees	unknown	0.01 miles	No
WA-CGC-00052	Nippoldt Milk House (razed)	8175 65th St. S.	0.02 miles	No
WA-CGC-00210	Pt. Douglas Rd.- Cottage Grove Segment	Pt. Douglas Rd.	0.02 miles	No
XX-ROD-00019	U.S./Trunk Highway 61 (formerly State Road/TH 1 and 3)	TH 61 - La Crescent to Duluth	0.02 miles	No
WA-CGC-00170	Eddy Shed	11313 77th St. S.	0.03 miles	No
WA-CGC-00046	Mars-Kernkamp Farmstead	7930 65th St. S.	0.03 miles	No
WA-CGC-00058	Theodore Furber-J.A. McClusky Farmstead	7717 Keats Ave. S.	0.03 miles	No
WA-CGC-00080	Oehlke House	8971 70th St. S.	0.04 miles	No
WA-CGC-00027	R. Elmer Furber House	8715 70th St. S.	0.04 miles	No
WA-CGC-00011	Watson Farmstead	7010 Iverson Ct S	0.04 miles	No
WA-CGC-00039	Granary	8677 70th St. S.	0.05 miles	No
WA-CGC-00060	Richard Roberts Farmstead	8348 Keats Ave. S.	0.06 miles	No
WA-CGC-00086	Gerlach Barn	11343 77th St. S.	0.07 miles	No
WA-CGC-00177	Smallidge Barn (razed)	10992 Pt. Douglas Rd.	0.09 miles	No
WA-CGC-00053	Shed (razed)	8305 65th St. S.	0.10 miles	No
WA-CGC-00133	Foley Barn	8225 Lamar Ave. S.	0.14 miles	No

SHPO Inventory No.	Property Name	Location	Distance from Study Areas	NRHP Eligibility
WA-CGC-00237	Bridge 9071	CSAH 19 3.1 mi NW of Jct. TH 95	0.15 miles	No
WA-WDC-00005	farmhouse	xxx Old Military Rd. Woodbudy	0.18 miles	No
WA-CGC-00087	Manke House	11405 77th St. S.	0.19 miles	No
WA-CGC-00099	F. Patrick Foley Farmstead	8239 Lamar Ave. S.	0.23 miles	No
WA-CGC-00154	Larson House	9747 Miller Rd.	0.28 miles	No
WA-CGC-00153	Kopren House	9735 Miller Rd.	0.29 miles	No
WA-CGC-00211	Chicago Milwaukee St. Paul & Pacific Railroad Line	unknown	0.31 miles	No
WA-CGC-00017	Langdon Consolidated School	8839 96th St. S.	0.33 miles	No
WA-CGC-00216	Langdon Village	off U.S. Hwy. 10	0.34 miles	No
WA-CGC-00214	Glacial River Channel	off U.S. Hwy. 10	0.36 miles	No
WA-CGC-00093	Ruona House	8782 96th St. S.	0.38 miles	No
WA-CGC-00134	George R. Crippen Farmstead	8601 Lamar Ave. S.	0.39 miles	No
WA-CGC-00109	Moritz House	9587 Islay Ave. S.	0.40 miles	No
WA-CGC-00108	Halberg-Kaiser House	9567 Islay Ave. S.	0.41 miles	No
WA-CGC-00107	Redmond House	9501 Islay Ave. S.	0.41 miles	No
WA-CGC-00174	Smallidge Farmstead	10051 Miller Rd.	0.41 miles	No
WA-CGC-00098	Old Public Works Building	9550 Islay Ave. S.	0.43 miles	No
WA-CGC-00090	Roberts-Jacobson House	9555 80th St. S.	0.43 miles	No
WA-CGC-00042	Hazel Halberg House	9564 Islay Ave. S.	0.44 miles	No
WA-CGC-00221	Town Hall	9540 Islay Ave. S.	0.44 miles	No
WA-CGC-00135	Haggeman Barn	8791 Lamar Ave. S.	0.45 miles	No
WA-CGC-00136	Kemp Barn	9101 Lamar Ave. S.	0.51 miles	No
WA-CGC-00208	West Draw	off U.S. Hwy. 10	0.59 miles	No
WA-CGC-00147	Pommerening Farmstead	9545 Lehigh Rd.	0.69 miles	No
WA-CGC-00062	Noltimier Farmstead	7510 70th St. S.	0.94 miles	No

16. Visual

A. Describe any scenic views or vistas on or near the project site. Describe any project related visual effects such as vapor plumes or glare from intense lights. Discuss the potential visual effects from the project. Identify any measures to avoid, minimize, or mitigate visual effects.

AUAR Guidance: Any impacts on scenic views and vistas present in the AUAR should be addressed. This would include both direct physical impacts and impacts on visual quality or integrity. EAW Guidelines contains a list of possible scenic resources.

If any non-routine visual impacts would occur from the anticipated development, this should be discussed here along with appropriate mitigation.

The AUAR anticipates a development pattern similar to those uses in the surrounding area and does not anticipate any adverse visual impacts as a result of the development scenario. The approximately 4,000-acre East Ravine AUAR Study Area is currently characterized by a mix of undeveloped land, natural features such as wetlands and ponds, and emerging residential and commercial development. The visual character of the area is expected to evolve significantly as development progresses, transitioning from a predominantly open and rural landscape to a more suburban and urbanized environment. While the area does not contain formally designated scenic viewsheds, the planned Ravine Parkway corridor will serve as a prominent visual and design feature, incorporating landscaped boulevards, green medians, trailways, and natural elements that enhance the aesthetic experience for residents and visitors. And the overall development will incorporate green areas and protection and preservation of wetlands and woodlands.

The introduction of residential neighborhoods, commercial nodes, and civic will alter the visual landscape. These changes may be perceived as significant, particularly by those familiar with the area's current undeveloped character. Notable visual effects include increased nighttime lighting associated with commercial development, roadway infrastructure, and public facilities. The Cottage View commercial node near Highway 10/61, in particular, may generate higher levels of light intensity due to larger-scale retail and community uses.

To mitigate potential visual impacts, the project will incorporate best practices in lighting design to reduce glare and light pollution.

17. Air

A. Stationary Source Emissions – Describe the type, sources, quantities, and compositions of any emissions from stationary sources such as boilers or exhaust stacks. Include any hazardous air pollutants, criteria pollutants, and any greenhouse gases. Discuss effects to air quality including any sensitive receptors, human health, or applicable regulatory criteria. Include a discussion of any methods used to assess the project's effect on air quality and the results of that assessment. Identify pollution control equipment and other measures that will be taken to avoid, minimize, or mitigate adverse effects from stationary source emissions.

AUAR Guidance: This item is not applicable to an AUAR. Any stationary air emissions source large enough to merit environmental review requires individual review.

Nearly all commercial and residential developments have potential to emit greenhouse gases (GHG) from various sources. Project construction may emit GHG by releasing gases that build up in soils. Carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) each build up in soils through plant life cycles and as organic material decays. These gas traps release GHG when disturbed by processes such as agricultural production and excavation. Project construction will use manufactured goods, the production of which likely relies upon energy developed from GHG. Natural gas-fired combustion equipment emit relatively low levels of typical combustion emissions, such as: Oxides of Nitrogen (NOx); Carbon Monoxide (CO); particulate matter (PM) and volatile organic compounds (VOCs); and GHGs such as CO2, CH4 and N2O. Natural gas-fired equipment also emits low levels of hazardous air pollutants (HAPs) that are normal constituents of combustion by-products.

Use of fossil fuels, refrigerants and electricity sourced in part from fossil fuels will continue throughout the expected development lifetime. After construction, sustained use of the site will generate GHG. While the development of a detailed GHG inventory is not possible because the final uses, tenants, buildings, construction materials and contents have not been determined, residential and commercial tenants are anticipated to consume energy developed partly from fossil fuels and may burn natural gas

for activities such as heating, cooking or other production. Trips by fuel-burning and electric vehicles relying on fossil fuel-sourced electricity will also generate GHG.

At this time, the likely types of emission sources, in aggregate, do not typically trigger an air emissions permit from MPCA for commercial and residential development projects. However, this determination can only be made once proposed equipment inventories and estimated throughputs are known with reasonable certainty. The Project Owner and/or Tenant(s) are responsible for making air permit applicability or exemption determinations prior to starting construction. Such permit or exemption determinations would apply to direct stationary source emissions resulting from equipment to be operated, and within certain sizes and throughput levels.

B. Vehicle Emissions – Describe the effect of the project's traffic generation on air emissions. Discuss the project's vehicle-related emissions effect on air quality. Identify measures (e.g., traffic operational improvements, diesel idling minimization plan) that will be taken to minimize or mitigate vehicle-related emissions.

AUAR Guidance: Although the MPCA no longer issues Indirect Source Permits, traffic-related air quality may still be an issue if the analysis in Item 18 indicates that development would cause or worsen traffic congestion. The general guidance from the EAW form should still be followed. Questions about the details of air quality analysis should be directed to MPCA staff.

Vehicle-related air emissions are quantified in item 18.

C. Dust and Odors – Describe sources, characteristics, duration, quantities, and intensity of dust and odors generated during project construction and operation. (Fugitive dust may be discussed under Item 16a). Discuss the effect of dust and odors in the vicinity of the project including nearby sensitive receptors and quality of life. Identify measures that will be taken to minimize or mitigate the effects of dust and odors.

AUAR Guidance: Dust and odors need not be addressed in an AUAR, unless there is some unusual reason to do so. The RGU might want to discuss as part of the mitigation plan, however, any dust control ordinances in effect.

The existing air quality in the area is good. According to the EPA's online NEPAssist Tool, the entire twin cities metro area is in a maintenance area for CO (Carbon Monoxide). There are no Ozone, Lead, SO2, particulate non-attainment/maintenance areas, or air emission facilities within 500 feet of the project. There are no topographical or meteorological conditions that hinder airflow in this area. There are no air quality permits required for the AUAR. No air quality mitigation measures are required or proposed for this project.

Temporary air impacts will result from equipment exhaust and dust during construction, but no permanent air quality concerns or impacts are expected. The project SWPPP will include provisions to minimize construction-related air impacts from both dust and construction vehicle exhaust. Dust control measures will include but not be limited to project phasing, application of water, use of mulch, and prompt soil stabilization.

The State of MN does not have any vehicle emissions test requirements; however, construction vehicles are encouraged to have functional noise and emission control systems in good working order. Equipment that lacks noise and emission control measures should be repaired or removed from the site.

18. Greenhouse Gas (GHG) Emissions/Carbon Footprint

A. GHG Quantification – For all proposed projects, provide quantification and discussion of project GHG emissions. Include additional rows in the tables as necessary to provide project-specific emission sources. Describe the methods used to quantify emissions. If calculation methods are not readily available to quantify GHG emissions for a source, describe the process used to come to that conclusion and any GHG emission sources not included in the total calculation.

1. About Greenhouse Gases (GHGs)

Global climate change results from the total accumulation of GHGs in the Earth's atmosphere, as well as other human-caused and natural factors. The GHG composition in the Earth's atmosphere is changing and causing the planet's climate to change. The proposed project's incremental contribution to global GHGs cannot be translated into specific effects on climate change, either globally or regionally.

In general, regional impacts from climate change may include the following effects: increased mean annual air temperature (summer and winter warming); increased surface water temperatures; later onset of winter and earlier onset of spring; precipitation may fall in fewer, but more intense, storms; species adapted to cold climates may shift out of the Great Lakes basin into Canada; and aspen and birch forests may be replaced by hardwood forests of oak and hickory. Moderate climate change may increase agricultural yields and food production, with some regional and annual variability.

The GHG emissions for the Project are calculated using the Greenhouse Gas Equivalencies Calculator - Calculations and References information from the U.S. EPA. The EPA Simplified Greenhouse Gas Emissions Calculator (SGEC) tool, and the EPA Waste Reduction Model (WARM) tool were also referenced. The methodologies for developing a carbon footprint are described in the Minnesota Environmental Quality Board's (EQB's) Revised EAW Guidance (June 2024). Table 29 shows the emission categories for project carbon footprint calculations, as provided in the EQB Guidance.

Table 29 - GHG Emission Categories

Category	Scope	Project Phase	Type of Emission
Direct Emissions	Scope 1 - Emissions	Operations	Combustion (Stationary, Area, Mobile Sources)
	Scope 1 - Emissions	Operations	Non-Combustion Process
	Scope 1 - Emissions	Construction	Combustion (Mobile Sources)
	Scope 1 - Emissions	Construction	Land-Use
Indirect Emissions	Scope 2	Operations	Off-site Electricity/Steam Production (Market-Based and Location-Based)
	Scope 3	Operations	Off-site Waste Management
Atmospheric Removal of GHGs	Scope 1 (Sinks)	Construction/Operations	Land -Use (CO2 removals to terrestrial storage)

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well as other human-caused and natural factors. The GHG composition in the Earth's atmosphere is changing and causing the planet's climate to change. The proposed project's incremental contribution to global GHGs cannot be translated into specific effects on climate change, either globally or regionally.

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Calculations are further detailed in Appendix 19. Units per acre and Floor Area Ratios (FAR) were obtained from the Cottage Grove Comprehensive Plan, Chapter 2: Land Use. Estimates of square footage and total residential units were derived using the comprehensive plan in conjunction with future land use and cover type acreage estimates. The following assumptions were used in the greenhouse gas calculations: High-Density Residential was estimated at 12 units per acre across 50 acres; Medium-Density Residential at 9 units per acre across 180 acres; Low-Density Residential at 3 units per acre across 1,625 acres; and Rural Residential at 0.5 units per acre across 220 acres. Mixed Use development was allocated across 20 acres, with 10 acres designated for residential use at 30 units per acre and the remaining 10 acres for commercial use with a FAR ranging from 0.1 to 0.2. Additional commercial development was estimated at 125 acres with a FAR of 0.1 to 0.2, while civic and institutional uses were estimated at 50 acres with a FAR ranging from 0.1 to 0.5. Vehicle estimates were based on the 2045 transportation projections from the AUAR 2025 update, totaling 31,600 vehicles. Additionally, 1,403 acres of agricultural land (cultivated crops cover type) were projected to be converted. The total estimated residential development includes 7,265 units, of which 7,205 are unattached units and 60 are attached apartment units. Commercial development is estimated at 5,880,600 square feet, while civic and institutional facilities account for approximately 1,089,000 square feet.

Construction Emissions

Construction activities for this project are anticipated to include the use of excavators, material handlers, skid steers, cranes, bulldozers, and haul trucks. These types of vehicles primarily rely on diesel as a fuel source, which results in the emission of CO2 and, to a lesser extent, CH4 and N2O. Table 30 provides an estimate for the emissions generated by this equipment assuming that activities will last for twenty construction seasons (approx. working 2400 days) and utilize approximately 20 diesel-powered pieces of heavy equipment and 20 gasoline-powered passenger vehicles. The total emissions from these activities are considered one-time emissions, however, the industry standard for determining long-term impacts of construction-related GHG output is to annualize the total emissions over a project's lifetime, which is defined as a 50-year period.

GHG emissions from construction are associated with fuel combustion in the mobile construction equipment and on-road vehicles. The assumed construction schedule is twenty construction seasons (2400 days). For on-road vehicles (commuting construction workers, dump trucks and semi-trucks, emissions are calculated by estimating the number of vehicles, miles traveled, gallons of fuel used (using default mileage rates in the Simplified GHG Emissions Calculator from the FHWA[13]), and

13 https://www.fhwa.dot.gov/policyinformation/statistics/2022/pdf/vm1.pdf

emission factors from the U.S. EPA's Emission Factors Hub[14].

20 diesel vehicles are estimated to travel 60 miles per day at 7.4 mpg (SGEC, 2025). The average vehicle miles traveled (VMT) for single-unit 2-axle 6-tire or more combination trucks in 2022 was 23,111 miles per year, which equates to about 60 miles per day, additionally these trucks run at 7.4 mpg (FHWA 2024). This equates to 389,189.19 gallons of diesel. According to the EPA's GHG Emission Factors Hub, 10,180 grams of CO2/gallon of diesel = 10.180 × 10-3 metric tons CO2/gallon of diesel (EPA, 2025). This equates to 3961.95 MTCO2e from the diesel trucks.

20 Passenger vehicles are estimated to travel 30 miles per day at 24.8 mpg (SGEC, 2025). The average vehicle miles traveled (VMT) by light duty vehicles in 2022 was 10,917 miles per year, which equates to about 30 miles per day, additionally these vehicles run at 24.8 mpg (FHWA 2024). This equates to 58,064.52 gallons of gas. According to the EPA's GHG Emission Factors Hub, 8,887 grams of CO2/gallon of gasoline = 8.887 × 10-3 metric tons CO2/gallon of gasoline (EPA, 2025). This equates to 516.02 MTCO2e from the construction worker passenger vehicles.

The total construction vehicle emissions are 4,477.97 MTCO2e. Per EQB's Revised EAW Guidance, total construction emissions to construct the Project are divided by the lifetime of the project, estimated to be 50 years. Annualized over the project lifetime of 50 years, the total construction vehicle emissions are 89.56 MTCO2e annually.

Carbon Sink

1,403 acres of cropland are to be converted to (various levels of) developed land. The USDA Natural Resource Conservation Service (NRCS) COMET-Planner tool reports that expected carbon sequestration rates for various farming practices in most regions of the United States are as follows: 0.31 MT/acre/year for no-till, 0.20 MT/acre/year for reduced tillage, and 0.37 MT/acre/year for cover crops (USDA NRCS, 2021).[15] In this calculation, the carbon sequestration rate for land with no practice is being estimated at 0.10 MT CO2E. Removing 1,403 acres equates to 140.30 MTCO2e no longer being sequestered annually.

Operational Emissions – Mobile Sources

According to the transportation study's 2025 AUAR updated projection for 2045, the total number of vehicles is estimated to be 31,600. Passenger vehicles are estimated to travel at 24.8 mpg (SGEC, 2025). The perimeter of the AUAR study area is about 20 miles. This calculation will use the value of 20 miles per day, at 24.8 mpg (FHWA 2024). This equates to 9,301,612.90 gallons of gas. According to the EPA's GHG Emission Factors Hub, 8,887 grams of CO2/gallon of gasoline = 8.887 × 10-3 metric tons CO2/gallon of gasoline (EPA, 2025). This equates to 82,663.43 MTCO2e annually from the operational passenger vehicles.

Operational Emissions – Stationary Combustion, Home Energy Use

According to the EPA's GHG Emission Factors Hub, the Total CO2 emissions for energy use per home: 4.798 metric tons CO2 for electricity + 2.16 metric tons CO2 for natural gas + 0.24 metric tons CO2 for propane + 0.25 metric tons CO2 for fuel oil = 7.45 metric tons CO2 per home per year (EPA,

14 https://www.epa.gov/climateleadership/ghg-emission-factors-hub, updated January 2025
15 https://ag.purdue.edu/commercialag/home/resource/2021/06/opportunities-and-challenges-associated-with-carbon-farming-for-u-s-row-crop-producers/

2025).

According to the U.S. Energy Information Administration, Residential Energy Consumption Survey (June 18, 2013), households living in apartment buildings with five or more units use about half as much energy as other types of homes[16]. There are an estimated 7,205 single family detached homes and an estimated 60 attached apartments. A single family detached home has 7.45 MTCO2e of emissions per unit and an attached apartment has 3.73 MTCO2e of emissions per unit. In total for both types of units, there are 53,900.8 MTCO2e of emissions per year.

Operational Emissions – Waste, Commercial, Civic/Institutional, Residential

Waste management estimates were completed using estimated solid waste generation rates from CalRecycle[17], square footage of each source, and the US EPA WARM Model[18], Mixed Solid Waste (MSW) category to get MTCO2e for each type. According to MPCA's SCORE[19] data, Washington county landfills 21% of waste and combusts the remaining 79%, this was used to determine the emissions. Commercial was estimated to have 0.005 lbs. of waste per square foot per day. With 5,880,600 square feet, this equates to 4,866.6 metric tons per year. Civic and institutional was estimated to have 0.006 lbs. of waste per square foot per day. With 1,089,000 square feet, this equates to 1,082.1 metric tons per year. Residential was estimated to have 12.23 lbs. of waste per household per day. With 7,265 units, this equates to 1,082.1 metric tons per year. In total, with 4,339.9 metric tons landfilled and 16,326.4 metric tons combusted, there is 1,491.46 MTCO2e per year from waste management.

Operational Emissions – Electricity, Commercial, Civic/Institutional

The U.S. Energy Information Administration's Table PBA4 (2012)[20], which details electricity consumption totals and conditional intensities by building activity subcategories, was used to determine kWh per square foot. The kWh totals were then inserted into the EPA SGEC tool to determine MTCO2e. These figures exclude residential homes as the energy rate given for them by EPA already includes electricity. For the mercantile category (used for commercial), the consumption is 18.3 kWh per square foot. With 5,880,600 square feet, this equates to 46,047.20 MTCO2e per year. For the government office category (used for civic/institutional), an estimate of 14.3 kWh per square foot is used for calculations. With 1,089,000 square feet, this equates to 6,663.40 MTCO2e per year. In total, 52,710.60 MTCO2e per year from electricity.

Operational Emissions – Natural Gas, Commercial, Civic/Institutional

The U.S. Energy Information Administration's Table C32 (2018)[21], which details natural gas consumption totals and conditional intensities by building activity subcategories, was used to determine natural gas consumption per square foot. The totals were converted to MMBtu and then inserted into the EPA SGEC tool to determine MTCO2e. These figures exclude residential homes as the energy rate given for them by EPA already includes natural gas. Mercantile (used for commercial) buildings, use 35.7 cubic feet of natural gas per square foot. With 5,880,600 square

[16] https://www.eia.gov/todayinenergy/detail.php?id=117310
17 https://www2.calrecycle.ca.gov/WasteCharacterization/General/Rates
18 https://www.epa.gov/warm/versions-waste-reduction-model
[19] MPCA, Select Committee on Recycling and the Environment (SCORE), https://data.pca.state.mn.us/views/SCOREreport2022/2022SCOREreport?%3Aembed=y&%3AisGuestRedirectFromVizportal=y
[20] https://www.eia.gov/consumption/commercial/data/2012/c&e/cfm/pba4.php
[21] https://www.eia.gov/consumption/commercial/data/2018/ce/pdf/c32.pdf

feet, this equates to 14,446 MTCO2e per year. Government office (used for civic/institutional) buildings, have a consumption rate of 22 cubic feet of natural gas per square foot. With 1,089,000 square feet, this equates to 1,648.50 MTCO2e per year. In total, 16,094.50 MTCO2e per year from natural gas.

Summary

Total estimated GHG emissions for the proposed AUAR scenario are 205,599.14 MTCO2e. A summary of GHG emissions is provided in Table 30. Emissions are presented in tons per year of carbon dioxide equivalent, which takes into account each GHG's global warming potential (GWP). Detailed emission calculations are provided in Appendix 19.

2. Project Related GHG Emissions

Project Related GHG Emissions

Table 30 - GHG Emissions

Scope	Emission Type	Emission Sub-type	Existing Conditions (MTCO2e)	Project-related Conditions (MTCO2e)	Total Emissions (MTCO2e)	Calculation method(s)
Scope 1	Combustion	Construction Mobile Equipment (annualized)	0	0	89.56	20 construction seasons, 120 days per season. 20 diesel vehicles, 60 miles per day, 7.4 mpg (EPA and FHWA, 2022), 10,180 grams of CO2/gallon of diesel = 10.180 × 10-3 metric tons CO2/gallon of diesel (EPA, 2025). 20 Passenger vehicles, 30 miles per day, 24.8 mpg (EPA and FHWA, 2022), 8,887 grams of CO2/gallon of gasoline = 8.887 × 10-3 metric tons CO2/gallon of gasoline (EPA, 2025). Annualized over the project lifetime of 50 years.
Scope 1	Land Use (Conversion)	Carbon Sink	0	140.30	140.30	1,403 acres of cropland removed. The USDA Natural Resource Conservation Service (NRCS) COMET-Planner tool reports that expected carbon sequestration rates for various farming practices in most regions of the United States are as follows: 0.31 MT/acre/year for no-till, 0.20 MT/acre/year for reduced tillage, and 0.37 MT/acre/year for cover crops (USDA NRCS, 2021). In this calculation, the carbon sequestration rate for land with no practice is being estimated at 0.10 MT CO2E.
Scope 1	Motor Vehicle Emissions	Personal Vehicles	0	82,663.43	82,663.43	31,600 vehicles, 20 miles per day, 24.8 mpg (EPA and FHWA, 2022). 8,887 grams of CO2/gallon of gasoline = 8.887 × 10-3 metric tons CO2/gallon of gasoline (EPA, 2025).

Scope	Emission Type	Emission Sub-type	Existing Conditions (MTCO2e)	Project-related Conditions (MTCO2e)	Total Emissions (MTCO2e)	Calculation method(s)
Scope 2	Off-Site Energy	Home Energy Use	0	53,900.8	53,900.8	Total CO2 emissions for energy use per home: 4.798 metric tons CO2 for electricity + 2.16 metric tons CO2 for natural gas + 0.24 metric tons CO2 for propane + 0.25 metric tons CO2 for fuel oil = 7.45 metric tons CO2 per home per year (EPA, 2025). 7,205 single family detached homes and 60 attached apartments. Attached single family homes use 2/3 energy as a detached home (Energy Information Agency, 2020) while apartments use half as much energy (Energy Information Agency, 2013).
Scope 2	Off-Site Energy	Electricity (excluding housing units)	0	52,710.60	52,710.60	5,880,600 sq. ft. of Commercial and 1,089,000 sq. ft. of Civic/Institutional. U.S. Energy Information Administration. Table PBA4. Electricity consumption totals and conditional intensities by building activity subcategories, 2012. Per Square foot (kWh) for Mercantile (commercial) category = 18.3 kWh per square foot. Per Square foot (kWh) for Public County Space (civic/institutional) category = 14.3 kWh per square foot.
Scope 2	Off-Site Energy	Natural Gas (excluding housing units)	0	16,094.50	16,094.50	5,880,600 sq. ft. of Commercial and 1,089,000 sq. ft. of Civic/Institutional. U.S. Energy Information Administration, Forms EIA-871A and C of the 2018 Commercial Buildings Energy Consumption Survey Mercantile (commercial) = 35.7 cubic feet natural gas per sq ft. Public County space (civic/institutional) = 22 cubic feet natural gas per sq ft
Scope 2	Off-Site Energy	Waste (including housing units)	0	1,491.46	1,491.46	5,880,600 sq. ft. of Commercial and 1,089,000 sq. ft. of Civic/Institutional. 7,265 housing units. Waste management estimates were completed using estimated solid waste generation rates from CalRecycle, square footage of each source, and the US EPA WARM Model, Mixed Solid Waste (MSW) to get MTCO2e for each type. Commercial was estimated to have 0.005 lbs. of waste per square foot per day. Civic/Institutional was estimated to have 0.006 lbs. of waste per square foot per day. Residential was estimated to have 12.23 lbs. of waste per household per day.
TOTAL*					**205,599.14**	**MTCO2e**

B. GHG Assessment

1. Describe any mitigation considered to reduce the project's GHG emissions.

Over the project's assumed 50-year lifespan, estimated greenhouse gas emissions without mitigation are 205,599.14 MTCO2e. These emissions could potentially be reduced or offset through carbon sequestration and other mitigation strategies.

To put these figures into perspective using the EPA's Greenhouse Gas Equivalencies Calculator[22] 205,599.14 MTCO2e is equivalent to 47,957 gasoline-powered passenger vehicles driven for one year.

Other mitigation measures can reduce indirect GHG emissions due to energy usage and other activities. These mitigation efforts may include planting native grasses to facilitate carbon uptake, establishing sustainability operations such as encouraging the use of high-efficiency natural gas water heaters to reduce electricity and natural gas usage, and encouraging efficient heating, ventilation, and air conditioning systems. The majority of these mitigation efforts will depend on municipal policy and end-user efforts and are therefore not a part of the current project proposal.

2. Describe and quantify reductions from selected mitigation, if proposed to reduce the project's GHG emissions. Explain why the selected mitigation was preferred.

No additional on-site mitigation is planned as part of the proposed project.

3. Quantify the proposed project's predicted net lifetime GHG emissions (total tons per number of years) and how those predicted emissions may affect achievement of the Minnesota Next Generation Energy Act goals and/or other more stringent state or local GHG reduction goals.

Minnesota has established ambitious greenhouse gas (GHG) reduction targets through both statutory mandates and strategic planning frameworks. The Next Generation Energy Act of 2007 set goals to reduce statewide GHG emissions by 30% below 2005 levels by 2025 and 80% by 2050[23]. These goals were updated in 2023 to align with international climate science, including targets from the Intergovernmental Panel on Climate Change (IPCC). Under the 2023 Climate Action Framework, Minnesota now aims to reduce emissions 50% by 2030 and achieve net-zero emissions by 2050.

To support these goals, the state has prioritized transitioning to 100% carbon-free electricity and 55% renewable electricity by 2040. These efforts reflect Minnesota's commitment to mitigating climate change impacts, which include rising temperatures, increased flooding, and ecosystem disruptions—particularly affecting vulnerable communities. The proposed project does not involve any large energy facilities but includes residential, civic/institutional, and commercial properties. Where feasible and as determined appropriate by the developer, to remain in keeping with state and local GHG reduction goals, construction best management practices to reduce greenhouse gas emissions may include the use of energy-efficient equipment and vehicles, minimizing idling time, sourcing materials locally to reduce transportation emissions, and recycling construction waste. The developer may also consider incorporating low-carbon building materials, such as recycled steel or concrete alternatives, and

[22] https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator
[23] https://mn.gov/mmb/one-mn-plan/measurable-goals/ghg-emissions.jsp

scheduling work to optimize fuel use. When practical, renewable energy sources like solar-powered lighting or equipment may be utilized to further reduce the carbon footprint of construction activities. Again, over the project's assumed 50-year lifespan, there will be an estimated 205,599.14 MTCO2e emitted without mitigations.

19. Noise

A. Describe sources, characteristics, duration, quantities, and intensity of noise generated during project construction and operation. Discuss the effect of noise in the vicinity of the project including 1) existing noise levels/sources in the area; 2) nearby sensitive receptors; 3) conformance to state noise standards; and 4) quality of life. Identify measures that will be taken to minimize or mitigate the effects of noise.

AUAR Guidance: Construction noise need not be addressed in an AUAR, unless there is some unusual reason to do so. The RGU might want to discuss as part of the mitigation plan, however, any construction noise ordinances in effect.

If the area will include or adjoin major noise sources, a noise analysis is needed to determine if any noise levels in excess of standards would occur, and if so, to identify appropriate mitigation measures. With respect to traffic-generated noise, the noise analysis should be based on the traffic analysis of Item 18.

1. Existing Noise

Existing noise levels were measured at two locations in the project area. Monitoring locations represent undeveloped lands expected to experience commercial and residential development or impacts from commercial and residential development. The future Build alternative and associated traffic volumes expected in the year 2020 were modeled using the Minnesota Department of Transportation traffic noise model, MINNOISE. Monitoring data and modeling results were compared with the Minnesota Pollution Control Agency (MPCA) Noise Rules to evaluate traffic noise impacts and recommend mitigation measures. Modeling results were used to create noise contours showing the location of the residential daytime and nighttime L10 and L50 noise contour lines. L10 and L50 are sound levels in decibels (dBA) that are exceeded in 10 percent or 50 percent, respectively, of the time for a one-hour survey.

Existing Noise Levels

On March 3, 2005, noise monitoring was conducted at two locations in the project area. The purpose of the noise monitoring was to document existing noise levels. Noise measurements were conducted in accordance with Minnesota Rules Chapter 7030, Noise Pollution Control. The meteorological conditions were as follows:

Temperature - +2 degrees

Humidity – 76%

Wind – Calm

Barometric Pressure – 30.27" Hg

Table 31 summarizes the equipment Earth Tech staff used to collect monitoring data for this noise analysis.

Table 31 - Noise Analysis Instrumentation Summary

Instrument	Make	Model	Calibration Date	Serial Number
Dosimeter 1	Quest	Q-300	2/28/05 at 114.0 dBA	QC6030052
Dosimeter 2	Quest	Q-30	2/28/05 at 114.0 dBA	QC2921212

The monitoring sites were selected at locations where existing noise levels could not be modeled with MINNOISE or to compare measured noise levels to modeled noise levels to confirm the validity of the model. The results of the noise measurements at the monitoring locations are listed in Table 32 and the locations of the sites are indicated in Appendix 20 on Figures 2 and 3. MPCA maximum allowable daytime noise levels are 65 dBA for L10 and 60 dBA for L50. The maximum nighttime noise levels are 55 dBA (L10) and 50 dBA (L50).

Table 32 - Nighttime Noise Monitoring Summary

Site	Date Sampled	Time Sampled	Distance from CL	L10 (dBA)	L50 (dBA)	MPCA Nighttime		Exceeding (Yes/No)
						L10 (dBA)	L50 (dBA)	
Gordon and Bonnie Tank Property	March 3, 2005	6:00 am to 7:00 am	150 feet	56	46	55	50	Yes
Washington County Property	March 3, 2005	6:00 am to 7:00 am	600 feet	51	54	55	50	Yes

2. Construction Noise

As stated in the AUAR guidelines, construction noise need not be addressed unless there is some unusual reason to do so. No unusual circumstances have been identified that would necessitate a detailed construction noise analysis. Construction of the proposed project would comply with all local, state, and federal regulations with regards to noise.

3. Traffic Generated Noise

Future Noise Levels

The traffic noise model analyzed the existing roadway network and proposed East Ravine Parkway. The Howard R. Green Company supplied the existing traffic levels in 2003 and the predicted traffic levels in 2020. Earth Tech adjusted the 2003 traffic data to 2005 conditions. The Washington County Department of Transportation provided information regarding truck percentages, speed limits, and nighttime peak hour volumes. Earth Tech used aerial orthographic mapping to determine roadway alignments and digitized the existing and proposed roadway alignments for use in the MINNOISE noise model. Keats Avenue, Kimbro/Lamar Avenue, Jamaica Avenue, 80th Street, 70th Street, and Military Road were modeled in the for year 2005 and 2020 peak hour traffic. The proposed Ravine Parkway was modeled only for year 2020 peak hour traffic. The highest peak hour traffic volume (PHV) for each modeled roadway is shown in Table 33.

The traffic stream in the MINNOISE model was determined to be 95% cars, 2% medium trucks, and 3% heavy trucks for all roadways except Keats Avenue. The traffic stream for Keats Avenue was determined to be 93% cars, 3% medium trucks, and 4% heavy trucks. Roadway speeds were modeled as follows:

Keats Avenue – 55 mph

Kimbro/Lamar Avenue – 55 mph

Jamaica Avenue – 45 mph

80th Street – 45 mph

70th Street – 45 mph

Military Road – 55 mph

Ravine Parkway – 40 mph

Table 33 - Peak Hour Traffic Volumes

Location	Existing (2005)		Predicted (2020)	
	Daytime*	Nighttime*	Daytime*	Nighttime*
70th Street to Military Road	1000	750	1680	1260
US 61 to Lamar Avenue	740	555	480	360
70th Street to Military Road	560	420	1510	1135
Jamaica Avenue to Keats Avenue	760	570	980	735
Jamaica Avenue to Keats Avenue	590	445	1520	1140
Ideal Avenue to Jamaica Avenue	750	565	1090	820
80th Street to 70th Street	N/A	N/A	1190	850

*Daytime is defined to mean those hours from 7:00 am to 10:00 pm. Nighttime is defined to mean those hours from 10:00 pm to 7:00 am.

Note: Table 33 is sourced from the original 2006 AUAR. A traffic study was not included in the scope of the 2025 update.

Results

Modeling results are shown as contours on Figures 2 and 3 of Appendix 21. Traffic noise levels between the roadway centerline and the contour line are predicted to exceed the corresponding MPCA Daytime L10 and L50 noise levels. Table 34 shows the distances from roadway centerline to the noise contour.

Table 34 - Distance to Contours

Location	Approximate Distance from CL in Feet			
	2005 MPCA Daytime		2020 MPCA Daytime	
	L10 (65 dBA)	L50 (60 dBA)	L10 (65 dBA)	L50 (60 dBA)
Keats Avenue (70th Street to Ravine Parkway)	197	164	262	262
Kimbro Avenue (US 61 to Lamar Avenue)	131	82	115	33
Jamaica Avenue (70th Street to Military Road)	262	203	197	190
80th Street (Jamaica Avenue to Keats Avenue)	108	69	135	85
70th Street (Jamaica Avenue to Keats Avenue)	115	59	152	150
Military Road (Ideal Avenue to Jamaica Avenue)	161	121	205	164
Ravine Parkway (80th Street to 70th Street)	N/A	N/A	118	80

Residences located within the distances above, as measured from the roadway centerline, are predicted to experience roadway noise levels that exceed MPCA's maximum allowable noise levels.

The Nighttime peak hourly volumes are approximately 75% of the Daytime peaks. Due to the nominal reduction in traffic and the substantial reduction (10 dBA) of the allowable L10 and L50, the distance from the roadway centerline to the nighttime noise contour is approximately 700 feet. At the present time, existing noise levels at monitored locations exceed MPCA Nighttime criteria. The Tank monitoring site is located 150 feet north of 80th Street and exceeds the L10 during the 6:00 am to 7:00 am time period. The Washington County monitoring site is located 600 feet east of Keats Avenue (CSAH 19) and exceeds the L50 during the 6:00 am to 7:00 am time period.

Mitigation

Results of these analyses suggest that future traffic noise levels will exceed MPCA's maximum allowable noise levels near roadways in the project area. The City of Cottage Grove is required to comply with Minnesota Rules 7030.0030. This statute requires municipalities to ensure that existing noise levels comply with state noise limits prior to occupants moving into residences in the proposed development. Barriers such as earthen berms or landscaping can reduce traffic noise levels. Increasing the distance between the source and the receiver also reduces traffic noise levels (i.e., larger setbacks from arterial or collector roadways).

The information above continues to be valid. A component of the Walmart commercial development included the completion of Noise Impact Study that can be referenced by contacting the City. Findings of the study indicated that the planned commercial growth will not have a negative impact on the surrounding area. City noise ordinances reference MPCA Noise Regulations Chapter 7030 and are regulated in Title 4, Chapter 7 of the City Code.

4. Operational Noise

The site is subject to the State of Minnesota Pollution Control Standards Rule 7030 'Noise Standards.' Operational noise will primarily be traffic noise. See 19.A.3 for discussion of operational noise.

20. Transportation

A. Describe traffic-related aspects of project construction and operation. Include 1) existing and proposed additional parking spaces; 2) estimated total average daily traffic generated; 3) estimated maximum peak hour traffic generated and time of occurrence; 4) source of trip generation rates used in the estimates; and 5) availability of transit and/or other alternative transportation modes.

A detailed traffic study was completed and is included as Appendix 21. This traffic study provides an analysis of existing traffic volumes, patterns and roadway characteristics for the East Ravine project area, provides analysis on impacts on traffic that would be caused by the development scenario and offers mitigation measures in the form of roadway improvements, intersection and signal adjustments and traffic management measures. The complete response to question 21 is referenced to the technical memorandum included as Appendix 21. This includes all figures illustrating existing traffic/transportation systems and future traffic impacts. See figure 16 for Traffic Analysis Zones (TAZ).

A component of the Walmart commercial development included the completion of traffic studies that can be referenced in Appendix 2. Phase I of the infrastructure improvements recommended in these studies were completed in 2013.

In 2017, the Phase II roadway improvements were completed in conjunction with the East Point Douglas Road and Highway 61 roundabout traffic improvement construction project. The traffic study of East Point Douglas Road and CSAH 19 is provided in Appendix 2.

A new version of Figure 3.5 (2020 ADT Volumes) from the 2005 traffic study in Appendix 21 has been provided to incorporate future traffic projections from the City's 2040 Comprehensive Plan (Figure 21.3—2040 Traffic with Ravine Parkway). As can be seen, traffic volumes in 2040 are generally projected to be less than originally thought in 2020 per the 2005 study. Because of this, impacts due to traffic and noise are expected to be consistent with (if not less than) the original studies of this AUAR.

Figure 3.5 (2020 ADT Volumes) from the 2005 traffic study has been revised to include 2024 existing AADTs and forecasted 2040 AADT volumes based on historical AADTs and population growth estimates from the City's 2040 Comprehensive Plan (Appendix 21 – 2040 Traffic with Ravine Parkway).

B. Discuss the effect on traffic congestion on affected roads and describe any traffic improvements necessary. The analysis must discuss the project's impact on the regional transportation system. If the peak hour traffic generated exceeds 250 vehicles or the total daily trips exceeds 2,500, a traffic impact study must be prepared as part of the EAW. Use the format and procedures described in the Minnesota Department of Transportation's Access Management Manual, Chapter 5 (available at: http://www.dot.state.mn.us/accessmanagement/resources.html) or a similar local guidance.

AUAR Guidance: For AUAR reviews, a detailed traffic analysis will be needed, conforming to the MnDOT guidance as listed on the EAW form. The results of the traffic analysis must be used in the response to Items 16 and 17.

The analysis of traffic congestion and necessary improvements for a full build condition of all proposed developments completed are shown in the 2005 traffic study in Appendix 21. Improvements included the realignment of CSAH 20 (Military Road to Jamaica Avenue) and CSAH 19 (Keats Avenue) from 2-lanes to 4-lanes, the closure of US 61 and Kimbro, possible improvements to US 61 and TH 95 to accommodate the rerouted traffic, and the installation of 10 traffic signals at stop-controlled intersections. Without improvements, the full developments would cause segments of CSAH 20 and CSAH 19 and the related intersections to operate over capacity at LOS E-F.

C. Identify measures that will be taken to minimize or mitigate project related transportation effects.

The improvements included in the 2005 traffic study were recommended to be installed in tandem with the proposed developments being constructed to limit unnecessary traffic control or costs associated with overdesigning the roadway network.

21. Cumulative Potential Effects

AUAR Guidance: Because the AUAR process by its nature is intended to deal with cumulative potential effects from all future developments within the AUAR area, it is presumed that the responses to all items on the EAW form automatically encompass the impacts from all anticipated developments within the AUAR area.

However, the total impact on the environment with respect to any of the items on the EAW form may also be influenced by past, present, and reasonably foreseeable future projects outside of the AUAR area. The cumulative potential effect descriptions may be provided as part of the responses to other appropriate EAW items, or in response to this item.

A. Describe the geographic scales and timeframes of the project related environmental effects that could combine with other environmental effects resulting in cumulative potential effects.

According to Minnesota Rules, part 4410.0200, subpart 11, cumulative effects are defined as the "effect on the environment that results from the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects actually planned or for which a basis of expectation has been laid, regardless of what person undertakes the other projects or what jurisdictions have authority over the projects. The geographic areas considered for cumulative effects are those areas adjacent to the AUAR study area, and the timeframe considered includes projects that would be constructed in the reasonably foreseeable future (by 2030).

B. Describe any reasonably foreseeable future projects (for which a basis of expectation has been laid) that may interact with environmental effects of the proposed project within the geographic scales and timeframes identified above.

At this time, there are no reasonably foreseeable future projects outside of the East Ravine AUAR Study Area for which a basis of expectation has been established. The City is not aware of any planned developments or infrastructure projects that would interact with the environmental effects of the proposed project within the geographic scope or timeframe identified.

Should any future projects arise that could potentially interact with the East Ravine development, they will be subject to all applicable local, state, and federal statutes, ordinances, and environmental review requirements. The City will ensure that any such projects are coordinated appropriately to avoid, minimize, or mitigate cumulative environmental impacts in accordance with established regulatory frameworks.

C. Discuss the nature of the cumulative potential effects and summarize any other available information relevant to determining whether there is potential for significant environmental effects due to these cumulative effects.

Future public and private development projects may result in impacts to transportation, water resources, and utilities. These impacts will be addressed via the regulatory permitting and approval processes and will be individually mitigated to ensure minimal cumulative impacts occur. These types of projects would also be required to complete an environmental review and if developed, coordinate with state and local agencies for the applicable permits and approvals, which would have the authority to determine if there were adequate resources available at the time of application.

22. Other Potential Environmental Effects

AUAR Guidance: If the project may cause any additional environmental effects not addressed by Items 1 to 19, describe the effects here, discuss how the environment will be affected, and identify measures that will be taken to minimize and mitigate these effects.

A. Additional Environmental Effects

There are no other potential environmental effects that have not been addressed in preceding sections.

DRAFT Mitigation Plan

This Draft Mitigation Plan is submitted as part of the AUAR to provide reviewers and regulators with an understanding of the actions that are advisable, recommended, or necessary to protect the environment and minimize potential impacts by the proposed development scenarios. This Mitigation Plan will be revised and updated based on comments received during the AUAR comment period.

This Draft Mitigation Plan is intended to satisfy the AUAR rules that require the preparation of a mitigation plan that specifies measures or procedures that will be used to avoid, minimize, or mitigate the potential impacts of development within the AUAR study area. Although mitigation strategies are discussed throughout the AUAR document, this plan will be formally adopted by the RGU as their action plan to prevent potentially significant environmental impacts.

The primary mechanism for mitigation of environmental impacts is the effective use of ordinances, rules, and regulations. The plan does not modify the regulatory agencies' responsibilities for implementing their respective regulatory programs nor create additional regulatory requirements. The plan specifies the legal and institutional arrangements that will ensure that the adopted mitigation measures are implemented.

There are multiple ways in which Mitigation Initiatives may be implemented such as:

- Enforcing existing zoning and subdivision ordinances and other development regulations at the time of development concept submittals, preliminary and final platting, and during construction monitoring activities
- Referencing and implementing policy directions provided in the Comprehensive Plan and the East Ravine Master Plan during the review and approval of development projects
- Planning and building public infrastructure (local roads, parks, trunk sewer and water systems) in conjunction with private development initiatives
- Maintaining and updating existing plans and studies for the community
- Requiring additional field work/investigation as part of pre-development planning where potential environmental or cultural resources may exist but have not been verified or where more detailed air quality testing or noise monitoring may be needed.

General Mitigation Initiatives

This section identifies a series of mitigation initiatives that are general in nature and apply to all public and private development within the AUAR.

1. All permits identified in the AUAR (see Question 9), as well as other necessary permits that may be required will be secured by private parties, or the City as appropriate, for all development activities within the project area.
2. The City will follow its own regulations, ordinances, plans, and policies currently in place in the review and approval of all development activities within the project area. These items include the *Comprehensive Plan*, the *East Ravine Master Plan*, and the official *zoning* and *subdivision ordinances*.

3. The City will extend public sewer and water services in a manner consistent with existing plans and policies. The City will monitor capacities, update plans, and extend services as necessary to ensure sufficient supply and quality of services.
4. The City will implement a development tracking mechanism to monitor development within the AUAR project area and its conformance with the development scenario using Geographic Information System (GIS) Software and mapping.
5. The City will enforce its parkland dedication policies consistent with the goals and policies of the Comprehensive Plan and Growth Area Plan, as well as the requirements of the subdivision ordinance.

Focused Mitigation Initiatives

Mitigation initiatives that are explicitly intended to mitigate or minimize impacts on a particular resource or action are outlined by topic in this section.

Land Use

The city will continue to implement its Comprehensive Plan policies, as well as zoning and subdivision regulations to ensure a development pattern consistent with the East Ravine Master Plan. Zoning Amendments have been identified as necessary in the permits section. New and existing Comprehensive Plan and City Code regulations will be used to incorporate the design objectives of the Master Plan. These include:

Existing Subdivision Ordinance requirements for preservation of natural features. FEMA identifies Zone A flood zones around the identified wetlands in the project area. NFIP Panels 0410E and 0417E. All development associated with the proposed project will occur in compliance with existing local, state, and federal regulations related to development within floodplains. A portion of the project area may fall within a Shoreland Overlay District. If applicable, development within these areas will comply with all relevant shoreland standards, including setbacks, vegetation buffers, and impervious surface limits.

Requirements for establishing landscaped buffer areas along major roadways.

Requirements for residential and commercial landscaping which provide sufficient green space minimizing irrigation requirements.

Residential design standards which ensure a variety of housing design.

Requirements on screening requirements between commercial and residential areas. Particular emphasis will be placed on providing adequate screening between the existing residential areas and the future Cottage View commercial area.

Development projects will incorporate best practices in lighting design to reduce glare and light pollution.

Geology, Soils, and Topography/Landforms

The city will enforce existing erosion control regulation for all new developments. These regulations are based on current “best management practices” outlined by the Minnesota Pollution Control Agency and other resources. These measures greatly reduce erosion and sedimentation during and after construction.

Water Resources

Water Supply and Appropriation

The East Ravine Master Plan includes a Public Water Supply Plan, which describes trunk watermain improvements necessary to extend municipal water service to the area. The city will apply its Wellhead Protection Plan to new and existing wells in the East Ravine area. This plan calls for abandonment and sealing existing residential and agricultural irrigation wells to reduce the likelihood of future contamination of groundwater supplies. Measures are also included in the plan for protecting future municipal wells in the area from contamination and to ensure regular testing of water supplied by these municipal wells.

The 2024 Water Supply and Distribution Plan incorporates the East Ravine area and describes the trunk watermain and PFAS treatment improvements necessary to provide municipal water service. Since the adoption of the AUAR, Well #12 was drilled in Sunnyhill Park near Ideal Avenue. The water supply to the existing and future East Ravine Areas will be treated at the Intermediate Zone Water Treatment Plant that is anticipated to be operational in 2028. Cottage Grove's Water Appropriation Permit was updated in 2022 and accounts for planned growth in the East Ravine. Trunk distribution lines will be extended into Neighborhood 2 in coordination with future developments. All improvements will follow the Water Supply plan and the Clean Water for Cottage Grove Plan.

Wastewater System

The East Ravine Master Plan includes a Sanitary Sewer Plan which describes trunk sanitary sewer improvements necessary to serve the area. The city through its development review process will monitor and verify estimated wastewater flows for conformance to the Sanitary Sewer Plan and treatment capacities of the Metropolitan Council Environmental Services facilities.

The 2040 Comprehensive Plan includes a section on sanitary sewer which describes ultimate service areas, trunk sewer lines, and connection points to the South Washington County Interceptor.

Storm Water Management

Development within the project area will increase the amount of storm water runoff. The City will require the development of a storm water management system which limits flooding and negative impacts on water quality within the watershed. Key strategies will include:

- Maintaining discharge rates at or below current levels, or as required in the City's Surface Water Management Plan or by the South Washington Watershed District.
- Water quality treatment in conformance with the City's Surface Water Management Plan or the requirements of the South Washington Watershed District.
- Pre-treatment of runoff prior to discharge.
- Cooperation with MPCA and other partners in development and implementation of strategies to meet the Total Maximum Daily Load (TDML) standard yet to be determined
- Design the stormwater management system based on principles of MPCA's Minnesota Stormwater Manual.

Conformance to National Pollution Discharge Elimination System (NPDES) Phase II requirements as outlined in the City's Municipal Separate Storm Sewer System (MS4) Permit. As an MS4 city, Cottage Grove must also comply with the MN Small Municipal Separate Storm Sewer Systems General Permit and maintain a snow and ice management policy to mitigate salt runoff impacts. Incorporating low-salt design solutions in the AUAR Study Area can further protect water quality and lower maintenance costs. Low-salt design strategies may include the use of permeable pavement to avoid melt water surface pooling, strategic roadway design to avoid low spots where vehicles frequently brake (reducing salt accumulation and application), and orienting roads to take advantage of wind and sun exposure, which helps naturally reduce roadway icing. These measures collectively decrease the need for deicing salt and support overall stormwater and environmental management goals.

Wetlands

Level 2 wetland delineations will be required for identified areas prior to development, ensuring accurate assessment and compliance with regulatory standards. Wetland delineations in Minnesota are valid for five years; therefore, any delineations completed prior to that timeframe will need to be updated.

Developments within the AUAR project area which impact wetlands will be subject to regulation under the Wetland Conservation Act, Chapter 103G Waters of the State (i.e. Department of Natural Resources), and possibly Section 404 of the Clean Water Act (i.e. Army Corps of Engineers). The City of Cottage Grove will work with the South Washington Watershed District, the local government unit responsible for administering the MN Wetland Conservation Act, on any development impacting wetlands. Should wetland impacts be part of a development within the project area, these regulatory programs have sequencing requirements which require applicants to demonstrate that wetlands impacts have been avoided and minimized to the extent practical and, if impacts cannot be avoided, these programs require replacement of wetlands impacted by fill or excavation.

The City completed a 2019 update of the City's Surface Water Management Plan, which includes constructed and future/ultimate storm sewer facilities. New Atlas-14 rainfall depths were analyzed and incorporated into the plan. The City will apply its Wellhead Protection Plan to new stormwater facilities in the East Ravine area, limiting infiltration where applicable.

Contamination/Hazardous Materials/Wastes

If hazards are identified from project activities, the current contingency plan is to follow MPCA, Washington County, and City Regulations for hazard mitigation.

As future development progresses, the City acknowledges the importance of monitoring and addressing emerging environmental concerns, including PFAS contamination. City of Cottage Grove has been working with experts and the Minnesota Department of Health to implement the best solutions to ensure clean water for Cottage Grove. The Clean Water for Cottage Grove plan has implemented water treatment to 8 of the 12 wells. Additional assessments and mitigation planning may be necessary to ensure long-term protection of water resources and public health.

Fish, Wildlife, Plant Communities, and Sensitive Ecological Resources (Rare Features)

Natural Resources: Protective measures will be taken to protect threatened and endangered species and their habitat. All requirements set forth by the DNR and USFWS during consultation will be implemented in the project area. This may include avoidance of certain areas during different times of the year, erosion control measures, or others. If any threatened or endangered species or designated critical habitat are believed to be in jeopardy, permits to take and mitigation will be determined through agency coordination.

Further coordination with the USFWS will be required to determine impacts to the Rusty Patched Bumble Bee.

Historic Properties

Historical and Cultural Resources: follow guidance in Comprehensive Plan and existing codes and ordinances.

Further study of the 21WA0080 and 21WA0079 sites and SHPO concurrence is recommended before any construction can be completed to identify site boundaries determine if Phase II investigations are necessary. Further investigation will be needed to narrow down the location of the identified unknown cemetery. A review of project activities to determine impacts to the three identified cemeteries is recommended.

The Documentation Supporting the Nomination of the Military Road Heritage Corridor to the City Register of Historic Sites and Landmarks contains a greater account of the historical significance of the Military Road Heritage Corridor and should be referenced for further details on the corridor. The report also contains a number of recommendations that lend support to mitigation initiatives for the Cottage Grove East Ravine Pre-Design project. Those recommendations include:

> The Military Road Heritage Corridor that are currently active roadways should be retained and preserved as an historic route within the existing city-county roadway system. The segment that is no longer a roadway cutting diagonally across Section 11 should be preserved as a rural historic landscape.
>
> The Military Road Heritage Corridor has important heritage values that should be interpreted as part of the City's heritage education program. Possible interpretive resources include publications, wayside exhibits, bicycle tour guides, and school programs.
>
> Maintain, whenever possible, the alignment, width, and grad of existing roadways that comprise the Military Road Heritage Corridor. Roadway maintenance and reconstruction should comply with highway safety standards in such a manner that the essential historic character of the Military Road corridor is preserved intact, respecting the existing shape, slope, elevation, aspect and contour of the historic route.
>
> Minimize disturbance of terrain in the abandoned segment of the corridor through Section 11 to reduce the possibility of destroying unknown archeological features. When this area is developed, archeological surveys should be carried out in accordance with the City's design review and compliance policies.

Air

The Project Owner and/or Tenant(s) are responsible for making air permit applicability or exemption determinations prior to starting construction. Such permit or exemption determinations would apply to direct stationary source emissions resulting from equipment to be operated, and within certain sizes and throughput levels.

Greenhouse Gas (GHG) Emissions/Carbon Footprint

Where feasible and as determined appropriate by the developer, to remain in keeping with state and local GHG reduction goals, construction best management practices to reduce greenhouse gas emissions may include the use of energy-efficient equipment and vehicles, minimizing idling time, sourcing materials locally to reduce transportation emissions, and recycling construction waste. The developer may also consider incorporating low-carbon building materials, such as recycled steel or concrete alternatives, and scheduling work to optimize fuel use. When practical, renewable energy sources like solar-powered lighting or equipment may be utilized to further reduce the carbon footprint of construction activities.

Transportation

Traffic will continue to grow as development occurs within the project area and as regional growth continues to add traffic to the system. Appendix 21 contains a number of roadway and intersection improvements that will serve to mitigate future congestion levels associated with growth in the region.

Results of noise analyses suggest that future traffic noise levels have potential to exceed MPCA's maximum allowable noise levels near major arterial and collector roadways in the project area. The City of Cottage Grove is required to comply with Minnesota Rules 7030.0030. This statute requires municipalities to ensure that existing noise levels comply with state noise limits prior to occupants moving into residences in the proposed development. Barriers such as earthen berms or landscaping can reduce traffic noise levels. Increasing the distance between the source and the receiver also reduces traffic noise levels (i.e. larger setbacks from arterial or collector roadways). The Master Plan includes

areas along major roadways that serve as buffers that will offer separation between the noise source and the receivers.

Monitoring of Development and Future Updates to the AUAR

The AUAR assumes a hypothetical development scenario. Since it is based on assumptions it is important that actual development be monitored and compared to the development that was assumed in the development of the AUAR. Tracking of this development will be done through the City's existing GIS system. As part of the final plat process the developer will submit electronic plats consistent with city development requirements in a compatible form to the City's GIS system. This data will enable to the City to maintain an ongoing inventory of platted lots and the ability to tie building permits to the lots so that occupied housing units could be tracked in the development area. The City's existing GIS system has the capacity to perform this task.

Background Report:

Market and Development Context

In support of:

2040 Cottage Grove Comprehensive Plan

Prepared for:

City of City of Cottage Grove, MN

August, 2016

Prepared by:

Tangible Consulting Services

Stantec

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Executive Summary

Purpose

The purpose of this background report is to outline the market and development context that shapes the future growth of Cottage Grove. It overviews the unique demography and economic base that characterizes the city. And it investigates the market and development factors that will shape future growth in housing, retail, and industrial development.

The report supports the Cottage Grove 2040 comprehensive and long-range planning process that will establish important parameters for future development.

In General

Cottage Grove is characterized by high quality development in its existing residential, commercial and industrial areas. It has experienced steady and moderately-paced growth over the past seven decades, and can expect that to continue.

It is a community that is well-situated for future growth. It has ample land to support growth in its Business Park, to expand its successful retail areas, and to accommodate additional housing of various types.

The high quality environments that have been created have largely been responsive to the practices of suburban-oriented developers. For this reason, there are some development types that are not well represented:

- The variety of place types and retail formats that is characteristic of older communities, and that have intentionally been created in some newer communities.
- Housing Developments that are responsive to the needs of renters, a lower to middle income workforce, and seniors.

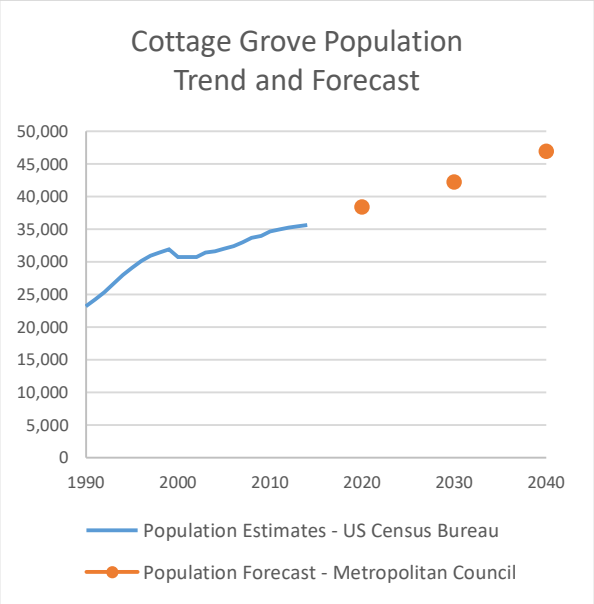
An active public sector role will be required If there is a desire to diversify the development landscape in these ways.

Demographic Overview

Cottage Grove's demographic mix is heavily shaped by the residential development patterns of the community. The vast majority of residential development is in single family detached homes and townhomes, which were built in the 1950s and later. As a result, households tend to be families, with an income that supports home ownership.

The predominance of owner occupied homes is one of the reasons there are relatively few older residents. And it is consistent with the low rates of unemployment and poverty.

Notwithstanding these facts, there is something of a working class flavor to the community. Compared with many of the communities that are at a comparable stage of development, it has a fewer residents with bachelor's degrees, and home prices are more affordable.



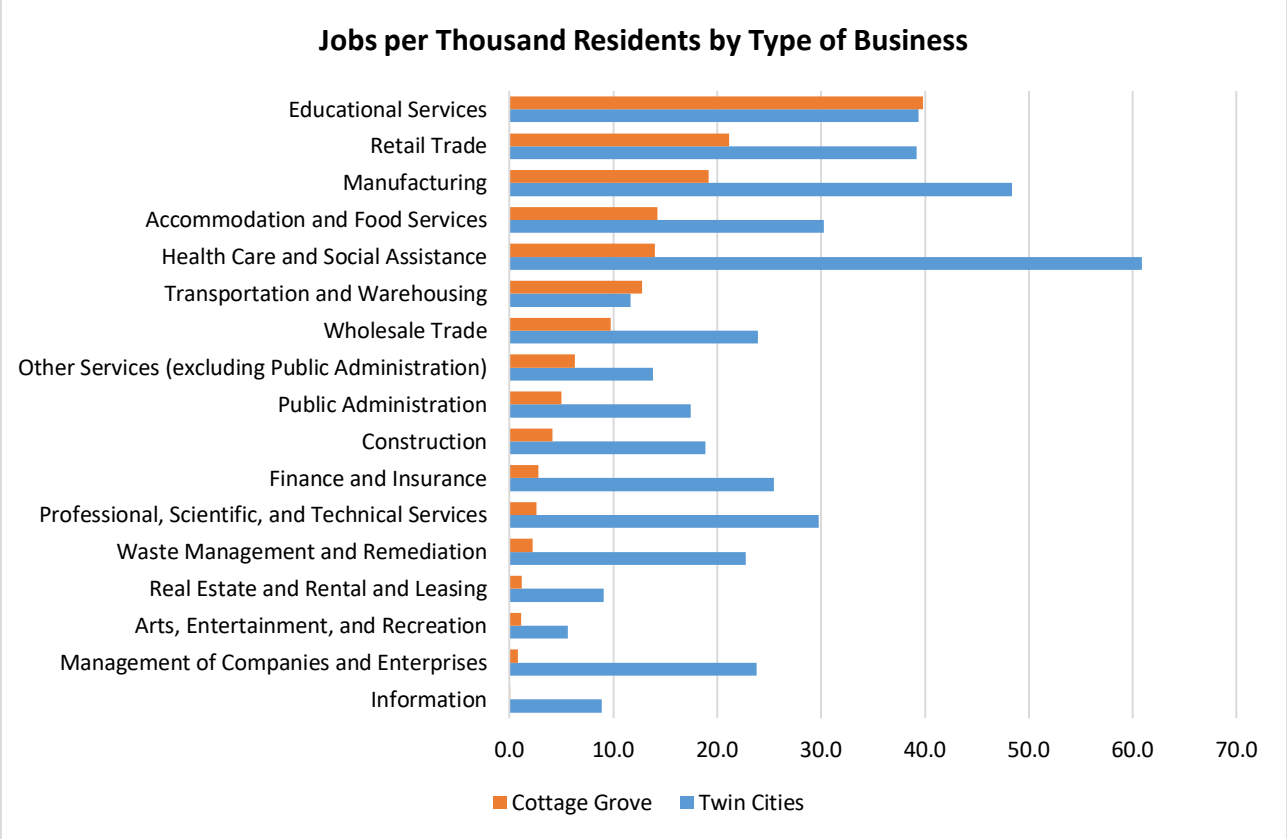
The City is expecting continued population growth, at a pace that matches the growth over the last decade.

Economic Overview

Cottage Grove has a small job base for a city of its size. It offers 17 jobs for each 100 residents.

The job base of Cottage Grove is centered around the retail centers, and its business park. This explains why its top two employment sectors, after educational services, are Retail Trade, and Manufacturing. The top employment sector is Educational Services, which encompasses those who work in the local schools.

Almost a third of the workers at businesses in Cottage Grove are residents of Cottage Grove.

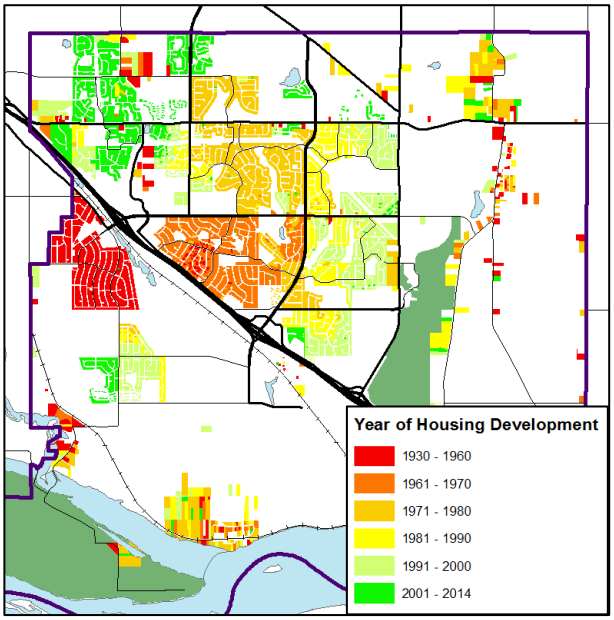


Source: US Census Bureau, OnTheMap Application

Residential Market Context

Residential development dominates the built environment in Cottage Grove.

Housing Development by Decade



Source: Assessor Data

Observations about residential development include:

- Development began in earnest in the 1950s. So most of the development has been defined by subdivision ordinance and home builder practices that prevailed from the 1950s to the present.
- Lot sizes stayed fairly consistent over this period (at around a third of an acre), but the size of homes spiked in the last two or three decades to the current norm of over 2,500 square feet of floor area.
- The historic average of around 180 homes developed per year has dropped off during the past decade to around 50 homes per year.
- Cottage Grove is a well-established market for owner occupied detached homes and townhomes. There is a much smaller inventory of multifamily housing developments—although some senior housing development is currently occurring.

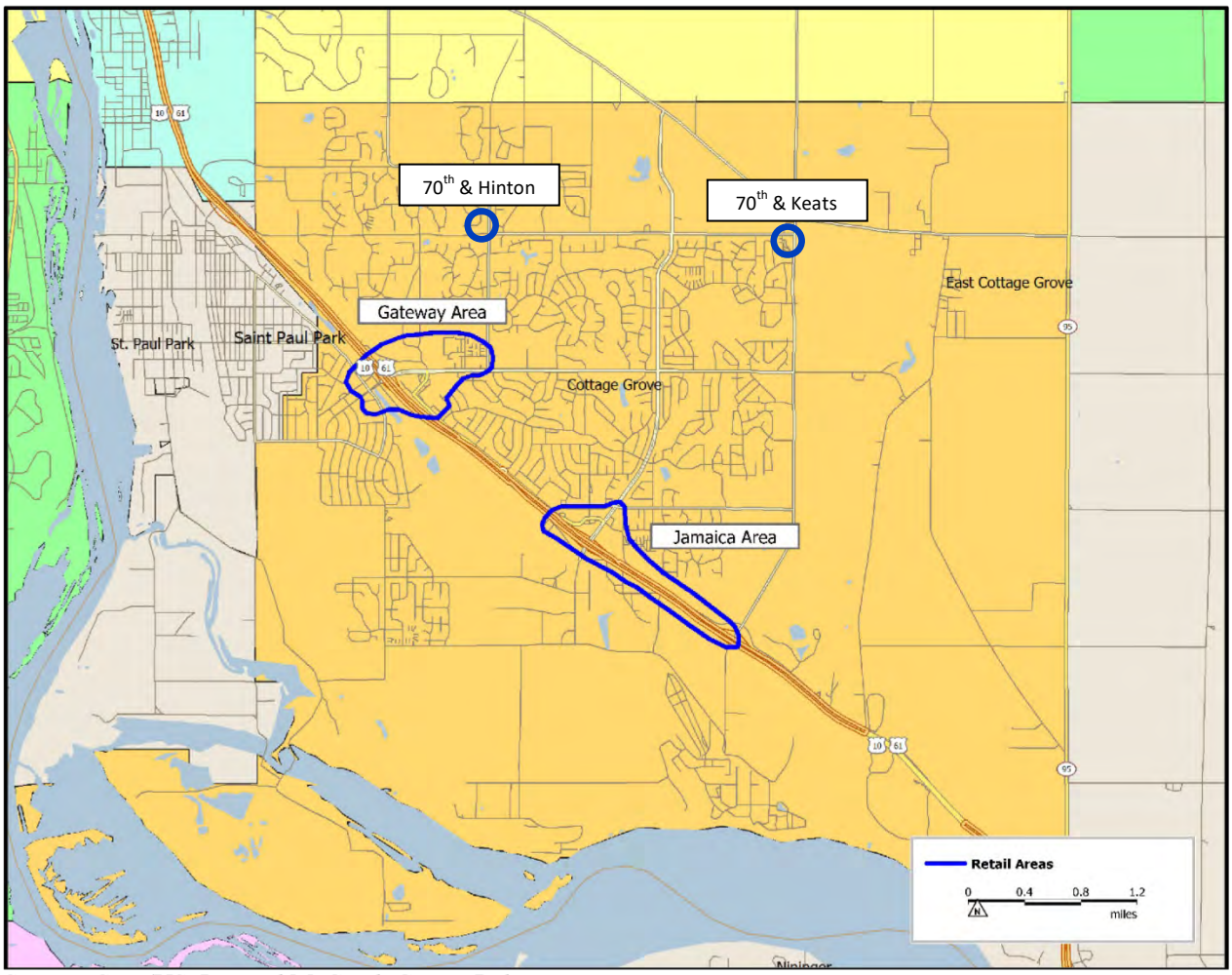
Some public support or intervention will be needed to establish housing types that are not well represented in the current housing inventory.

Land analysis. Around 1,500 acres of land will be needed to accommodate an estimated 3,500 new single family homes by 2040. Around 75 acres will be needed by 2040 to accommodate around 1,100 apartment units. This would encompass market rate and affordable housing development, as well as housing developments for general occupancy and for seniors.

Retail Market Context

Retail development is focused at two of the Highway 61 interchanges. These retail districts, the Gateway Area and the Jamaica Area, are well positioned for ongoing strength because:

- They are located at some distance from competing retail areas in Woodbury and Hastings, which allows them to capture a sizable commuter-shed and destination market.
- They have an established set of strong anchors that are well suited to the population in the trade area, and that creates an inviting environment for additional retailers.



Source: Scan/US, Inc. and McComb Group, Ltd.

Land is available to accommodate retail growth, especially into the Cottage View area, which would be an extension of the Jamaica Area retail district to Innovation Road.

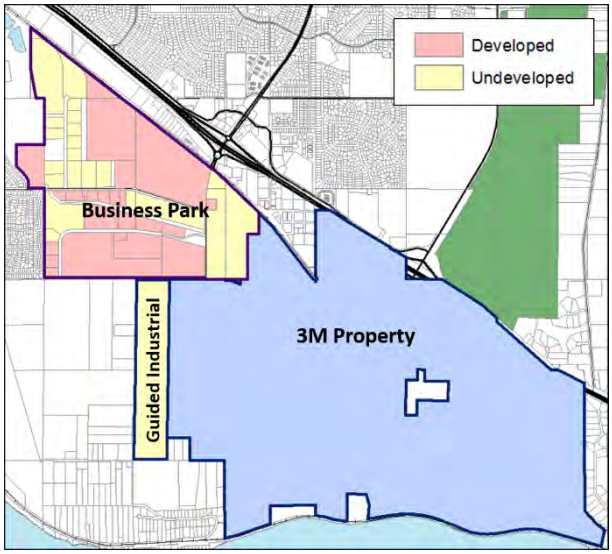
Visionary plans have been developed for two additional retail areas, Langdon Village and Cedarhurst. These areas provide the opportunity to create retail areas that are qualitatively different from the highway-oriented retail districts along Highway 61, in that they area envisioned to be of a mixed-use, pedestrian-oriented development character. An active role will be required from the public sector in order to establish these new retail areas.

Land analysis. An estimated 87 acres of land will be needed by 2040 to accommodate a growth in trade area purchasing power of around 40%.

Industrial Market Context

Industrial businesses in Cottage Grove are almost all located in the 300-acre Cottage Grove Business Park.

Industrial Context Map



Source: Assessor Data, City of Cottage Grove

The Business Park has a long list of assets that make it attractive for new business development. The most important of these is its strong connection to the regional highway network via Highway 61. But it also boasts large, flat land with good utility infrastructure. And the City has a reputation for being responsive and supportive to development proposals.

The industrial development market is recovering, and that has been observed in expansions of businesses in the Business Park—and in the first new industrial development proposal in a decade.

Land analysis. Although the Business Park is only about half developed, there are only a few undeveloped parcels that are larger than 10 acres. There is a good likelihood that these will be purchased and developed over the next decade or two. If the City wants to accommodate ongoing Business Park growth, it should consider steps to maintain a supply of suitable land.

Sources of Information

This report is based on several types of information:

- Market research
- Review of existing reports
- Interviews with local developers and real estate professionals
- Direct observation

Information is filtered against the previous experience of the authors.

As the Cottage Grove planning process progresses, the findings in this report will be modified and augmented by further findings, and as a result of further communication with policy makers, stakeholders, and others.

Demographic Overview

The demographic profile of Cottage Grove has an important bearing on how Cottage Grove will grow and develop in the future.

The character of Cottage Grove's residents and communities says a lot about who will be attracted to live in Cottage Grove in the future.

The needs and purchasing power of Cottage Grove households are important to retail development. They impact the amount of retail that is viable, as well as what retail stores and shopping center formats are likely to work.

The demographics of the community are an important factor in attracting businesses to Cottage Grove. In the competition for talent, employers are looking for people with the right education, training, and household stability to meet their labor-force needs.

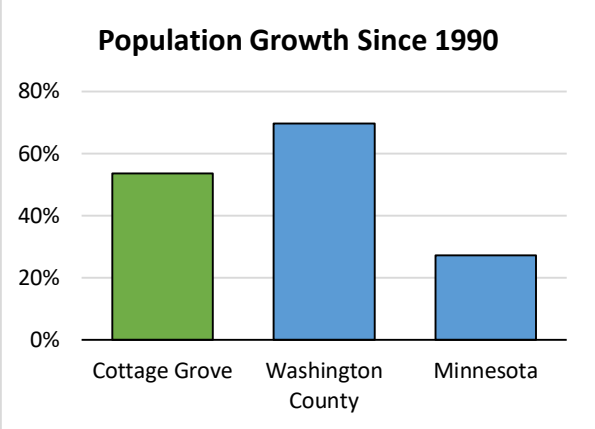
General findings. Cottage Grove's demographic mix is heavily shaped by the development patterns of the community. Single family homes predominate, three-quarters of which were built in the 70s or later. The 1990s were the boom decade, when a full quarter of current Cottage Grove homes were constructed.

Cottage Grove is, accordingly, a family-oriented community. Almost 80% of households are family households—either couples, or families with children. Because of this, the average household size is larger than nearby cities, and larger than the Twin Cities Metropolitan area as a whole. This also makes Cottage Grove skew younger in the age profile of its residents.

It takes some wherewithal to purchase and own a home, and so Cottage Grove experiences a lower rate of poverty, and a higher median income, than the Twin Cities metropolitan as a whole.

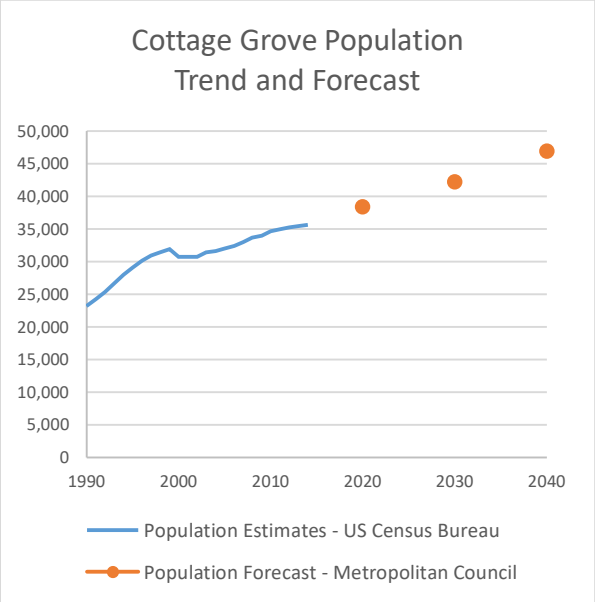
Population

Cottage Grove achieved an estimated population of 35,600 in 2014, according to the 3-year American Community Survey. This represents a growth of 55% since 1990.



Source: 2014 ACS 3-Year Estimates

Census data showed a rate of growth that slowed a bit in the early 2000s, and then stayed fairly steady through the rest of that decade. The first half of the 2010s saw an additional modest slowing of population growth—although it's important to bear in mind that this is with the backdrop of the Great Recession.



Source: 2014 ACS 3-Year Estimates

Cottage Grove is projected to continue growing over the next several decades. The Metropolitan Council forecasts population growth as follows.

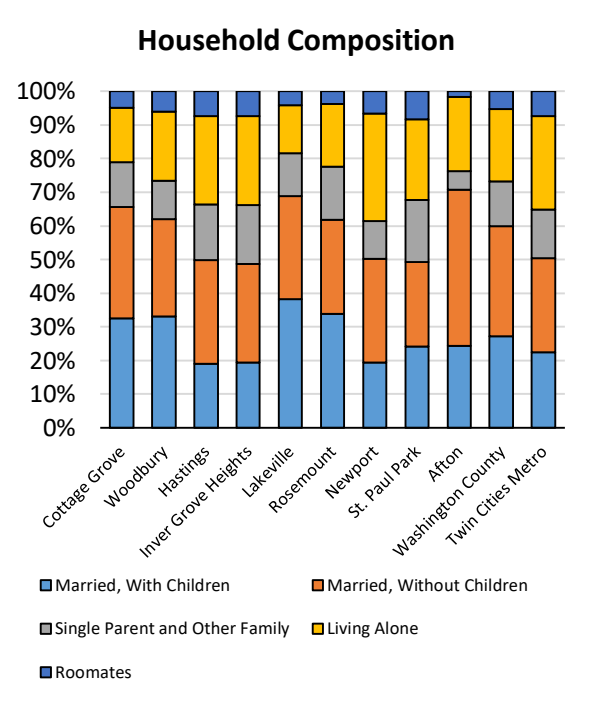
Forecast Year	Population
2010	34,589
2020	38,400
2030	42,200
2040	47,000

This projection is roughly equivalent to a straight-line projection of growth at a rate that is equivalent to that which occurred between 2000 and 2010.

Population and Household Characteristics

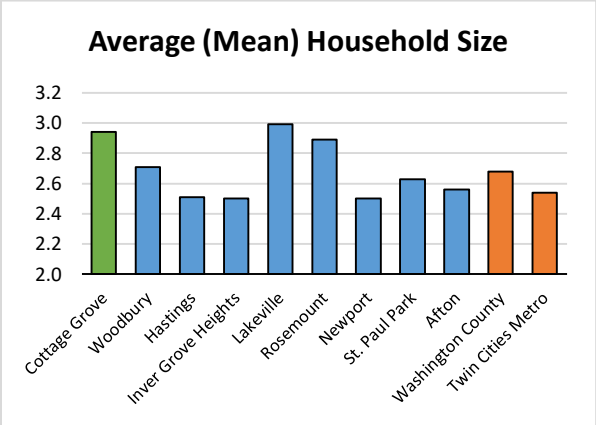
There are currently around 12,000 households in Cottage Grove. The Metropolitan Council forecasts that number to grow to 17,300 by 2040.

Household composition. Family households predominate, representing almost 80% of total households. 42% of all households have children under 18, compared to 36% in Washington County and 31% in the Twin Cities Metro.



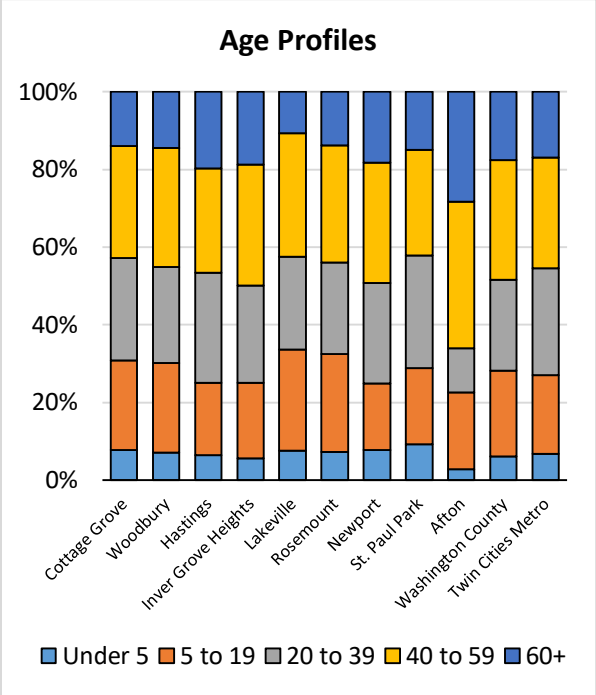
Source: 2014 ACS 3-Year Estimates

The prevalence of family households in Cottage Grove is echoed in its large household sizes relative to neighboring cities.

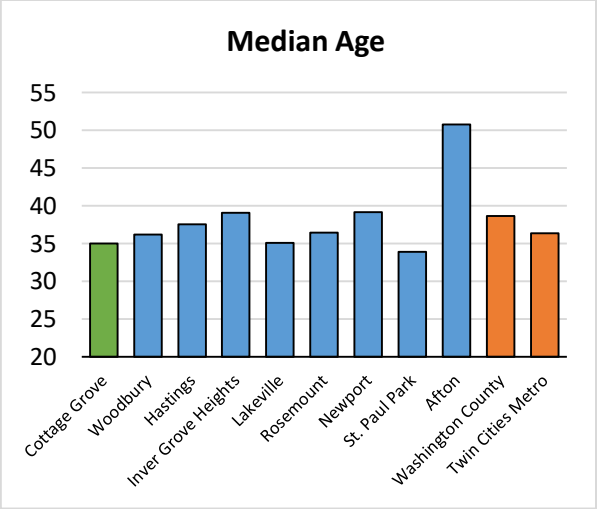


Source: 2014 ACS 3-Year Estimates

It can also be seen in the age profile of residents. Almost a third (31%) of Cottage Grove residents are under the age of 20. The proportion of residents who are 60 or older is less than any of the neighboring communities.

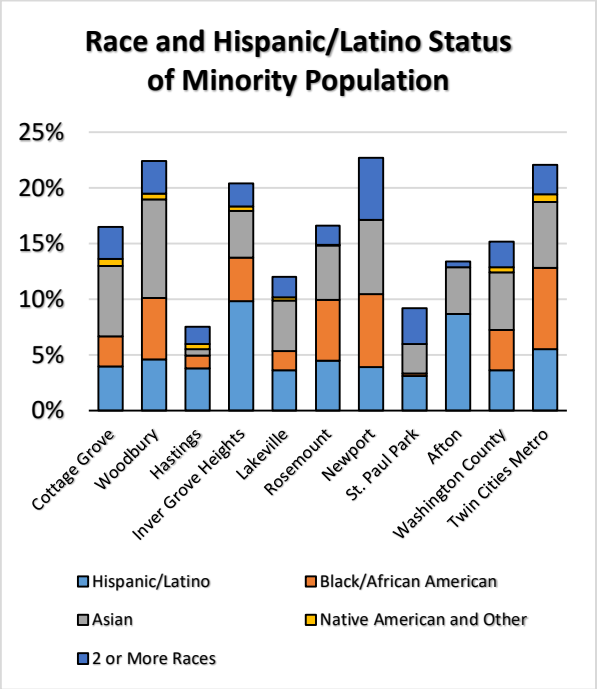


Source: 2014 ACS 3-Year Estimates



Source: 2014 ACS 3-Year Estimates

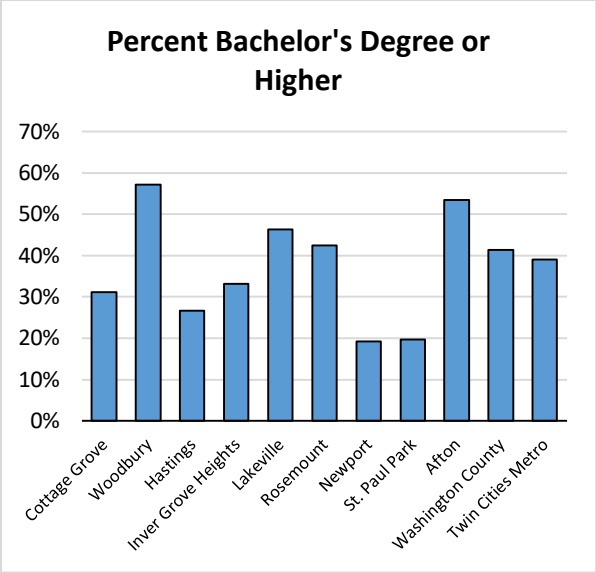
Minority population. Relative to the Twin cities average, Cottage Grove has a higher proportion of Asian residents, and proportionately fewer African American and Hispanic/Latino residents.



Source: 2014 ACS 3-Year Estimates

Education level.

Cottage Grove residents have less formal education than the residents of many nearby and comparison cities.

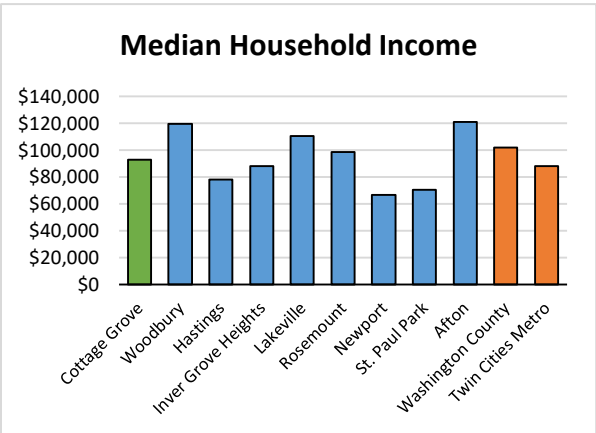


Source: 2014 ACS 3-Year Estimates

Financial characteristics and employment. Development patterns in Cottage Grove bear on the financial characteristics of residents. Single family homes predominate, with most being built since 1980. So most householders have income and employment characteristics that support obtaining a mortgage.

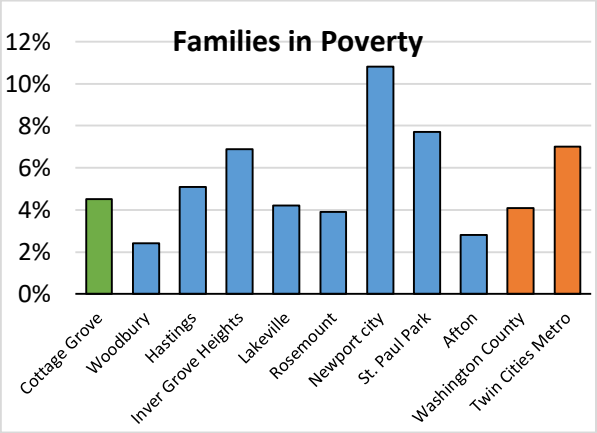
On the other hand, the homes built in Cottage Grove homes have tended to be more affordable than the average Twin Cities home.

These factors may explain why the median household income in Cottage Grove is higher than the Twin Cities average. But it is a bit lower than many of the other populous cities in Washington County.



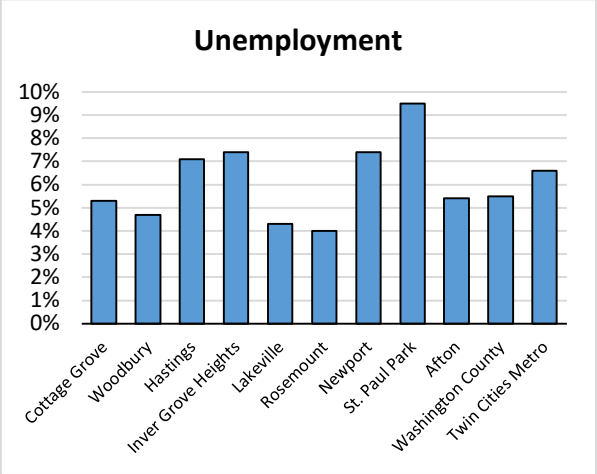
Source: 2014 ACS 3-Year Estimates

4.5% of families in Cottage Grove fall below the poverty line. That is a low proportion by metropolitan standards, but near the Washington County average.



Source: 2014 ACS 3-Year Estimates

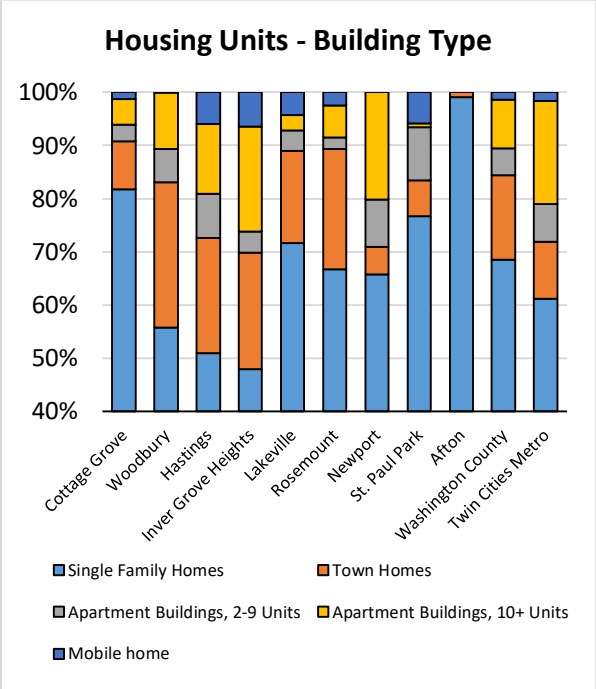
Cottage Grove residents suffer unemployment at a lower rate than Washington County or the Twin Cities as a whole. And in all likelihood the current rate is lower than what is shown, since the most recent American Community Survey data are drawn from 2012 to 2014 survey samples.



Source: 2014 ACS 3-Year Estimates

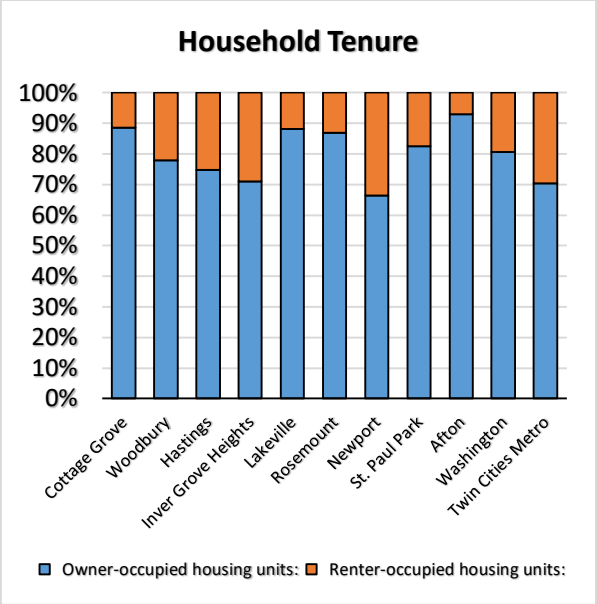
Housing Characteristics

Types of housing. Cottage Grove has a markedly high proportion of single family homes, and a small number of apartments, relative to peer cities. Less than 10% of dwelling units are in apartment buildings.



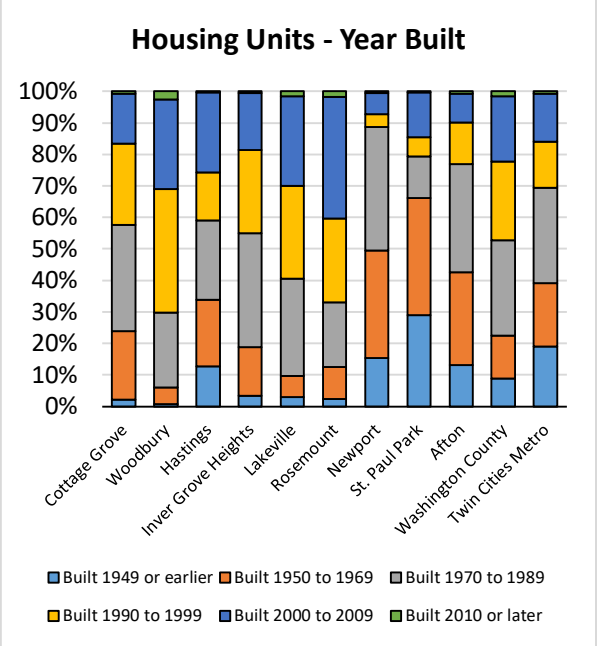
Source: 2014 ACS 3-Year Estimates

Tenure (ownership/rental status). The majority of housing units in Cottage Grove are owner-occupied. Only around 1,400, or 12%, of roughly 12,000 households are renting their housing units. This is partly explained by the dominance of single family homes and townhomes in its housing landscape, but it also means that few single family homes and townhomes are being rented.



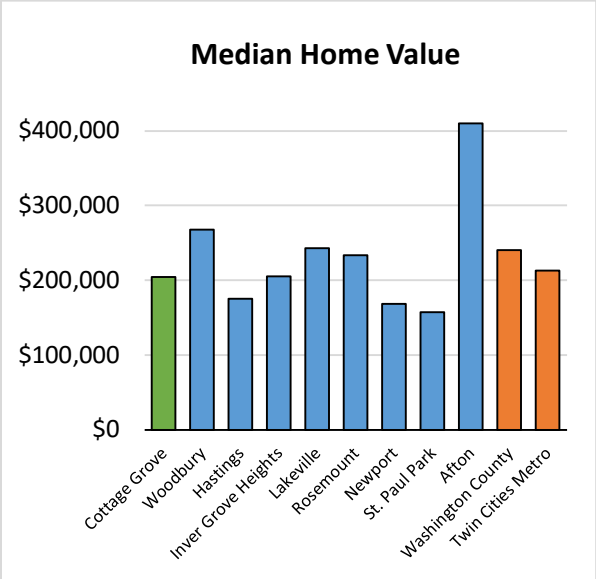
Source: 2014 ACS 3-Year Estimates

Year built. Almost all Cottage Grove homes are of postwar construction—built in the 1950s or later. The 1990s were the boom years. A quarter of current Cottage Grove homes were built in the '90s.



Source: 2014 ACS 3-Year Estimates

Home value. Homes in Cottage Grove are a little more modest, on average, than homes in comparison cities. The average home value in Cottage Grove is $205,000. This is below the average value of homes in both Washington County ($240,000) and the Twin Cities metropolitan area ($213,000). It's important to note that home sizes have varied greatly over time. Homes built since 2000 are markedly larger and more valuable/costly than those built in earlier decades.



Source: 2014 ACS 3-Year Estimates

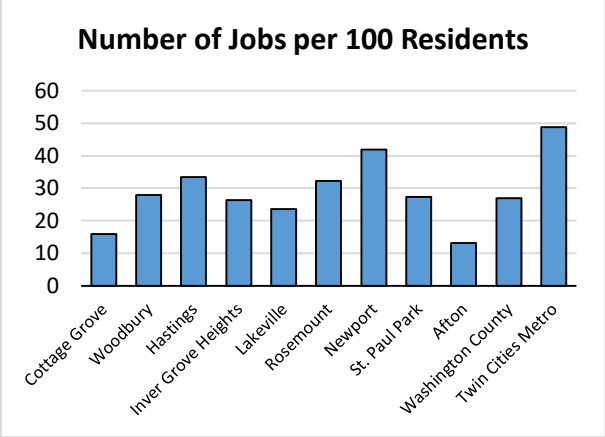
Economic Overview

The economic and business base of Cottage Grove is relevant to the City's future growth and development. Workers are an important component of the daytime population of the City, and can support local restaurants and retail businesses. Future business growth, and the types of businesses that might be attracted to the City in the future, are influenced by the businesses that have already located in Cottage Grove. Even residential growth is impacted by the City's business inventory, since there are significant benefits to living close to one's workplace, and so Cottage Grove employees may well become Cottage Grove residents.

Business Establishments and Jobs

According to the US Census Bureau's OnTheMap application, Cottage Grove had 419 business establishments in 2014. These workplaces provided around 5,600 primary jobs, and around 6,200 total jobs.

This is a smaller business footprint than average for suburban communities. There are around 17 jobs offered in Cottage Grove for each 100 residents. The ratio for the Twin Cities Metro as a whole is about 49 jobs per 100 residents.



Source: US Census Bureau, OnTheMap Application

The Metropolitan Council, perhaps relying on a different data source, estimated slightly greater employment in Cottage Grove in 2010 (6,484 jobs) than the Census Bureau. The Metropolitan Council foresees job growth in Cottage Grove on the order of 600 to 700 per decade, to 2040.

Forecast Year	Employment
2010	6,484
2020	7,700
2030	8,400
2040	9,000

Employment Sectors

The Employment Sector chart illustrates the industry sectors of workers in Cottage Grove businesses.

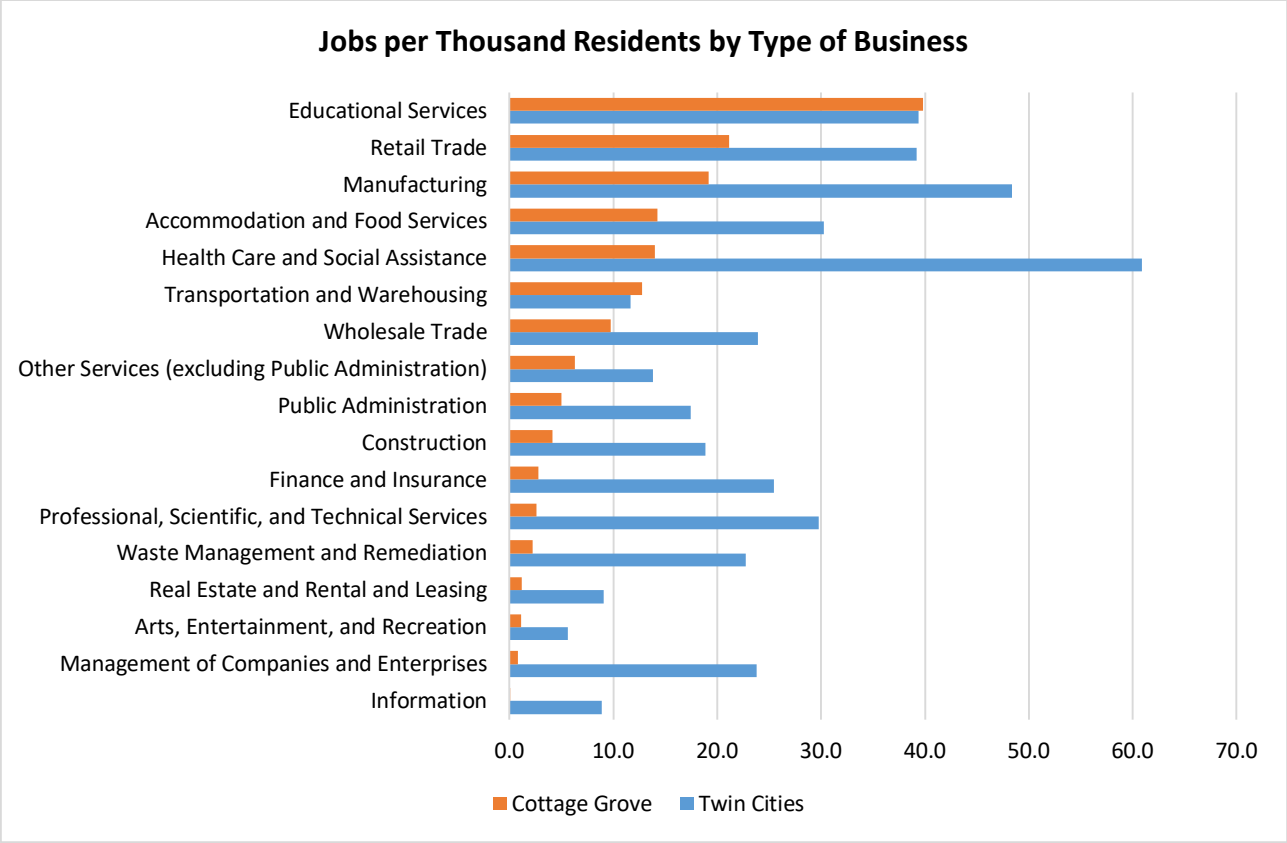
The top six employment sectors in Cottage Grove are:

- Educational Services
- Retail Trade
- Manufacturing
- Accommodation and Food Services
- Health Care and Social Assistance
- Transportation and Warehousing
- Wholesale Trade

Three of these sectors, manufacturing, transportation/warehousing, and wholesale trade, are undoubtedly rooted in the Cottage Grove Business Park, which offers a location conducive to these industries.

The two strongest sectors in Cottage Grove relative to their average presence in other Twin Cities locations, are:

- Educational Services
- Transportation and Warehousing

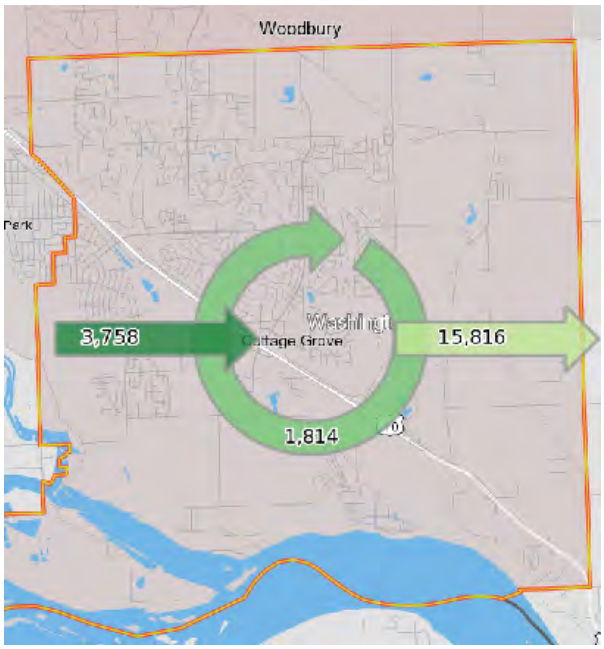


Source: US Census Bureau, OnTheMap Application

Employee Location

Of the roughly 5,600 primary jobs in Cottage Grove, around 1,800 of them are filled by people who are also Cottage Grove residents. (US Census, OnTheMap application) In other words, Cottage Grove residents supply around a third of the workforce in Cottage Grove businesses.

The chart at right shows the inflow and outflow from home to work. Around 15,816 Cottage Grove residents work outside of Cottage Grove. Around 3,758 live elsewhere but work in Cottage Grove. The 1,814 people who are represented by the circle are those who both live and work in Cottage Grove.

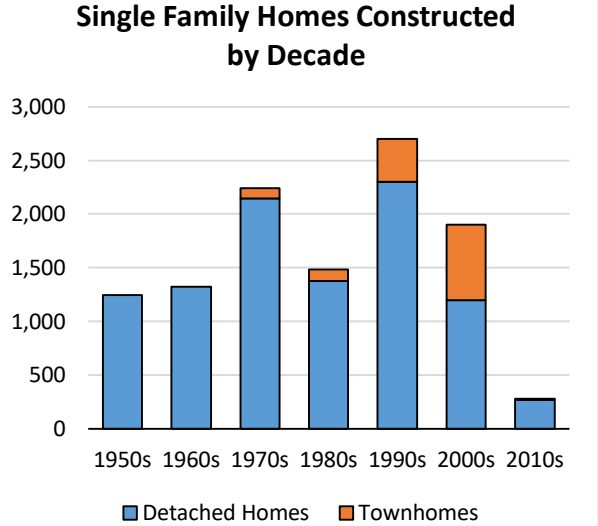


Source: US Census Bureau, OnTheMap Application

Residential Market Context

Existing Conditions

Single family housing. Housing in Cottage Grove was first developed in significant numbers in the post-war era. Less than 200 homes remain that were constructed before 1950. The 1950s launched the steady production of single family homes, and the creation of single family home oriented neighborhoods. Starting in the 1950s, over a thousand homes have been built in each decade. They are primarily detached homes, but townhomes have been a growing part of the City's housing stock.

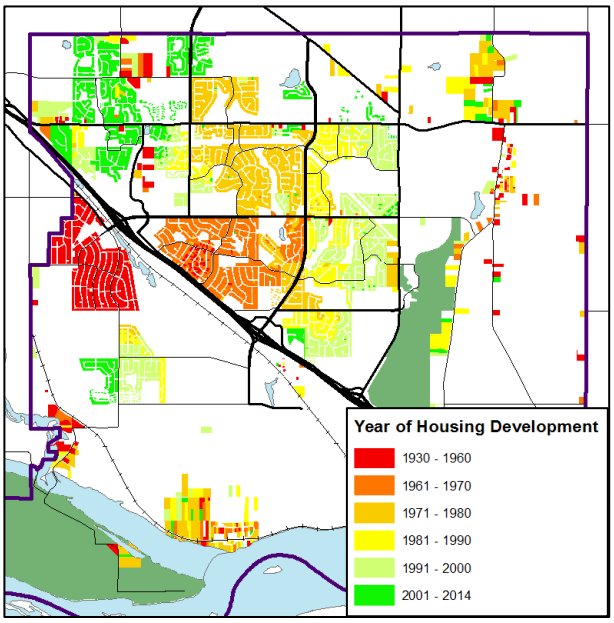


Source: Assessor Data

Homes and neighborhoods reflect the practices of the home builders who purchased and subdivided the land—in the layout of streets, the size and arrangement of lots, and the design features of the houses themselves.

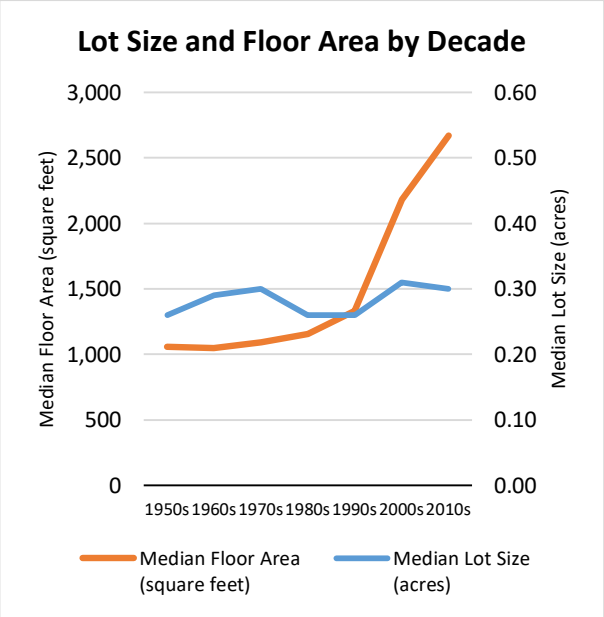
A color-coded map of Cottage Grove shows the progression of neighborhood formation over time. The earliest neighborhoods were built south of Highway 61 near the 80th Street exit. The newest neighborhoods are located north of Highway 61 in the northwest corner of the City. (Note that areas colored forest green are parks, not housing development.)

Housing Development by Decade



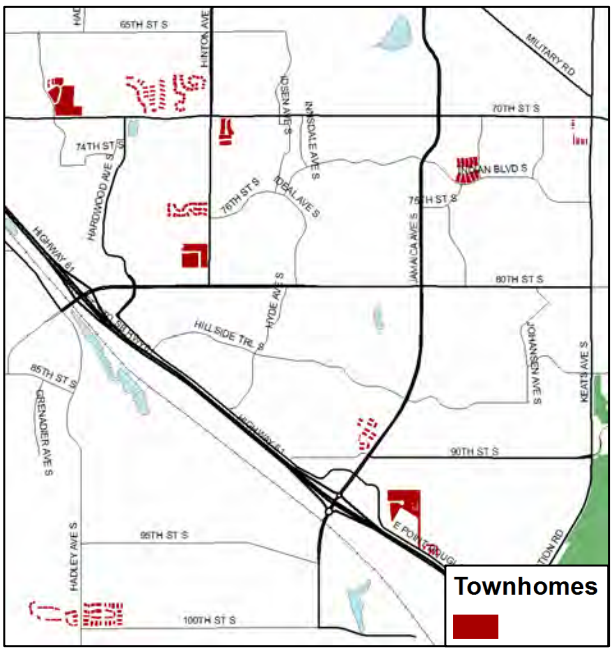
Source: Assessor Data

The characteristics of single family homes and neighborhoods reflects the era in which it was built. Lot sizes have remained fairly consistent over the decades. Home sizes stayed relatively constant over four decades from 1950 until 1990. Homes built since 1990 are markedly larger.



Source: Assessor Data

Townhomes. 1,300 of Cottage Grove's single family homes are attached homes in a townhome format. They are scattered in various locations around the City of Cottage Grove, as illustrated in the map below. Over half of all existing townhomes were built in the 2000s.



Townhome Developments

Source: Assessor Data

Multifamily housing. Cottage Grove has a small number of rental apartment and townhome developments. Costar, a market data provider, has records of seven rental apartment and rental townhome developments. These developments, constructed between 1973 and 1996, comprise a total of 716 rental units. In terms of format, they range from townhomes to garden apartments and low-rise apartments. Apartments buildings taller than three stories are not present—with the exception of a couple of senior housing developments.

Three of the housing developments are rent-restricted affordable developments. The other four are market rate developments.

Senior housing. Three senior-oriented developments, which are not in the Costar database, expand the multifamily options in Cottage Grove. Norris Square is a market rate senior housing development, with 146 apartment units. It is significant in that it is the only four-story development in Cottage Grove, and one of only two with underground parking. It is the most recently constructed multifamily housing project, having been built in 2010.

White Pine Senior Living is a low-rise development, also recently constructed (in 2008), with 86 housing units. Both of these senior developments offer assisted living and memory care.

Cottages of Cottage Grove offers affordable/subsidized senior housing units in one-story buildings.

A project by Dominium, called Legends of Cottage Grove, is in development, and will offer 184 affordable senior apartment units, with underground parking.

Market Dynamics

Residential Market Characteristics. Cottage Grove has many attractive features for existing and prospective residents. Most neighborhoods have parks, many of which are interconnected via multiuse trails. Larger parks include Cottage Grove Ravine Regional Park, and Grey Cloud Dunes Scientific and Natural Area.

Most neighborhoods are relatively new. Homes are well kept, and have held their value. Public schools are considered to be strong.

Many residents value the semi-rural character of Cottage Grove. It is at the agricultural fringe of the metropolitan area, and yet it may be one of the closest areas to the metropolitan core where that semi-rural character can be found. Connections to the core cities, and the rest of the metropolitan area are strong, with a well-functioning Highway 61 connecting to the Interstate 494/694 freeway ring.

Homes may be attractive to cost-conscious buyers, who are able to buy homes in a range of sizes at a price discount compared to homes in many other suburbs.

There are also some factors that may dampen interest in living in Cottage Grove. Its distance from the urban center is a market negative (even as it may be seen as positive by some homebuyers). As a new city, Cottage Grove lacks an identifiable city center—an element that can contribute to a sense of community. And it is lacking in retail offerings in comparison with some peer cities.

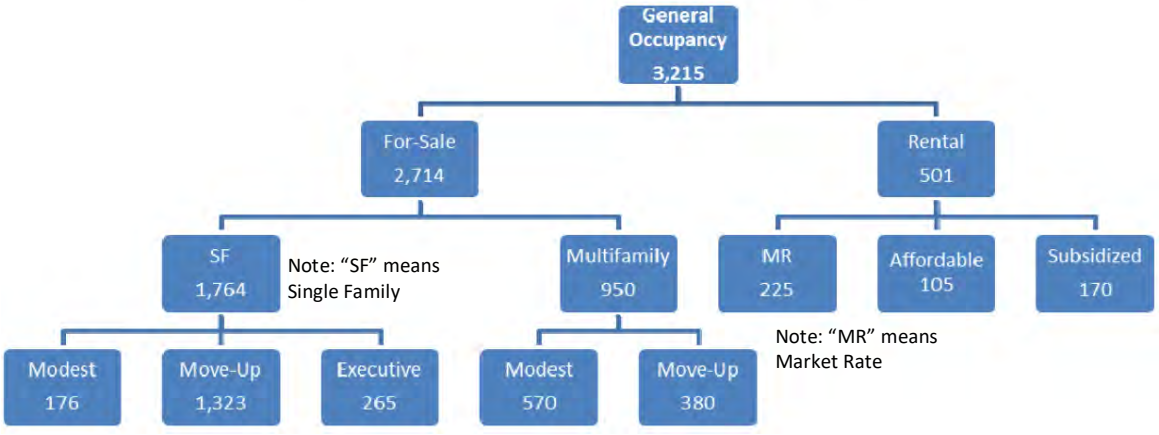
Housing demand. A Comprehensive Housing Needs Assessment was completed for Washington County in 2013 by Maxfield Research. The study identified a Cottage Grove submarket of Washington County, which includes all of Cottage Grove, along with neighboring small cities Newport, St Paul Park, and Grey Cloud Island Township.

The study estimated that, by 2030, the demand for housing in the Cottage Grove submarket would total:

- 5,800 for-sale housing units
- 1,100 rental housing units
- Additional senior-oriented rental housing

The demand from 2013 (the time of the study) to 2020 was also estimated, and it was broken down into a range of housing products, as illustrated in the chart below. Senior housing would also be demanded, amounting to 603 additional units by 2020.

Cottage Grove Projected General Occupancy Demand, 2013 – 2020



Source: Comprehensive Housing Needs Assessment for Washington County, Minnesota (2013)

Note that rental housing demand is divided between subsidized, affordable, and market rate housing projects, with over half of the demand for affordable or subsidized products. The Needs Analysis recognized that a marked increase in the development of affordable rental housing would be required to meet this demand.

The Needs Analysis suggested that overall housing growth could be higher if the Red Rock bus rapid transit service is developed.

Single family housing—detached and townhome. The Needs Analysis offers information on the sale prices of homes in the Cottage Grove submarket of Washington County.

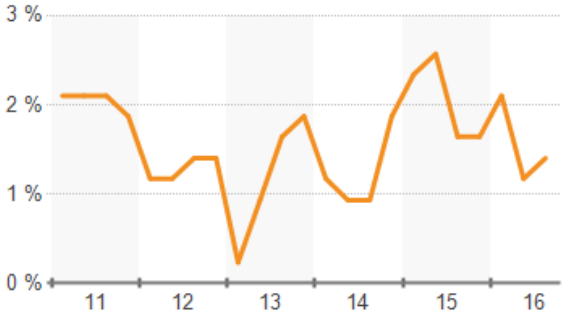
- From 2000 to 2006, the average sale price increased 56.5%
- From 2006 to 2012, the average sale price decreased 25.2%

Taken together this is a somewhat stronger performance than what occurred in neighboring Woodbury, and in Washington County as a whole.

Multifamily and senior housing. With its limited history of multifamily housing development, Cottage Grove is not a well-established apartment market. However, as is true in most parts of the Twin Cities, existing developments have low vacancy rates. The chart shows the vacancy rates for the four market rate developments in Cottage Grove that are in the Costar records.

The current 1.4% vacancy rate in Cottage Grove is lower than both Washington County (2.5%), and the Twin Cities metropolitan area (3.4%).

Apartment Vacancy Rates



Source: Costar

Cottage Grove's two seniors developments also have extremely low vacancy rates.

Rents in the Costar-tracked properties have risen about 13% over the course of the last five years—a little over 2% a year. This is a smaller increase than in most parts of the Twin Cities.

Asking Rent Per Square Foot



Source: Costar

Rents in the two seniors developments are significantly higher, but more analysis would be required to understand how rents are impacted by the services that are available on site.

Development Considerations—Single Family Housing

Single family home development is well established in Cottage Grove. It is on the radar screen of well-known national builders such as Lennar, D.R. Horton, and Pulte Homes. Both detached and townhome developments have shown notable success in Cottage Grove.

The slower pace of development in recent years is due to a set of factors, many of which are widespread in the aftermath of the Great Recession. These include decreased builder capacity, more conservative lending practices in both construction loans and mortgages, and a macro shift in preferences toward rental housing and urban living.

In Cottage Grove specifically, the pace of development is also highly dependent on the decisions of a dwindling set of individual landowners about when to sell their properties. If the land is providing an economic return from farming, the landowners may feel they can afford to be patient in waiting for a target land price.

A countervailing factor relates to the metropolitan land supply for single family homes. As other locations that are suitable for single family home development are developed, there could be increased developer attention on Cottage Grove.

Given this combination of considerations, we estimate an increased pace of single family home development in the coming years, although it may continue to lag the historically average pace of development. This is discussed in more detail below.

Public sector role. The public sector's role in the development of detached home and townhome neighborhoods is primarily focused on maintaining subdivision regulations and review processes that result in the development of high quality neighborhoods, and coordinating the provision of infrastructure with the development process.

More assertive steps may be needed, however, if there is a public goal of expanding the diversity of home offerings beyond what builders are delivering. These steps may include outreach to certain developers, or providing incentives.

Development Considerations—Multifamily and Senior Housing

Cottage Grove faces some challenges in attracting multifamily housing development. Apartment and condominium developers are most comfortable building in established market areas, and in fact typically build very near other developments that have performed well and "proven the market." Cottage Grove lacks a development history that would support this market confidence.

The rent levels in existing developments may give developers pause, since they are about half of the rents that would be required for a new building to make financial sense.

Developers, whether urban or suburban, tend to seek high-amenity locations that have such characteristics as proximity to transit connections, high quality retail areas, or natural settings. It is possible to create a locational context with this kind of characteristics, but such settings are not currently established in Cottage Grove.

Affordable housing development can bring multiple benefits to a city, including providing options for housing a City's diverse workforce, and establishing a high quality design standard. It is less sensitive to location, since rent levels are capped at defined levels. This makes it easier to attract, in some respects. On the other hand, it typically requires multiple layers of public financial support, which means that a supportive local context is extremely important in attracting this development.

Senior housing will benefit from a high amenity location, but the quality of the site and in-house services are more important than the external context. It will typically require some public subsidy.

Public sector role. Fostering a greater set of multifamily options in Cottage Grove is a more difficult challenge than supporting the ongoing buildout of single family neighborhoods. But the public sector's role will differ for different types of development.

- Building the context for market rate apartments requires a proactive set of activities that must be maintained over time.
- An affordable housing development proposal must be met with support that includes but is not limited to financial resources.

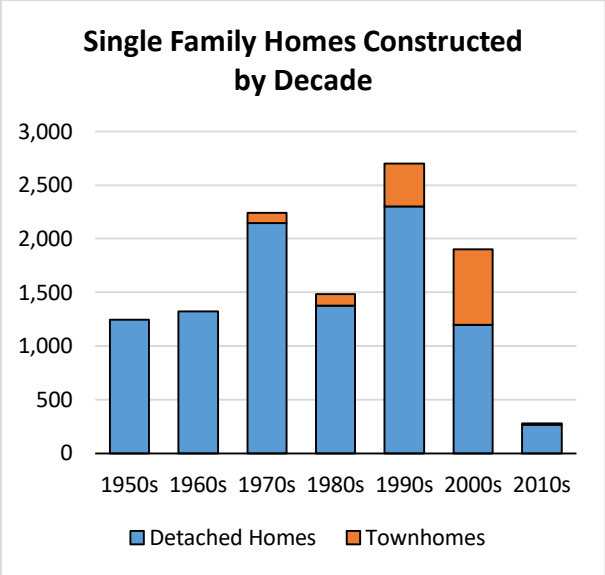
- A senior housing development is also likely to require some public financial support.

The following are strategies that can be pursued to increase the multifamily housing options in Cottage Grove.

- Rental townhome products could be an early focus, since they are most similar to the low density patterns that have already been established in Cottage Grove, and rents may come close to supporting the cost of construction.
- One or more high quality affordable housing developments might establish a high standard for design and good management, while setting the stage for attracting market rate apartment developments.
- The City could seek and support the rehabilitation of one or more of the existing apartment buildings for a somewhat higher-income rental market. This could start to establish rent comps that build a financial case for new market rate apartments.
- The City might help to establish a high quality setting for new multifamily housing. Plans for the Cedarhurst and Cottage View areas, developed in the Ravine Master Plan, are examples of this, as are concepts for Landon Village, at a Red Rock BRT station area.
- Public attitudes can be a barrier to multifamily housing development. These concerns can be softened over time through making opportunities to educate citizens. Options abound for demonstrating how higher density housing can be good neighbors that support local businesses and animate public places. The fiscal benefits of multifamily housing can also be explored.

Land Need Analysis

Single family detached and townhome development. This historical pace of single family detached and townhome development is well documented in assessor data and building permit records. This diagram is offered again to illustrate the number of homes developed by decade.



Source: Assessor Data

Starting in 1960, the average number of for-sale homes constructed in Cottage Grove is around 180 homes per year, or 1,800 homes per decade. From 2007 to the present, by contrast, homes have been developed at the much-reduced pace of around 50 homes per year. Some of the reasons for the reduced development are outlined in the pages above.

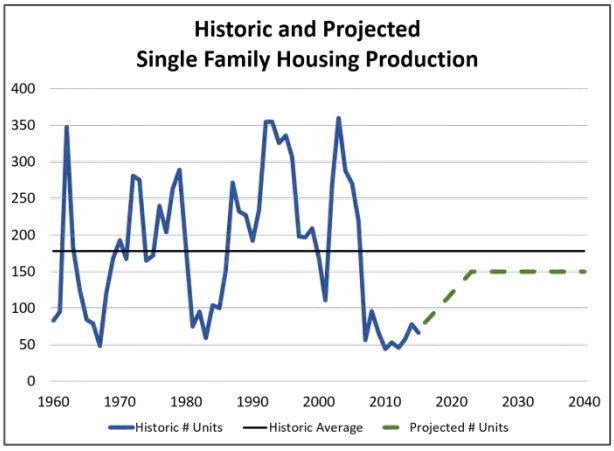
This analysis uses the following assumptions in projecting future single family detached and townhome development.

- The development market will recover from many of the conditions that have slowed the rate of single family home development. However, some of these conditions are more fundamental changes that will continue to exert influence over the long run.
- Single family development will continue to recover from the Great Recession, which we modeled by showing home production increasing by 10 units per year until a post-recession equilibrium is reestablished.
- The new equilibrium rate of development will be somewhat below the historic rate of development. We estimate 150 low density dwelling units a year will be the new equilibrium rate of development.

Of course, in reality housing production varies greatly with the cycles of economic growth and recession. So the production rate would be expected to exceed 150 units a year in boom times, and underperform that number in recessionary years.

It's also helpful to think in terms of a window of possibilities. Future housing growth could outperform or underperform these estimates by 30% or more.

The following chart illustrates the estimated growth trajectory.



The following table shows the implications of this growth trajectory on the need for land for single family homes.

	Home Production by Decade (dwelling units)	Cumulative Home Production (dwelling units)	Cumulative Land Need (acres)
2015 to 2020	500	500	220
2020 to 2030	1,470	1,970	850
2030 to 2040	1,500	3,470	**1,500**

Calculation of the land needed to support single family housing growth is based on the following assumptions.

- Average (mean) lot size is 0.35 acres. This is consistent with a median lot size of 0.30 acres, which is the historic norm. Mean (average) lot size is commonly larger than median (typical) lot size, where some homes are developed on a large lot format.
- Lots cover 60% of total land. The remaining 40% is used for streets, parks, schools, trails, and common areas such as stormwater management features.

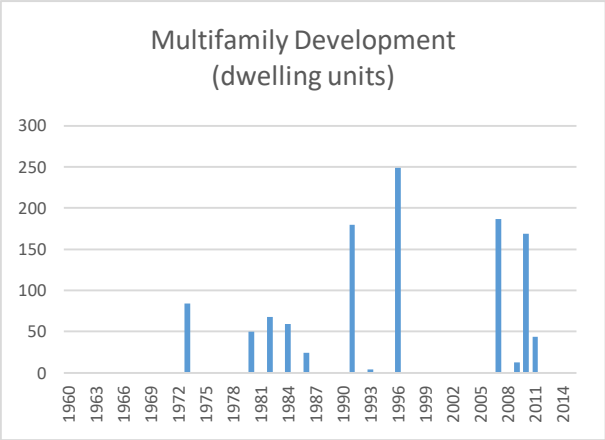
Given these assumptions, the calculation of land from 2015 to 2020 is:

500 single family lots needed
× 0.26 acres per lot
÷ 60% ratio of lot area to total land area
= 220 acres of total land required

The other calculations follow the same pattern.

Multifamily development. Land needs for future multifamily development is much more difficult to project than that for single family development.

This is partly because the history of multifamily housing production in Cottage Grove has been very sporadic, as illustrated below.



Using data from the 2013 Housing Needs Analysis, it is possible to project cumulative demand for general occupancy apartments, and new senior housing, to be as follows.

Cumulative Demand by 2030	
General Occupancy Multifamily Housing	**Senior Housing**
770	600

But demand estimates are different than growth estimates, because multifamily housing development depends on more than the existence of demand. Multifamily development, whether for seniors or general occupancy, also requires supportive public policies, a constructive public partnership when project proposals are received, and the availability of public financial support.

If we make the assumption that a supportive policy framework and public financial resources are available to produce 50% of the development that the demand would support, we can estimate the following multifamily housing growth by decade.

Cumulative Multifamily Housing Production (dwelling units)

	General Occupancy	Senior	Total
2015 to 2020	128	100	228
2020 to 2030	385	300	685
2030 to 2040	642	500	1,142

The cumulative land need for multifamily production is:

	Cumulative Multifamily Housing Production (dwelling units)	Cumulative Land Need (acres)
2015 to 2020	228	15
2020 to 2030	685	46
2030 to 2040	1,142	**76**

Calculation of the land required to support the housing production is based on an assumed housing density of 15 dwelling units per acre.

Retail Market Context

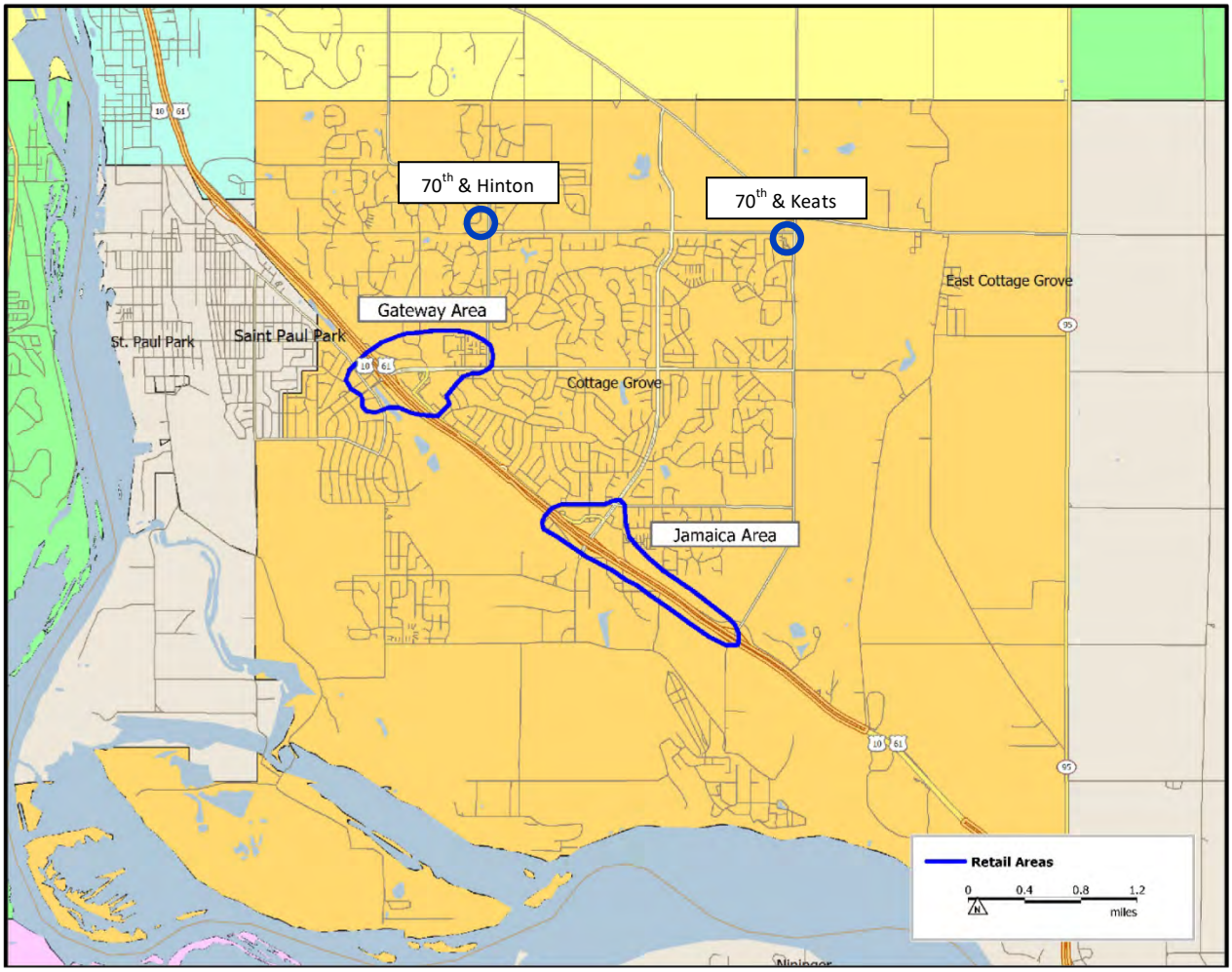
Existing Conditions

According to the McComb Group report, Retail Market Analysis and Sales Potential (2015), Cottage Grove's retail areas encompassed 71 retail stores and 101 service establishments in 2015. Costar data puts the total retail footprint at 1.3 million square feet.

Cottage Grove retail businesses are primarily located at two locations—the Gateway Area at the 80th Street exit and Highway 61, and the Jamaica Area at the Jamaica Avenue exit. Each of these retail areas support an array of businesses in freestanding and strip center formats, and from big box retailers to small stores.

There are two small retail areas to the north, at 70th and Hinton Avenue, and at 70th and Keats Avenue.

The map below, from the 2015 retail report, outlines the Gateway Area and Jamaica Area retail districts. We had added the two smaller retail nodes to the map.

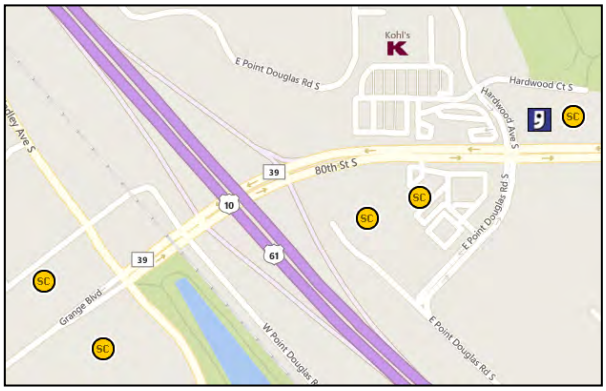


Source: Scan/US, Inc. and McComb Group, Ltd.

Gateway Area. The Gateway Area at 80th Street and Highway 61 has a total of around 450,000 square feet of total retail floor area. If office developments are included, it is about 590,000 square feet of floor area.

The total floor area has reduced by 200,000 square feet over the past 10 years by the closures of a Home Depot store in 2007, and a Rainbow Foods store in 2014. It will gain a new anchor this year in the form of a 95,700 square foot Hy Vee grocery store.

Gateway Area



Source: Costar

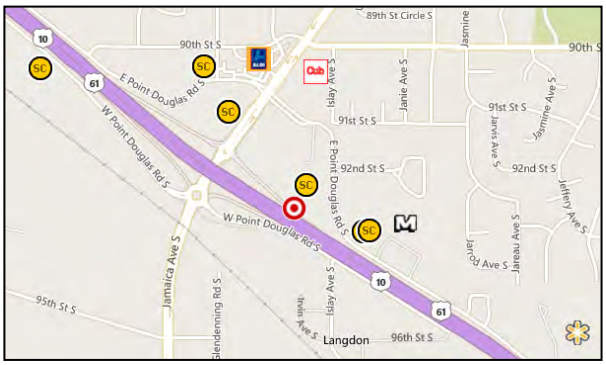
The map shows the Gateway retail area. In addition to identifying the multitenant shopping centers (as "SC"), the map calls out other existing anchor retailers by their logos. These include:

- Goodwill
- Kohl's

The Hy Vee grocery store will be an important additional anchor store that will draw customers, and improve the performance of existing and future retailers in the area.

Jamaica Area. The Jamaica retail area at Jamaica Avenue and Highway 61 has around 770,000 square feet of total retail floor area. Including office development, the total is 870,000 square feet.

Jamaica Area



Source: Costar

The map shows the Jamaica Avenue retail area. It identifies multitenant shopping centers and existing anchor retailers. Anchor stores are illustrated by their logos as:

- Target
- Walmart
- Aldi
- Cub Foods
- Menards

Walmart opened in 2014. It is closer to the Innovation Road exit than to Jamaica Avenue, and should serve to attract additional retail development near Innovation Road.

Keats & 70th Street. The neighborhood retail node at Keats & 70th is comprised of a SuperAmerica gas station/convenience store, a standalone retail building, and a strip center. Together they offer around 22,000 square feet of retail floor area.

Hinton & 70th Street. The neighborhood retail node at Hinton and 70th Street offers around 56,000 square feet of commercial floor area—38,000 square feet of office space, and 18,000 square feet of retail.

Market Dynamics—Regional

Metropolitan Area. The Twin Cities is a growing region with a vibrant and diversified economy—factors which support a positive long-term outlook for retail development in the region.

Current market conditions are also strong. The economic recovery has supported store openings by established retailers and new entrepreneurs. This has resulted in steadily declining vacancy rates, and increases in retail rents.

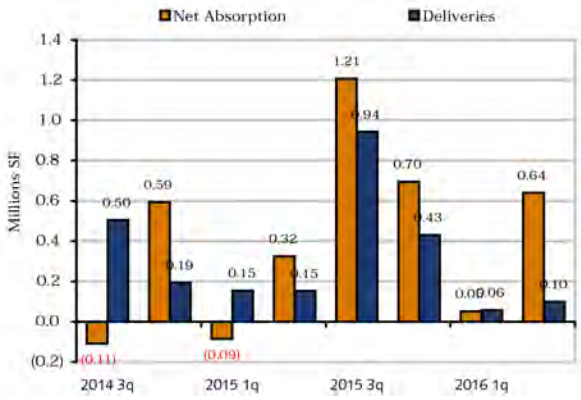
Retail Rents & Vacancies
Twin Cities Metro



Source: Costar

Improving conditions are also seen in the positive absorption of retail space. And, while still nowhere near its pre-recession pace, an upward trend in the development of new retail space can clearly be seen.

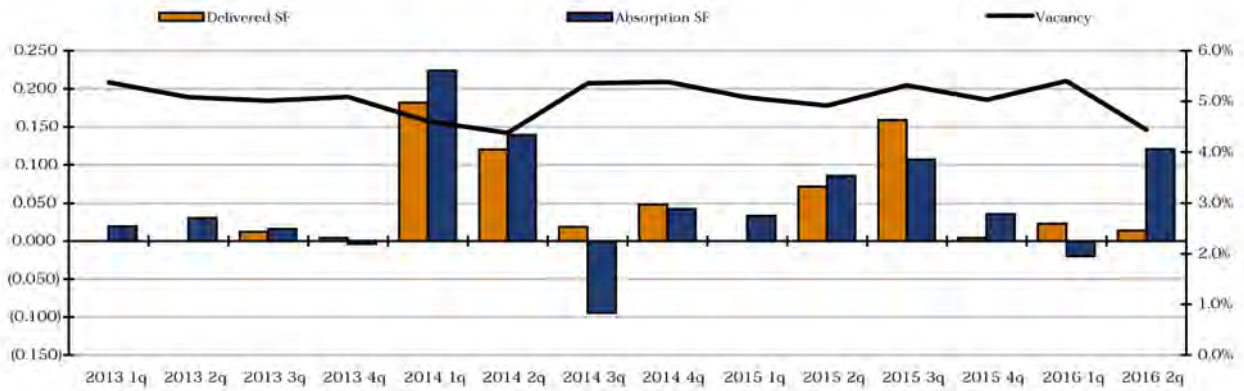
Retail Absorption and Construction Deliveries
Twin Cities Metro



Source: Costar

Woodbury Submarket. Cottage Grove is in a southeast metro retail submarket which Costar has designated the "Woodbury Submarket". The majority of the Woodbury Submarket is in Washington County. This submarket is experiencing a very similar pattern to the metropolitan area as a whole. Vacancy rates have fallen from 5 ½% to 4 ½% since the beginning of 2013, and there has been positive absorption of retail space in 11 of the past 14 quarters. Average quoted rents are around $14.50 per square foot.

Retail Vacancy, Absorption, and Deliveries
Woodbury Submarket (Includes Cottage Grove)

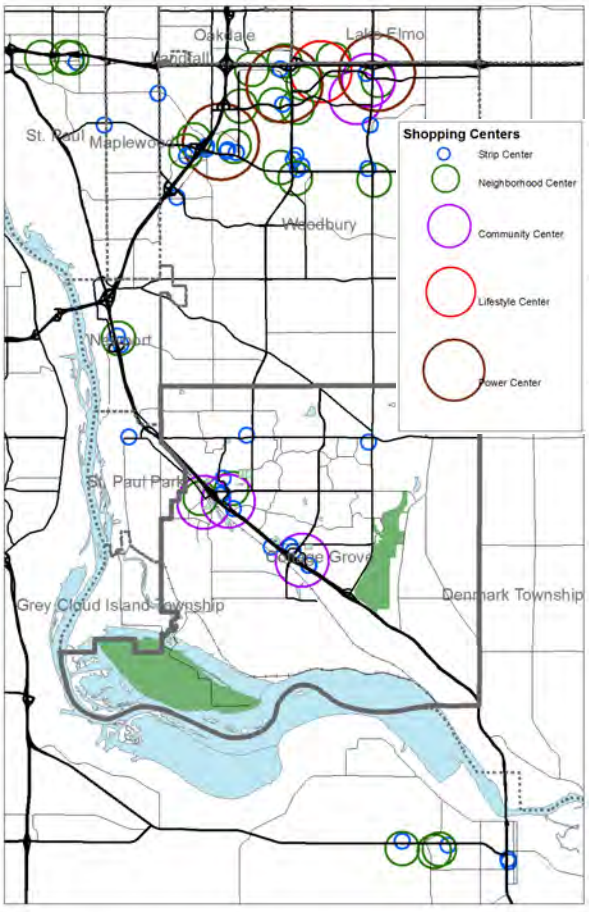


Source: Costar

Market Dynamics—Cottage Grove

Characteristics of existing retail areas. Cottage Grove's location relative to other retail areas has an important impact on the opportunity for additional retail development in Cottage Grove.

One way to understand Cottage Grove's surrounding retail context is by viewing the array of shopping centers close to Cottage Grove. The map below illustrates shopping centers tracked by Costar according to type of center. Centers are given circular symbols that are illustrative of the size of the center. Large circles indicate regional centers. Small circles illustrate neighborhood-oriented retail centers.



Source: Costar

Retail areas along the northern edge of Woodbury are the destination retail focus of the east metro. Interstate 94, where the retail areas are primarily situated, carries around 90,000 automobile trips each day, which is significantly more than Highway 61 in Cottage Grove. The retail areas in Woodbury benefit from a commuter-shed that extends north and south, and also well into Western Wisconsin. This has resulted in the presence of 4.4 million square feet of retail space in Woodbury, compared with 1.3 million square feet in Cottage Grove. Discounting for its greater population, Woodbury has a *per capita* retail footprint that is 1.8 times that of Cottage Grove.

One effect of the retail primacy of northern Woodbury is that the many destination retailers who already have a presence in northern Woodbury may be reluctant to open a second store 10 miles away in Cottage Grove.

But Cottage Grove has its own locational strengths. Woodbury's retail areas are 6 to 10 miles away by automobile. To the southeast, the nearest retail areas are a similar distance, and are smaller than the retail areas on Jamaica Avenue and 80th Street.

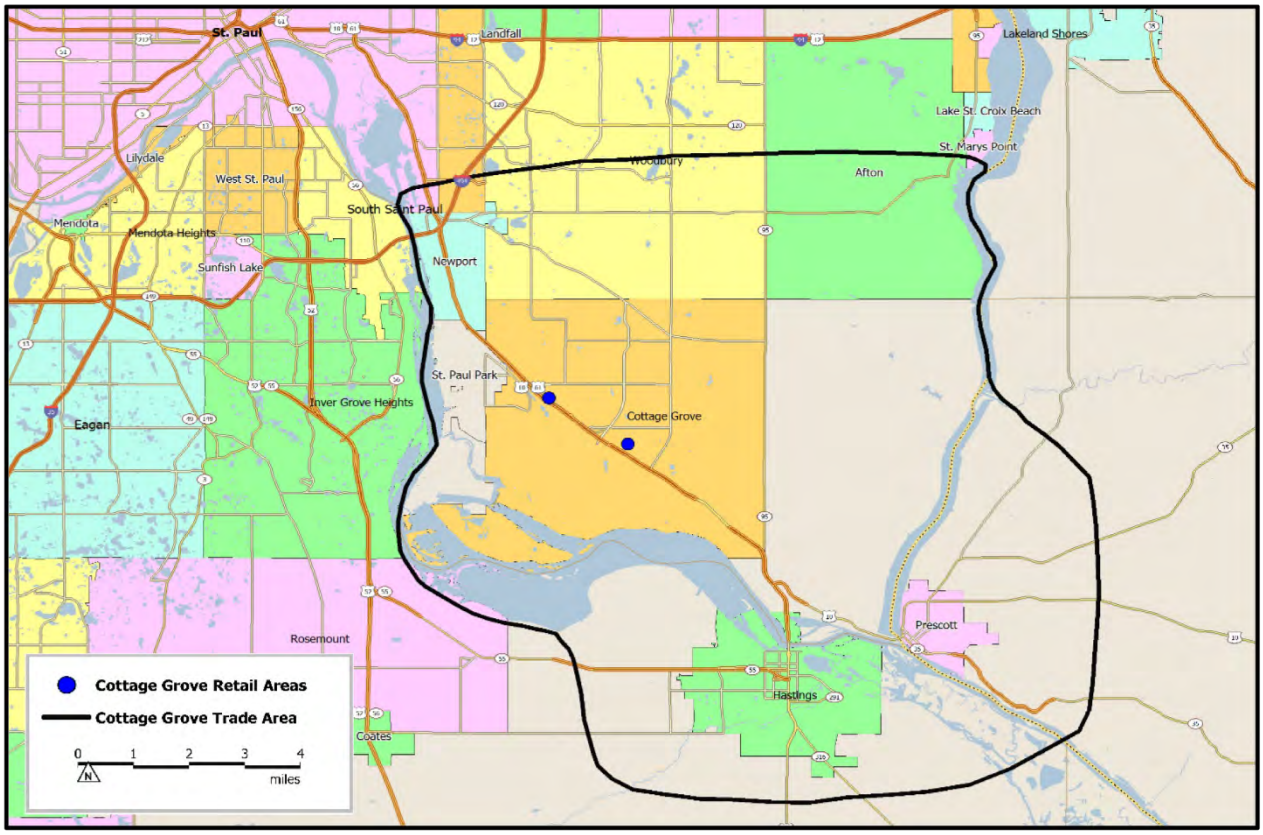
Highway 61 is a commuter-shed highway in its own right. It is the most direct path to the central cities for most Cottage Grove residents, and for residents to the south and east of Cottage Grove, including those who live in Hastings, and in Prescott, Wisconsin. Around 35,000 automobile trips are recorded daily on Highway 61, and Cottage Grove's retail areas are highly visible from Highway 61.

The cross streets carry important traffic volumes as well. The average daily traffic (ADT) on 80th Street is around 19,000 north of Highway 61, and 17,000 south of Highway 61. Jamaica Avenue carries 17,000 ADT north of Highway 61, and 10,000 south of Highway 61.

Retail demand—trade area population and spending. Retailers understand their customer base in terms of a) numbers of, and b) preferences of, potential consumers. They ask a) how many consumers are likely to be drawn to or past a particular store location? And b), what are the shopping patterns of the particular groups of consumers that are in the vicinity of retail location?

The Retail Market Analysis report defined a primary trade area for Cottage Grove retail areas. A primary trade area is the area from which 80% of the demand for retail goods and services is expected to come from.

Retail Trade Area



Source: Scan/US, Inc. and McComb Group, Ltd.

On the basis of this trade area, the Retail Market Analysis estimated a trade area population of around 100,000 people, and households numbering around 36,000. Average household income in the trade area was estimated to be around $95,000 per year. These figures allow an estimate of the total retail purchasing power, or spending potential, of households in the trade area. The following table provides this spending potential, broken out by certain broad categories of store types.

Cottage Grove Trade Area
Retail Purchasing Power, 2015 & 2020
(in thousands of dollars)

Merchandise Category	2015	2020
Shopping Goods	$506,198	$624,319
Food Service & Drinking	$190,515	$234,970
Convenience Goods	$288,188	$355,433
Gasoline Service Stations & Convenience	$209,484	$258,366
Other Stores	$502,330	$619,546
Total	**$1,696,715**	**$2,092,634**

Source: McComb Group, Ltd

Note that total retail spending by households in 2015 in the trade area is estimated to be approximately $1.7 billion annually.

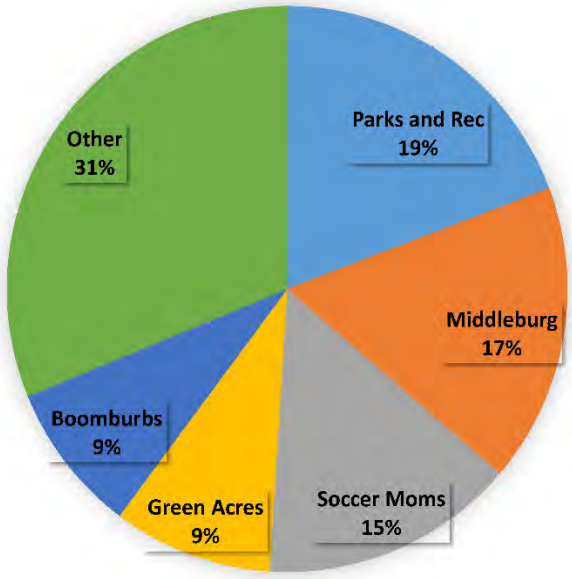
Cottage Grove's retailers capture a "market share" of this spending, which varies by store type. For most categories the Cottage Grove market share ranges between 15% and 35%. That is above average for retail areas in the Twin Cities—which the Retail Market Report credits to the City's distance from competing shopping areas in Woodbury and Hastings.

Retail demand—consumer segmentation. Consumer preferences and behavior in the Cottage Grove trade area are somewhat distinctive compared with consumer preferences and behavior in the core cities, or in rural parts of Minnesota. And that matters for the types of stores that may do well in Cottage Grove.

One way retailers think about customer character is through identifying distinctive demographic and cultural groups that customers fall into—which are associated with distinctive spending patterns. This categorization of consumers is called segmentation.

In ESRI's "Tapestry Segmentation" system, almost 70% of the trade area population falls into five segments (out of 67 ESRI segments). Their descriptions paint a portrait of the dominant demographic/cultural groups in the trade area, and their shopping behaviors. A brief profile of each segment is offered below. Much more detail can be obtained online.

Tapestry Segments: Retail Trade Area



Source: ESRI Business Analyst Online

- **Parks and Rec.** This segment comprises 19% of trade area households. Most households are two-income families approaching retirement. They are "practical homeowners who have bought homes within their means." They budget wisely, and will carefully research big ticket items.
- **Middleburg.** This segment comprises 17% of trade area households. These households enjoy semirural subdivisions. They are conservative, family oriented consumers. Spending priorities are family goods and activities, and do it yourself projects.
- **Soccer Moms.** This segment comprises 15% of trade area households. It is an "affluent, family-oriented market with a country flavor." Mostly two income families, they look to a quiet suburban setting to offset life's pace. Households have higher than average incomes, and are active in family activities. Most households own at least two vehicles, and have the equipment to maintain their property.
- **Green Acres.** This segment comprises 9% of trade area households. They value country living and self-reliance. Most are homeowners. Many are empty nesters. Households are conservative, and active in their communities. They pursue gardening, and outdoor recreation.
- **Boomburbs.** This segment comprises 9% of trade area households. They are primarily young professional families with college educations, who opted to purchase a new suburban home. They appreciate new technology and leisure activities.

Retailers know their markets, and those that sell products appealing to these to these demographic and cultural groups are likely to view Cottage Grove retail areas with interest.

Development Considerations

Cottage Grove is well-positioned to continue building its retail sector. The Gateway and Jamaica Areas enjoy a well-defined locational niche between the commercial areas in Woodbury and Hastings. They capture a healthy commuter-shed and destination market, and there is no evident location for a new retail area to emerge that would take market share from them. In the future, these areas will benefit from further population growth in Cottage Grove, as well as in areas to the south.

Retail development thrives where there are strong anchors. The existing anchors at the Gateway and Jamaica areas, with the addition of Hy Vee in the Gateway Area, are strong and well suited to the trade area population. There is potential for further anchor attraction. For example, a YMCA or similar large health club, and a movie theater complex are suggested in the 2015 Retail Market Analysis report.

There is land available for retail expansion. The Jamaica area along Highway 61 in particular is fortunate to have breathing room. With the development of Walmart, the area between Walmart and Innovation Road has become a natural location for new retail development to be constructed, as population and market demand grows. This retail area, oriented primarily to Innovation Road, but connected to Jamaica Avenue via the Highway 61 frontage road, is called the Cottage View area in the East Ravine Master Plan.

In addition to the Gateway, and the Jamaica/Cottage View Areas, City plans have identified additional areas for retail development. The commercial node at 70th and Hinton is built out, but two other areas have been explored for future retail development as part of a mixed use development vision.

Cedarhurst. The East Ravine Master Plan has identified an expansion of the retail at Keats and 70th Street into the other three quadrants of the intersection. This area takes on a new character, and is dubbed "Cedarhurst" in the plan. It would offer neighborhood oriented retail which would serve newly developed residential neighborhoods to the north and east, as well as higher density residential development in the blocks closest to the intersection.

It could further distinguish itself from the Gateway and Jamaica retail areas by offering some storefront or pedestrian-oriented retail formats—a retail character that is currently absent in Cottage Grove.

Langdon Village. The proposed Red Rock bus rapid transit service offers an opportunity for the City to explore a higher-density, mixed use, development pattern on the south side of Highway 61 at Innovation Road. The vision for the area, called Langdon Village, is for a walkable mix of commercial and community businesses and activities, serving a new higher density neighborhood, as well as the broader City. It could expand Cottage Grove's retail, both in terms of land area, and in terms of offering a different character of retail development.

New mixed use areas like Cedarhurst and Langdon Village have been created in suburbs like Cottage Grove, but they are challenging from a development perspective. Their distinctive character, and high amenity level, is important for achieving the rents that make the multifamily development work. And yet, retail stores require a certain amount of residential density and pedestrian traffic to do well.

Assertive steps and patience are required on the public sector side. And an innovative master developer may need to be identified as a private sector partner.

Land Analysis

With household numbers around 12,000 today, the Metropolitan Council's 2040 forecast of 17,300 households represents a 44% increase in number of households over that period. This analysis suggests a similar growth rate of 38% over that period.

Metropolitan Council forecasted population growth over the current estimated population is a somewhat smaller 32% by 2040.

Based on these estimates, this analysis makes the following assumptions.

- The growth in total retail purchasing power to 2040 will be around 40%.
- The trade area's growth in households and purchasing power will be at the same rate as Cottage Grove's.
- A 40% increase in overall purchasing power can be satisfied through a 35% increase in the retail land footprint, since efficiencies in land utilization and some more walkable retail formats are likely to be introduced over the time frame.

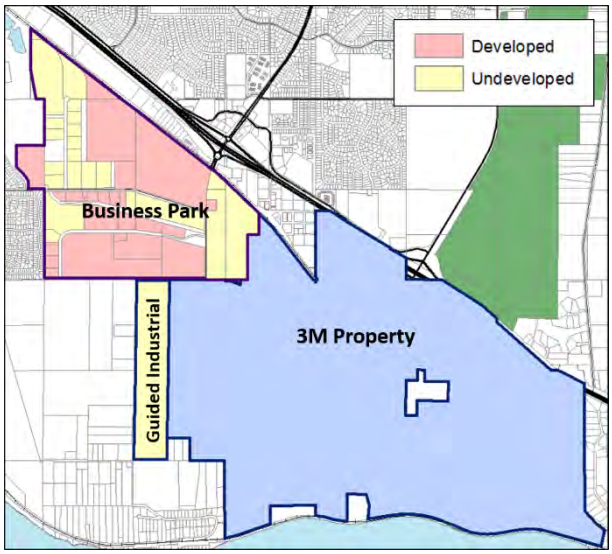
The existing retail footprint in Cottage Grove is around 250 acres. An additional 87 acres of retail area should be identified to accommodate retail growth.

Industrial Market Context

Existing Conditions

Industrial development in Cottage Grove is focused in the Cottage Grove Business Park. The business park is south of Highway 61, and most easily accessible from Jamaica Avenue.

Industrial Context Map



Source: Assessor Data, City of Cottage Grove

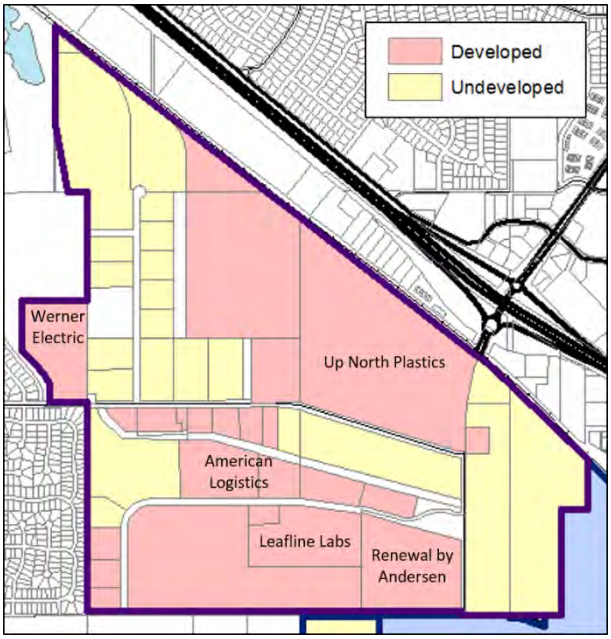
300 acres of property are developed in the Business Park, and there is room for facility expansion within some properties. Roughly the same amount of property is undeveloped. Aside from a 39-acre parcel recently acquired for development, undeveloped property is in the hands of two property owners, one of which is the Soo Line Railroad Company.

115 acres of land south of the Business Park are also guided for industrial development.

Rail access is available to some of the properties along the northern edge of the Business Park.

The Cottage Grove Business Park offers a wide range of parcel sizes, with the largest being 73 acres. Land is fairly flat. Properties are well served by roads and utility infrastructure. Some regional stormwater facilities have been created, which reduces the extent of stormwater infrastructure that needs to be built on site, freeing up more of the land for development.

Cottage Grove Business Park



Source: Assessor Data, other information sources

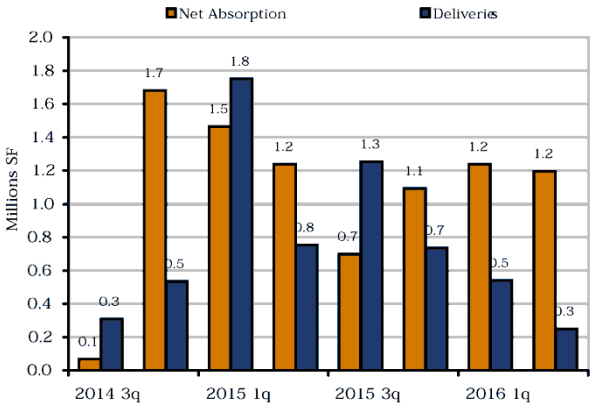
The property in the most northwesterly corner of the Business Park has received City approvals for an industrial development that would make use of an existing rail line spur.

Market Dynamics—Regional

Metropolitan Area. The Twin Cities is a growing region with a vibrant and diversified economy—factors which support a positive long-term outlook for industrial development in the region.

Current market conditions have strengthened in the industrial market. There has been positive absorption of industrial space in each of the past eight quarters. New development of industrial space region-wide is at around 2.5 million square feet per year over the last four years. That's up from around 0.5 million square feet per year in the preceding three years. But there's still room to grow, since the historic average is around 5 million square feet of new industrial space per year.

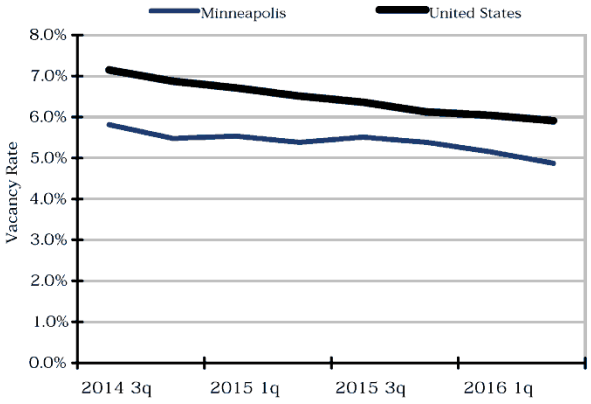
Industrial Absorption & Deliveries: Twin Cities



Source: Costar

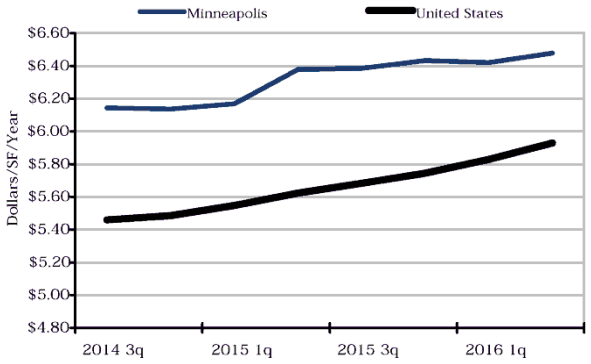
The ongoing absorption of industrial space over the last few years demonstrates a growing demand, which manifests itself in two ways. The vacancy rate for industrial property has dropped over the past few years to under 5%. And industrial rents have been gradually rising.

Industrial Vacancy Rate: Twin Cities



Source: Costar

Industrial Rents: Twin Cities



Source: Costar

The tightening of industrial space leads to the development of new space. Increased rent levels also support new development, since higher rents are sometimes needed for new development to bring a financial return.

East Submarket. Cottage Grove is in the "East" industrial submarket as defined by Costar. The East submarket aligns very closely with the boundary of Washington County.

The East submarket is performing very similarly to the Twin Cities market as a whole, with a vacancy rate of around 5%. Average quoted rents are at $7.80, which is a little higher than the Twin Cities average rent of around $6.50. This could reflect a different mix of industrial building types.

Market Dynamics—Cottage Grove

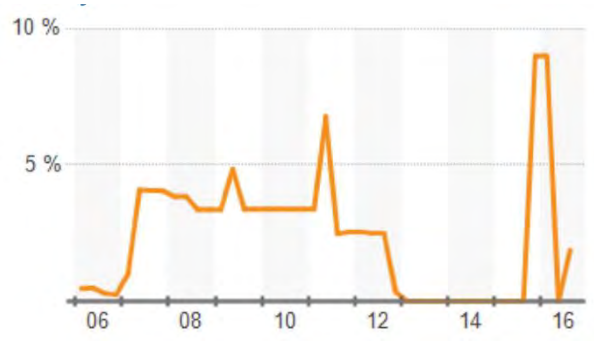
Strengths and weaknesses. While the regional focus of industrial development has been on other parts of the Twin Cities in recent years, the Cottage Grove Business Park has a number of characteristics that make it a strongly competitive location for industrial businesses.

- **Connectedness.** According to interviewees in the development and real estate community, the Business Park is understood to be very well connected to metropolitan freeway system as any vacant industrial land in the metropolitan area.
- **Size of parcels.** Large parcels are available for development.
- **Topography.** Properties are flat, which makes them suitable for large single-level facilities.
- **Rail access.** Rail access is available for some properties.
- **Site readiness.** Business Park properties are well served by the local street network and utilities. Some stormwater management is accommodated through regional facilities.
- **Supportive local government.** The City of Cottage Grove is known for its supportive stance toward business development, and for showing reasonable flexibility with regard to regulatory requirements.
- **Residential options.** Cottage Grove is a developing suburb that will continue to provide a range of home ownership options for employees of local businesses.
- **Transit.** The development of the Red Rock bus rapid transit line would provide opportunities for a reverse commute, which would expand the labor pool for businesses in the Business Park.
- **Area amenities.** There are nearby retail and restaurant amenities that employees of businesses can take advantage of.

This is an impressive set of positive attributes, and there is little in the way of offsetting weaknesses—aside from the simple fact that "greenfield" industrial development has reached this distance from the metropolitan center.

Rents and Vacancies. The market strength of Business Park properties is demonstrated in the low level of property vacancies over the past 10 years.

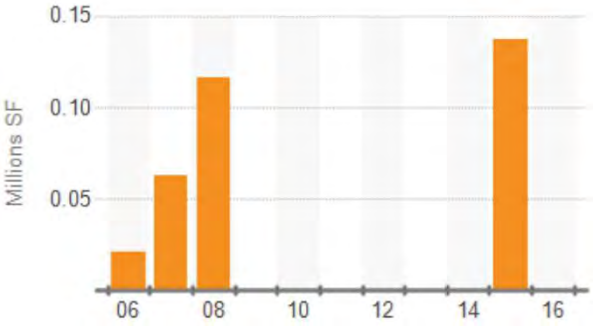
Industrial Vacancy Rate: CG Business Park



Source: Costar

Development of Business Park property took a pause during the great recession, but has now resumed with a set of facility expansions, and the recent acquisition of a 39-acre property for new development. The following chart shows the incidence of new industrial development in the Business Park. The deliveries that are illustrated include both the physical expansion of existing facilities, and new development of industrial facilities.

Construction Deliveries: CG Business Park



Source: Costar

Development Considerations

Development context. The competitive landscape for industrial development is different from the competitive landscape for retail, in that industrial development in the Cottage Grove may be weighed against industrially zoned properties all over the Twin Cities.

The positive attributes of Cottage Grove's Business Park are significant, and are expected to draw greater attention from the industrial business and real estate community over time. In fact, new attention on Cottage Grove is already evident in the recent or proposed expansion of four businesses in the Cottage Grove Business Park, and a new development proposal on recently acquired property.

The Business Park is well suited to both light manufacturing, and office warehouse facilities.

New industrial development in Cottage Grove may be initiated by developers, or by businesses that have need for new facilities. In either case, projects will normally be designed to meet the needs of a particular business user. In the current market context, we are less likely to see the development of an industrial facility "on spec"—that is, without an identified tenant. It is common, however, for a business to occupy newly developed property on a tenant basis—even if the facility was built with their specific business needs in mind.

Public sector role. There are several roles the City of Cottage Grove can play in order to attract additional industrial development to its Business Park area. These are roles that the City is familiar with. The City is already taking assertive public action in these areas, and that is a major factor in the existing attractiveness of the Business Park.

- **Site readiness.** The City can continue taking actions to ensure that industrial sites are served by a strong street and utility network. Clearance and grading of industrial land can also contribute to site readiness. Providing common stormwater facilities makes for more efficient utilization of land.
- **Marketing.** The City can continue to take actions to highlight the desirable features of the Business Park, and to keep the Business Park on the radar screen of the commercial broker community.
- **Business friendliness.** The City can continue to demonstrate that it values existing and prospective businesses, and will accommodate new business needs in appropriate ways in its development review process.
- **Increase industrially guided land.** As discussed below, the City should be prepared to increase the size of the business park as needed.

These actions establish a supportive foundation for attracting new business development to the City's Business Park. They are more fundamental and more important than the provision of public financial support. In fact, although it may be requested by some prospective businesses, it should not be necessary to provide public subsidy in order to attract business development to the Business Park. The attractiveness of the Business Park will continue to grow over time, as comparable Twin Cities properties become more distant from the metropolitan transportation network.

The existing and growing attractiveness of the Business Park should also allow the City of Cottage Grove to set high standards for new development.

Land Analysis

In contrast to the residential and retail sectors, the past rate of property development in the Business Park is not a good indicator of future business growth. Industrial land can reach tipping points at times of high economic activity, as similarly situated areas become built out, and as new development creates a buzz in the real estate community.

These factors could lead to a succession of new development projects in the Business Park over the next five to ten years. Note that three or four additional large developments, similar to the one currently being pursued in the northwest corner of the Business park, would consume most of the remaining land in the Business Park.

Given this, the City is advised to identify 300 acres of land that could serve as an expansion of the Business Park as needed, with options for further expansion in the coming decades.

Kimley»Horn

MEMORANDUM

To:	Jon Horn, P.E.
From:	Brandon Bourdon, P.E.
Date:	October 13, 2016
Subject:	Intersection Configuration and Control Memo New Roadway Connection & East Point Douglas Road Cottage Grove, MN

Kimley-Horn and Associates, Inc., (Kimley-Horn) was retained by the City of Cottage Grove to evaluate the geometry and intersection control that may be necessary for a future intersection on East Point Douglas Road at a new roadway connection approximately 600 feet west of CSAH 19 (Innovation Road) in Cottage Grove, Washington County, Minnesota (see **Figure 1;** Site Location). Cottage Grove is located in east central Minnesota and is situated in the southern portion of Washington County. The estimated population of Cottage Grove in 2013 was 35,399, and by 2040, Cottage Grove is expected to grow to 47,000 residents. Recent development on East Point Douglas Road has significantly increased traffic volumes in the area. Therefore, Washington County is currently investigating design solutions to improve existing conditions and accommodate future growth for the intersections of the westbound TH 10/61 Ramps and East Point Douglas Road with CSAH 19.

As a part of this study, the planned roadway connection to East Point Douglas Road (west of CSAH 19) was examined under the anticipated future baseline conditions as well as a potential access alternative in which only an access to East Point Douglas Road is provided for the future development and there is no access to CSAH 19. This memorandum summarizes the analysis for the future baseline scenario as well as the alterative access scenario. Existing and forecast traffic volumes were used to determine whether the subject intersection could meet warrants for a traffic signal or all-way stop and capacity analyses were completed for each control type (two-way stop-control (TWSC), all-way stop-control (AWSC), and signalization) to understand future operations at the intersection. A sensitivity analysis was also performed for the alternate access scenario to determine if and at what level of development could occur prior to the minor-leg stop-control no longer operating acceptably. The findings of the analyses are detailed in the following sections of this memorandum.



Kimley»Horn

Figure 1: Project Location
East Point Douglas Road & New Roadway Connection
Figure 1: Site Location

FUTURE CONDITIONS

West of CSAH 19, East Point Douglas Road is a two-lane two-way local roadway with a speed limit of 40 mph. The proposed design alternative for the improvements planned for the intersections along CSAH 19 would slightly realign East Point Douglas Road to the south and provide a six-leg roundabout at its intersection with CSAH 19. A single inbound and outbound lane are planned for the west leg of the roundabout to East Point Douglas Road. Based on a review of the forecast traffic volumes, that are described later, the intersection of the new roadway connection and East Point Douglas Road was evaluated using the initial intersection geometry and shown in **Figure 2**; Conceptual Intersection Geometry.



Figure 2: Conceptual Intersection Geometry

- **Southbound Approach (New Roadway Connection):** Provide exclusive left- and right-turn lanes.
- **Eastbound Approach (East Point Douglas Road):** Provide an exclusive left-turn lane and a single through lane.
- **Westbound Approach (East Point Douglas Road):** Provide an exclusive right-turn lane and a single through lane.

Count data collected on November 17, 2015, showed East Point Douglas Road, west of CSAH 19, to have an ADT of 5,500 vehicles per day. During the morning peak hour, 100 westbound and 65 eastbound vehicles were observed. During the evening peak hour, 295 westbound and 290 eastbound vehicles were observed.

In order to evaluate future conditions at the planned new roadway connection, future traffic volumes were developed for this intersection with East Point Douglas Road using the forecasted volumes for CSAH 19 and East Point Douglas Road, as described in the Kimley-Horn memo to Washington

County titled, *CSAH 19 Travel Demand Forecasting* (April 2016). The initial forecasts developed at CSAH 19 and East Point Douglas Road did not include an additional connection to CSAH 19 north of East Point Douglas Road as this level of detail is not included within the travel demand model. The forecasted future year morning and evening peak hour trips on East Point Douglas Road west of CSAH 19 are summarized in **Table 1**, and do not include the north access on CSAH 19.

Table 1: Existing Volume, Projected New Trips, and Total Forecast Volume on East Point Douglas Road West of CSAH 19 (prior to adjustments to account for additional access to CSAH 19)

Peak Hour	Direction	Existing (2015) Volume	Projected New Trips (2040)	Total Forecasted Volume (2040)
AM	Eastbound	65	280	345
	Westbound	100	545	645
PM	Eastbound	290	670	960
	Westbound	295	360	655

Off-model adjustments were then used to estimate the impact of adding a new access to CSAH 19 north of East Point Douglas Road to serve future demand from adjacent properties. In order to distribute these forecasted trips between the two access connections provided for the New Roadway Connection (to East Point Douglas Road and to CSAH 19 to the north), the following assumptions were made:

- 80% of new trips to and from the south on CSAH 19 were assumed to use the south access (East Point Douglas Road); the remaining 20% would use the north access.
- 80% of new trips to and from the north on CSAH 19 were assumed to use the north access; the remaining 20% would use the south access (East Point Douglas Road)

Following the development of forecasts for East Point Douglas Road west of CSAH 19 using the assumptions above, the following additional assumptions were made to develop turning movement forecasts for the intersection of East Point Douglas Road and the proposed New Roadway Connection:

- All new trips to the area were assumed to use the new roadway connection to access the new development; this is a conservative assumption as some traffic may access new development in the area via the existing Walmart east access.
- All existing trips on East Point Douglas Road were maintained.
- In addition to the new trips shown in **Table 1**, 25% additional trips were assumed in order to account for new trips to and from the west on East Point Douglas Road that were not captured in the forecasts on CSAH 19. Which results in the following additional trips:
    - 140 inbound trips from the west, 70 outbound trips to the west during the AM peak hour
    - 90 inbound trips from the west, 170 outbound trips to the west during the PM peak hour

The resulting forecasted turning movement volumes for the **Baseline Scenario** are shown in **Figures 3 and 4.**

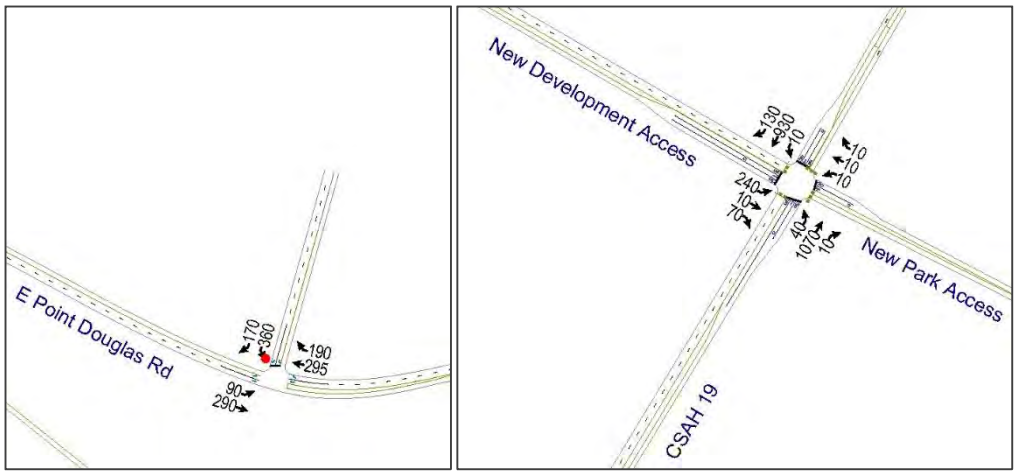


Figure 3: Baseline Scenario – 2040 PM Forecasted Peak Hour Turning Movement Volumes

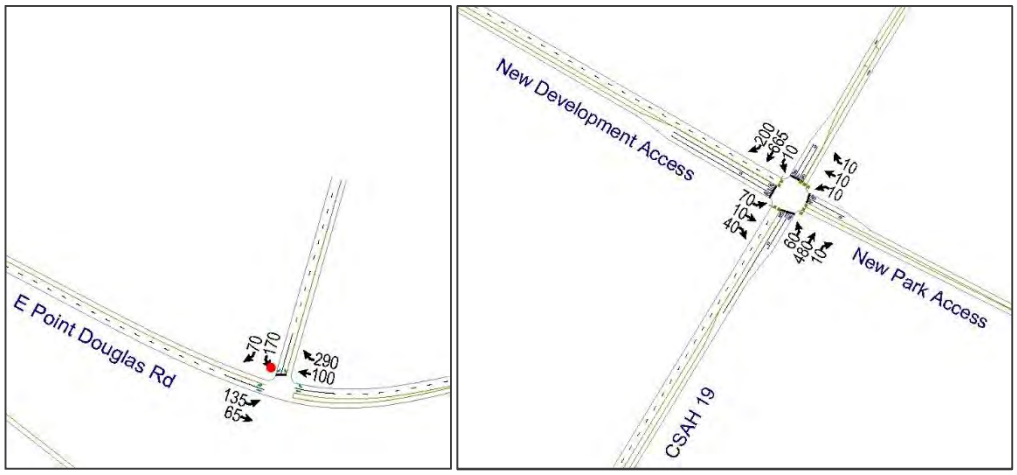


Figure 4: Baseline Scenario – 2040 AM Forecasted Peak Hour Turning Movement Volumes

An additional scenario was also developed to test operations on East Point Douglas Road if no additional connection to CSAH 19 is assumed. Forecasted volumes for this **Alternate Access Scenario** are shown in **Figures 5 and 6.**

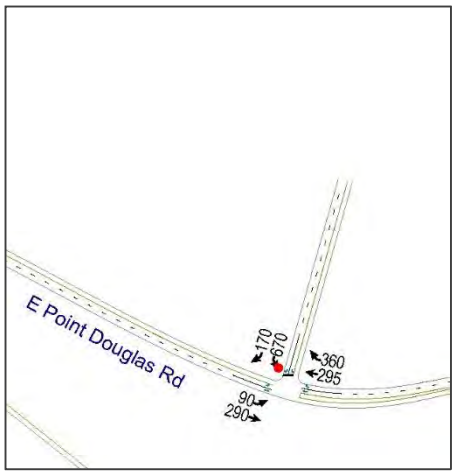


Figure 5: Alternate Access Scenario – 2040 PM Forecasted Peak Hour Turning Movement Volumes

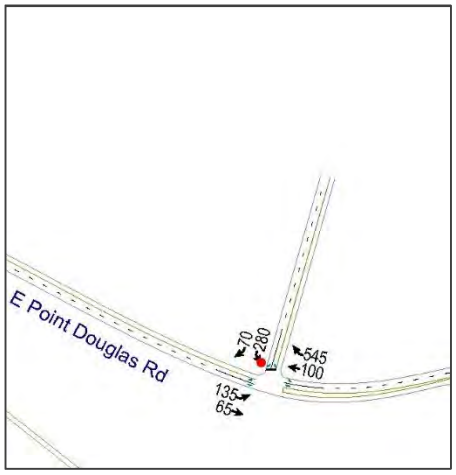


Figure 6: Alternate Access Scenario – 2040 AM Forecasted Peak Hour Turning Movement Volumes

WARRANT ANALYSES

Using the recommended geometry and future volumes developed for the new roadway connection to East Point Douglas Road (Figures 3 through 6), signal warrant analyses were completed to identify the appropriate intersection control for the new intersection under the future scenarios. Since the intersection does not currently exist, turning movement data could not be collected for use in evaluating the signal warrants. As a result, the projected future volumes were utilized to evaluate Warrant 2, Four-Hour Vehicular Volume, and Warrant 3, Peak Hour Vehicular Volume, from the *Minnesota Manual on Uniform Traffic Control Devices* (MnMUTCD). Additional warrants could be evaluated for the intersection such as Warrant 1, Eight-Hour Vehicular Volume; however, given the limited data available, they were not included as part of this analysis.

To evaluate Warrant 2, projected morning and evening peak hour volumes were used to develop four hours of turning movement volumes for the intersection assuming that the hour before (or after) each peak hour carries approximately 85% of the peak hour volume. For the purposes of this evaluation, the combination of these four hours, the two peak hours and the respective adjacent hour, are assumed to be the highest four hours of the day. The projected approach volumes utilized for the warrant evaluations are show in **Table 2** below. Per Minnesota Department of Transportation (MnDOT) guidelines, minor street right turns were not considered as part of this analysis.

Table 2: Projected Major and Minor Street Volumes

Time	Approach Volume			
	Baseline Scenario		Alternate Access Scenario (No North Access)	
	Major Street	Minor Street[1]	Major Street	Minor Street[1]
AM Peak Hour	590	170	845	280
AM 85% Adjacent Hour	502	145	718	238
PM Peak Hour	865	360	1035	670
PM 85% Adjacent Hour	735	306	880	570

1 - Excludes right turns per MnDOT guidance

The volume of both the eastbound left turns are greater than 50% of the total respective approach volume for both scenarios during the morning hours. In addition, exclusive turn lanes, with sufficient storage to accommodate the anticipated queuing, are planned for the approaches. As a result, the major approaches are considered as two lanes per MnMUTCD guidance. Because right turns are not considered on the minor street (per MnDOT guidance), the southbound approach is considered as a single lane for the purposes of this analysis. The approach geometry assumed for the warrant analyses is shown in **Table 3**.

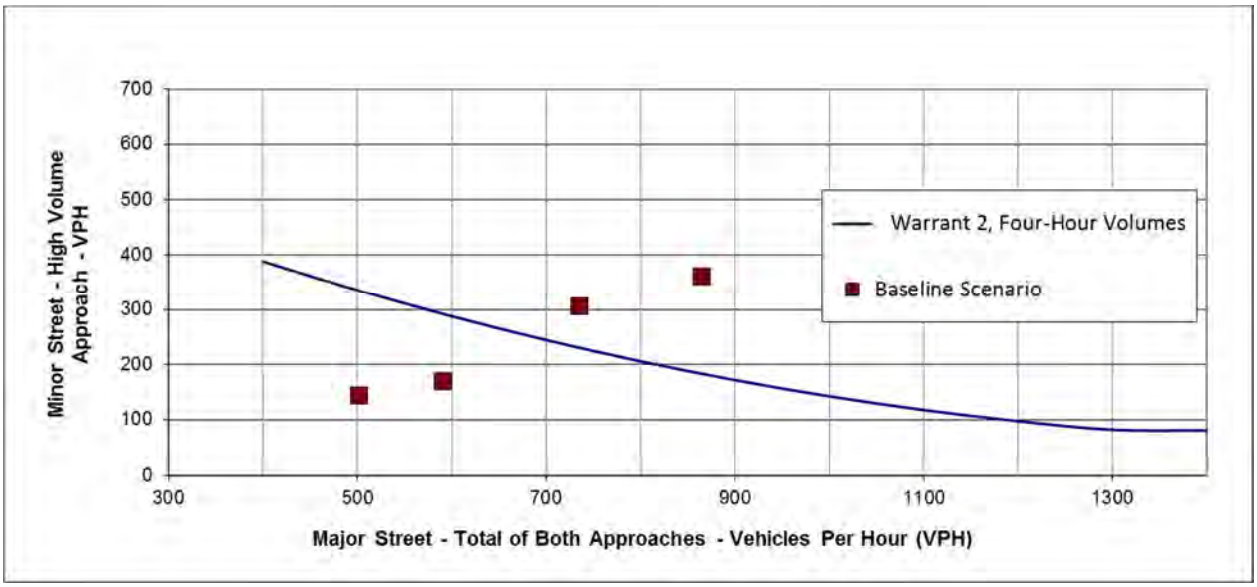
Table 3: Approach Lanes for Signal Warrant Analyses

Approach	Lane Usage
Eastbound East Point Douglas (Major Approach)	2 approach lanes
Westbound East Point Douglas (Major Approach)	1 approach lane
Southbound New Roadway Connections (Minor Approach)	1 approach lane

Baseline Scenario

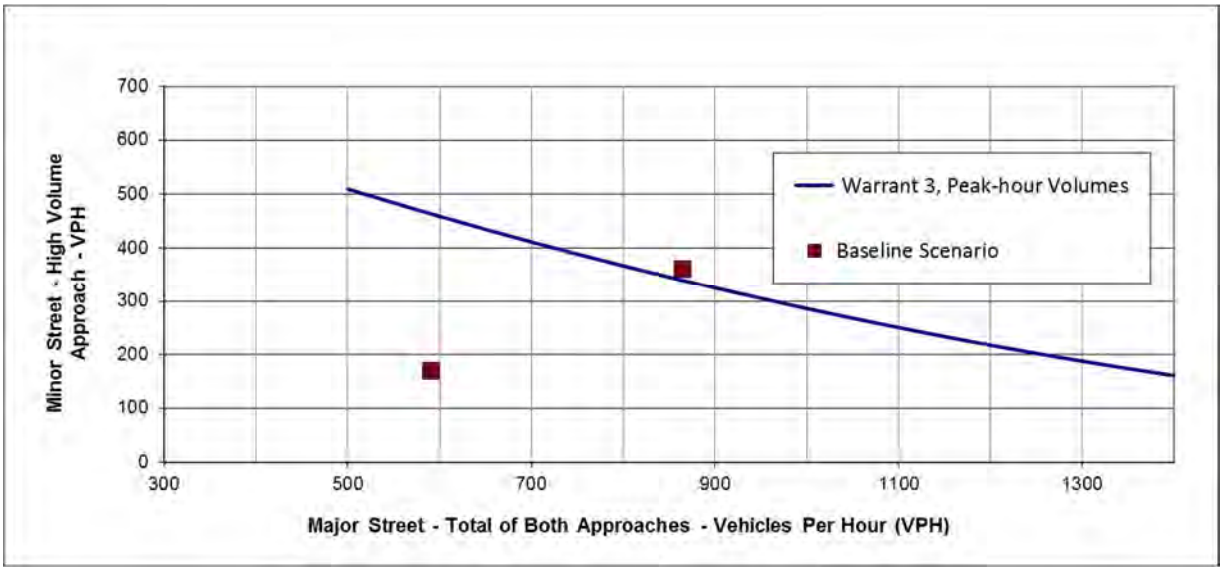
The projected approach volumes were then plotted for the Baseline Scenario in **Graph 1** for Warrant 2 and **Graph 2** for Warrant 3. In order to meet the criteria for the warrants, four hours of vehicular volumes must fall above (to the right of) the blue curves shown on the graph for Warrant 2 and one hour must fall above the curve for Warrant 3. The curves shown on graphs represent those shown in Figure 4C-1 (Warrant 2) and Figure 4C-3 (Warrant 3) of the MnMUTCD for an intersection with one approach lane for both the major and minor streets.

Graph 1: Baseline Scenario - MnMUTCD Figure 4C-1 - Warrant 2, Four-Hour Vehicular Volume, Warrant Evaluation



As shown in **Graph 1**, two of the four hours analyzed for the baseline scenario fall above the curve and thus meet the specified volume criteria for Warrant 2. It should be noted that only the projected evening peak hour volumes meet the criteria and the 85% evening volumes are just slightly above the curve. As a result, it is not certain that future volumes at the intersection will meet the volume criteria for Warrant 2; however, they should be monitored in future years to determine if/when the intersection does meet the warrant criteria.

Graph 2: Baseline Scenario - MnMUTCD Figure 4C-3 - Warrant 3, Peak Hour Vehicular Volume, Warrant Evaluation



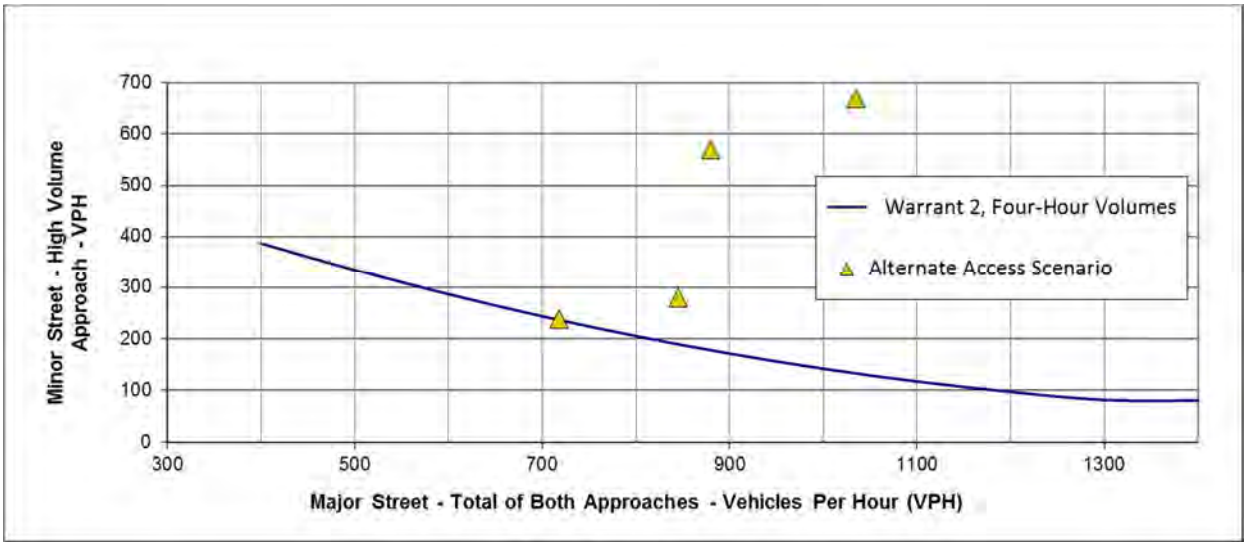
As shown in **Graph 2**, the projected evening peak hour volumes are just above the specified volume criteria for Warrant 3 for the baseline scenario. Therefore, it is possible the future volumes at the intersection could meet Warrant 3 volume criteria. Warrant 3 is not typically used to warrant a signal in a suburban area and is seldom recognized by MnDOT. We then reviewed Warrant 1 (Eight Hour Warrant) and only two of the four hours of data satisfy either condition A or B for this warrant so it is unlikely that Warrant 1 will be satisfied for the baseline scenario. We recommend that volumes at the intersection be monitored in future years to determine if and when the intersection meets the warrant criteria.

In addition to traffic signal warrant analysis, an all-way stop control (AWSC) and roundabout were investigated for the subject intersection. Generally, a roundabout is warranted when volumes at the intersection meet the criteria for AWSC. A review of the 2015 hourly traffic volumes collected for East Point Douglas Road (detailed in **Appendix A**) reveals that the major street currently meets the AWSC criteria of at least 300 vehicles per hour for more than eight hours. However, in order to meet the criteria, the minor street approach must have at least 200 vehicles per hour for the same eight hours. Since the projected minor-street volumes are only greater than 200 vehicles during the evening peak hours, it is not likely that the approach will have the volume necessary to meet the volume warrant. Therefore, it is unlikely that an all-way stop be warranted for the subject intersection, and as a result, a roundabout is not likely necessary to facilitate traffic through the intersection. Given the projected volumes, that the intersection is projected to operate well under all-way stop and signal control (detailed in the following section), the close intersection spacing, and the more significant construction impacts that would result from the installation of a roundabout, a roundabout is not considered as a viable option for this location and is not analyzed further in this memorandum.

Alternate Access Scenario

Similar to the baseline scenario, the projected approach volumes for the alternate access scenario were plotted to evaluate Warrant 2 and Warrant 3, and are shown in **Graphs 3** and **4**, respectively. As detailed above, to meet the criteria for Warrant 2, four hours of vehicular volumes must fall above (to the right of) the blue curves shown on the graph, and for Warrant 3, one hour must fall above the applicable curve.

Graph 3: Alternate Access Scenario - MnMUTCD Figure 4C-1 - Warrant 2, Four-Hour Vehicular Volume, Warrant Evaluation



As shown in **Graph 3**, three of the four hours analyzed for the alternate access scenario fall above the curve and the fourth is just below meeting the criteria. Therefore, the scenario does not meet the specified volume criteria for Warrant 2.

Graph 4: Alternate Access Scenario - MnMUTCD Figure 4C-3 - Warrant 3, Peak Hour Vehicular Volume, Warrant Evaluation



As shown in **Graph 4**, the projected evening peak hour volumes also meet the specified volume criteria for Warrant 3. Warrant 3 is not typically used to warrant a signal in a suburban area and is seldom recognized by MnDOT. We then reviewed Warrant 1 (Eight Hour Warrant) and four of the four hours of data satisfy either condition A or B for Warrant 1 may be satisfied for the alternative access scenario in 2040. We recommend that volumes at the intersection be monitored in future years to determine if and when the intersection meets the warrant criteria.

The implementation of all-way stop control (AWSC) and a roundabout were also investigated for the alternate access scenario. As detailed above, the 2015 hourly traffic volumes collected for East Point Douglas Road satisfy the major-street volumes needed to warrant an all-way stop. Since the projected volumes for the minor-street approach are greater than 200 vehicles during both the morning and evening peak hour, it is possible that the intersection could have the necessary volume throughout the day to warrant an all-way stop. However, a roundabout is not recommended at this location as the intersection is projected to operate well under signal control (detailed in the following section), and due to the close intersection spacing and the more significant construction impacts that would result from the installation of a roundabout. As a result, a roundabout is not further analyzed in this memorandum as it is not considered a viable option for the alternate access scenario.

CAPACITY ANALYSIS

To understand how the intersection may operate under two-way stop-control, all-way stop-control, and signalized conditions, intersection capacity analyses were completed for future conditions during the projected morning and evening peak hours. Per MnDOT standards, the analysis was completed using SimTraffic simulation software.

Baseline Scenario

The delay and level of service projected for the intersection for the Baseline Scenario under each control type is shown in **Table 4** and the projected 95th percentile queues are shown in **Table 5**.

Table 4: Projected Future Control Delay and LOS

Movement	AM Peak Hour						PM Peak Hour					
	TWSC		AWSC		Signal		TWSC		AWSC		Signal	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
EBL	5	A	6	A	29	C	5	A	10	B	36	D
EBT	1	A	8	A	14	B	1	A	16	C	19	B
WBT	1	A	9	A	17	B	1	A	18	C	20	C
WBR	1	A	5	A	5	A	1	A	6	A	4	A
SBL	14	B	6	A	8	A	> 120	F	24	C	11	B
SBR	3	A	3	A	2	A	99	F	6	A	5	A

Table 5: Projected 95th Percentile Queues

Movement	95th Percentile Queue (Feet)					
	AM Peak Hour			PM Peak Hour		
	TWSC	AWSC	Signal	TWSC	AWSC	Signal
EBL	66	57	131	53	58	107
EBT	-	52	63	-	125	174
WBT	-	55	80	-	137	179
WBR	26	87	88	11	74	70
SBL	106	69	98	> 1320	242	184
SBR	38	37	37	568	95	72

For the majority of the analyzed scenarios, the intersection is projected to operate well. With the exception of the TWSC during the evening peak hour, all movements operating at LOS D or better under TWSC, AWSC, or signalization. For TWSC, only the minor street approach and eastbound left-turn experience delay greater than one second since through vehicles along East Point Douglas do not have to stop at the intersection. During the evening peak hour, the southbound left- and right-turn movements are shown to operate at LOS F and the left-turn is shown to have a 95th percentile queue greater than a half-mile in length. Conversely, the movement operates well during the morning peak hour (LOS B) with a 95th percentile queue of about four vehicles. The higher delay in the evening peak hour is fairly typical for minor-leg stop controlled approaches with major streets, particularly at intersections that have a concentrated period of higher minor leg volume for a short period during the day, which can be reflective of concentrated retail locations that are often not open during the morning peak period. The projected queues for the southbound approach under TWSC are not reasonable and therefore, TWSC is not recommended for the intersection.

With AWSC, delay is balanced between the minor and major legs as all vehicles must stop prior to continuing through the intersection. Under AWSC all movements are shown to operate at LOS C or

better during the morning and evening peak hours. The maximum 95th percentile queues are projected as approximately 242 feet or less (~10 vehicles or less) for all movements at the intersection during both the morning and evening peak hours. Based upon the simulation results, if AWSC is implemented at the intersection, operations at the proposed roundabout to the east are not anticipated to be negatively impacted by westbound queues at this proposed intersection.

For the signalized scenario, all movements at the intersection operate at LOS D or better during both the morning and evening peak hours. The maximum 95th percentile queue length simulated for the westbound right-turn movement is roughly 3 vehicles (88 feet during the morning peak hour and 70 feet during the evening peak hour). Based upon these results, operations at the proposed adjacent roundabout are not anticipated to be negatively impacted by westbound queues if a signal were installed for the intersection with the new roadway connection. The eastbound approach is shown to have a maximum 95th percentile queue length of approximately 131 feet (~5 vehicles) for the left-turn movement and 125 feet (~5 vehicles) for the through movement. The maximum 95th percentile queues for the southbound approach are projected during the evening peak hour as approximately 184 feet (~7 vehicles) for the left-turn movement and 72 feet (~3 vehicles) for the right-turn movement.

Alternate Access Scenario

For the Alternate Access Scenario, delay and corresponding level of service projected for the intersection is shown in **Table 6** for each control type. 95th percentile queues projected for the intersection under each control type are shown in **Table 7**.

Table 6: Projected Future Control Delay and LOS

Movement	AM Peak Hour						PM Peak Hour					
	TWSC		AWSC		Signal		TWSC		AWSC		Signal	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
EBL	13	B	7	A	21	C	8	A	12	B	28	C
EBT	1	A	9	A	11	B	1	A	20	C	22	C
WBT	1	A	10	A	19	B	1	A	24	C	33	C
WBR	2	A	12	B	9	A	1	A	9	A	7	A
SBL	47	E	8	A	15	B	> 120	F	> 120	F	17	B
SBR	6	A	3	A	3	A	> 120	F	> 120	F	2	A

Table 7: Projected 95th Percentile Queues

Movement	95th Percentile Queue (Feet)					
	AM Peak Hour			PM Peak Hour		
	TWSC	AWSC	Signal	TWSC	AWSC	Signal
EBL	92	61	106	59	64	98
EBT	-	53	57	-	148	200
WBT	-	79	91	-	164	240
WBR	53	208	182	18	122	113
SBL	377	102	183	> 1320	> 1320	354
SBR	144	36	42	555	383	122

For the Alternate Access scenario, the intersection is projected to operate well in the morning under all control types; however, during the evening peak hour delay for the southbound approach is projected to be significant (greater than two minutes per vehicle) under TWSC and AWSC. In addition, queueing is anticipated to be significant for the southbound left-turn under the stop-control scenarios (greater than a half-mile in length). As a result, two-way and all-way stop control are not recommended for the Alternate Access scenario.

For the signalized scenario, all movements at the intersection operate at LOS C or better during both the morning and evening peak hours. The maximum 95th percentile queue length simulated for the westbound right-turn movement is approximately 7 vehicles during the morning peak hour (or 182 feet). Based upon these results, if a signal were installed for the intersection with the new roadway connection, it does not appear the westbound queues would negatively impact operations at the proposed adjacent roundabout. The eastbound approach is shown to have a maximum 95th percentile queue length of approximately 98 feet (~4 vehicles) for the left-turn movement and 200 feet (~8 vehicles) for the through movement. The maximum 95th percentile queues for the southbound approach are projected during the evening peak hour as approximately 354 feet (~14 vehicles) for the left-turn movement and 122 feet (~5 vehicles) for the right-turn movement. The anticipated evening peak hour queuing for the southbound left-turn movement is quite common for minor-leg approaches with major streets, particularly at intersections that have a concentrated period of higher minor leg volume for a short period during the day, which can be reflective of concentrated retail locations that are often not open during the morning peak period.

SENSITIVITY ANALYSIS

As requested, a sensitivity analysis was performed for the alternate access scenario to determine the density of development that could be added prior to minor-leg stop-control no longer operating acceptably. To perform this analysis, turning movement volumes to and from the New Roadway Connection were iteratively reduced until the delay and queueing for the southbound left-turn are projected to be reasonable for future conditions. Only the evening peak hour was tested as part of the analysis since the capacity results reveal that this is when queueing and delays is the worst for the intersection. Based upon the analysis, it appears that the intersection begins to breakdown with greater than fifty percent of the development volume turning to and from the new roadway connection. Therefore, if no access is provided to CSAH 19 and TWSC is desired, the future build-out

of the planned development would need to be reduced by fifty percent in order to maintain acceptable operations and queueing for the intersection.

CONCLUSIONS AND RECOMMENDATIONS

The intersection of East Point Douglas Road with the New Roadway Connection will eventually require AWSC or signalization in 2040. If the connection to CSAH 19 is created, AWSC is anticipated to serve traffic adequately though 2040. Without the connection to CSAH 19, a signal is likely necessary by 2040 if the anticipated development occurs. If over 50% of the anticipated development occurs and the connection to CSAH 19 is not constructed, AWSC or signalized control will likely be required to adequately serve traffic. If all the development occurred and the connection was never built to CSAH 19, a signal should be able to adequately serve the projected traffic under the proposed intersection geometry.

Since the area is underdeveloped, traffic volumes will need to be monitored as the area develops to determine when the installation of AWSC or a signal is warranted.

APPENDIX

A) Existing 2015 Traffic Volumes
B) Future 2040 Traffic Volumes
C) SimTraffic Outputs

Appendix A

Existing 2015 Traffic Volumes

Turning Movement Counts (November 17, 2015)

File Name: C:\Users\Max\Dropbox (Spack Consulting)\TDI-SpackConsulting Network\TDI 2015\124-15-15 Cottage Grove TMCs & Tube\TMCs\
Start Date: 11/17/2015
Start Time: 12:00:00 AM
Site Code: 3
Comment 3: Innovation Rd & E Point Douglas Rd
Comment 4: Cottage Grove, MN

	Innovation Rd Southbound					E Point Douglas Rd Westbound					Innovation Rd Northbound					E Point Douglas Rd Eastbound				
Start Time	UTrn	Left	Thru	Right	Peds	UTrn	Left	Thru	Right	Peds	UTrn	Left	Thru	Right	Peds	UTrn	Left	Thru	Right	Peds
12:00 AM	0	0	0	3	0	0	0	0	0	0	0	2	5	0	0	0	1	0	9	0
12:15 AM	0	0	0	0	0	0	0	0	1	0	0	3	2	0	0	0	1	0	2	0
12:30 AM	0	0	1	0	0	0	0	0	0	0	0	2	1	0	0	0	1	0	3	0
12:45 AM	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	3	0
01:00 AM	0	0	2	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	4	0
01:15 AM	0	0	3	1	0	0	1	0	0	0	0	2	1	0	0	0	0	0	3	0
01:30 AM	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	4	0
01:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	6	0
02:00 AM	0	0	1	1	0	0	0	0	0	0	0	1	5	0	0	0	0	0	1	0
02:15 AM	0	0	2	0	0	0	0	0	0	0	0	2	4	0	0	0	1	0	2	0
02:30 AM	0	0	2	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1	0
02:45 AM	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
03:00 AM	0	0	3	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0
03:15 AM	0	0	5	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0
03:30 AM	0	0	4	0	0	0	0	1	0	0	0	3	2	0	0	0	1	0	4	0
03:45 AM	0	0	1	0	0	0	0	1	0	0	0	4	3	0	0	0	1	0	1	0
04:00 AM	0	0	6	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0
04:15 AM	0	0	5	1	0	0	0	1	0	0	0	1	4	0	0	0	0	0	0	0
04:30 AM	0	0	11	2	0	0	0	0	0	0	0	9	2	0	0	0	0	0	2	0
04:45 AM	0	0	19	2	0	0	0	0	0	0	0	5	1	0	0	0	0	0	2	0
05:00 AM	0	0	15	1	0	0	0	0	0	0	0	6	5	0	0	0	0	1	1	0
05:15 AM	0	0	30	2	0	0	1	0	0	0	0	5	7	0	0	1	1	0	2	0
05:30 AM	0	0	24	1	0	0	2	1	0	0	0	6	10	1	0	0	0	0	8	0
05:45 AM	0	0	32	2	0	0	2	0	0	0	0	6	6	0	0	0	2	0	4	0
06:00 AM	0	0	39	2	0	0	0	0	0	0	0	10	14	0	0	0	2	1	4	0
06:15 AM	0	0	72	3	0	0	2	1	0	0	0	10	21	0	0	0	1	0	8	0
06:30 AM	0	0	86	4	0	0	1	0	0	0	0	13	27	0	0	0	2	0	6	0
06:45 AM	0	0	81	4	0	0	4	0	0	0	0	11	34	0	0	0	1	1	8	0
07:00 AM	0	0	56	4	0	0	0	1	0	0	0	14	59	0	0	0	4	0	14	0
07:15 AM	0	0	76	2	0	0	0	2	1	0	0	17	59	0	0	0	5	0	12	0
07:30 AM	0	0	79	14	0	0	2	0	0	0	0	15	49	0	0	0	5	0	11	0
07:45 AM	1	2	86	11	0	0	1	0	0	0	0	19	37	0	0	0	4	0	9	0
08:00 AM	0	0	42	4	0	0	0	0	3	0	0	26	42	1	0	0	4	0	17	0
08:15 AM	0	0	56	9	0	0	0	0	1	0	0	15	40	1	0	0	4	0	12	0
08:30 AM	0	0	44	15	0	0	0	3	1	0	0	25	21	0	0	0	5	0	20	0
08:45 AM	0	0	43	19	0	0	2	0	0	0	0	18	19	0	0	0	7	1	15	0
09:00 AM	0	0	23	9	0	0	0	0	1	0	0	37	12	0	0	0	9	0	16	0
09:15 AM	0	0	52	7	0	0	0	0	0	0	0	18	17	2	0	0	6	0	17	0
09:30 AM	0	0	30	8	0	0	0	1	1	0	0	24	24	1	0	0	11	1	25	0
09:45 AM	0	0	30	17	0	0	0	0	1	0	0	31	21	0	0	0	4	0	29	0
10:00 AM	0	0	19	6	0	0	0	0	0	0	0	26	23	0	0	0	13	1	21	0
10:15 AM	0	0	33	11	0	0	0	0	0	0	0	25	24	1	0	0	11	0	20	0
10:30 AM	0	0	25	7	0	0	0	2	0	0	0	25	16	2	0	0	6	0	20	0
10:45 AM	0	1	23	9	0	0	0	0	1	0	0	26	17	0	0	0	13	0	29	0
11:00 AM	0	2	25	11	0	0	0	0	0	0	0	28	20	2	0	0	4	2	22	0
11:15 AM	0	0	19	14	0	0	2	0	0	0	0	25	38	0	0	0	8	1	36	0
11:30 AM	0	0	24	16	0	0	0	2	1	0	0	34	25	0	0	0	12	0	21	0
11:45 AM	0	2	18	13	0	0	2	1	2	0	0	41	25	1	0	0	14	3	42	0
12:00 PM	0	0	30	12	0	0	0	1	0	0	0	36	23	0	0	0	11	3	30	0
12:15 PM	0	0	24	13	0	0	1	3	0	0	0	35	24	2	0	0	10	1	24	0
12:30 PM	0	1	27	15	0	0	0	0	1	0	0	30	32	0	0	0	10	2	41	0
12:45 PM	0	0	24	16	0	0	0	2	0	0	0	22	23	1	0	0	4	1	39	0
01:00 PM	0	1	26	15	0	0	2	0	0	0	0	37	25	0	0	0	14	2	30	0
01:15 PM	0	0	19	19	0	0	0	1	0	0	0	30	12	0	0	0	18	3	44	0
01:30 PM	0	0	22	14	0	0	1	0	1	0	0	26	20	1	0	0	14	3	37	0
01:45 PM	0	0	30	15	0	0	1	2	0	0	0	43	27	1	0	0	17	2	34	0
02:00 PM	0	0	31	13	0	0	2	3	1	0	0	42	57	1	0	0	17	5	43	0
02:15 PM	0	1	40	14	0	0	0	1	0	0	0	32	38	0	0	0	16	3	38	0
02:30 PM	0	0	23	17	0	0	0	1	2	0	0	45	48	0	0	0	7	0	44	0
02:45 PM	0	1	35	13	0	0	0	0	0	0	0	44	33	1	0	0	25	1	45	0
03:00 PM	0	0	25	16	0	0	0	1	0	0	0	38	57	3	0	0	12	1	36	0
03:15 PM	0	1	44	17	0	0	0	0	0	0	0	39	57	1	0	0	13	1	40	0
03:30 PM	0	1	42	22	0	0	0	2	2	0	0	47	56	0	1	0	20	2	40	0
03:45 PM	0	0	46	22	0	0	0	1	0	0	0	41	54	4	0	0	18	2	50	0
04:00 PM	0	0	53	20	0	0	1	2	0	0	0	51	65	2	0	0	14	4	49	0
04:15 PM	0	2	57	24	0	0	0	1	0	0	0	40	85	1	0	0	14	1	58	0
04:30 PM	0	0	70	21	0	0	0	4	1	0	0	42	87	1	0	0	19	3	51	0
04:45 PM	0	0	57	36	0	0	0	0	0	0	0	54	77	0	0	0	18	1	38	0
05:00 PM	0	1	56	25	0	0	1	3	2	0	0	43	84	1	0	0	19	0	69	0
05:15 PM	0	0	43	19	0	0	0	1	0	0	0	46	63	0	0	0	28	2	63	0
05:30 PM	0	1	32	13	0	0	1	1	2	0	0	30	62	2	0	0	16	2	49	0
05:45 PM	0	0	24	25	0	0	0	4	0	0	0	35	60	1	0	0	13	3	40	0
06:00 PM	0	0	30	18	0	0	2	3	0	0	0	38	51	4	0	0	24	2	37	0
06:15 PM	0	0	29	20	0	0	1	2	0	0	0	35	51	4	0	0	11	1	41	0
06:30 PM	0	0	17	12	0	0	3	0	0	0	0	18	21	0	0	0	12	2	40	0
06:45 PM	0	0	30	16	0	0	0	1	0	0	0	25	26	0	0	0	9	3	29	0
07:00 PM	0	1	27	14	0	0	0	0	2	0	0	19	23	1	0	0	12	0	33	0
07:15 PM	0	1	26	12	0	0	0	0	0	0	0	19	22	0	0	0	8	1	20	0
07:30 PM	0	0	11	11	0	0	0	0	0	0	0	11	15	0	0	0	14	0	21	0
07:45 PM	0	1	11	4	0	0	0	0	1	0	0	15	18	0	0	0	6	1	25	0
08:00 PM	0	1	14	5	0	0	1	0	0	0	0	10	23	0	0	0	10	2	31	0
08:15 PM	0	0	14	10	0	0	0	2	0	0	0	12	21	1	0	0	10	0	12	0
08:30 PM	0	0	20	9	0	0	1	1	0	0	0	11	18	1	0	0	8	2	13	0
08:45 PM	0	1	18	5	0	0	1	0	0	0	0	9	7	0	0	0	12	0	13	0
09:00 PM	0	0	11	10	0	0	0	1	0	0	0	7	18	0	0	0	6	0	11	0
09:15 PM	0	0	8	5	0	0	0	0	0	0	0	9	10	1	0	0	11	1	22	0
09:30 PM	0	0	13	5	0	0	0	0	0	0	0	12	10	0	0	0	3	1	4	0
09:45 PM	0	1	8	3	0	0	0	1	0	0	0	18	12	0	0	0	7	0	11	0
10:00 PM	0	0	8	11	0	0	0	0	0	0	0	7	15	0	0	0	6	1	14	0
10:15 PM	0	0	8	1	0	0	0	0	0	0	0	9	8	0	0	0	4	0	9	0
10:30 PM	0	0	6	5	0	0	0	0	0	0	0	3	12	0	0	0	3	0	10	0
10:45 PM	0	0	4	0	0	0	0	0	0	0	0	7	11	1	0	0	3	1	8	0
11:00 PM	0	0	3	1	0	0	0	0	0	0	0	5	9	0	0	0	4	0	5	0
11:15 PM	0	0	5	0	0	0	0	0	1	0	0	4	13	0	0	0	1	0	8	0
11:30 PM	0	0	4	1	0	0	0	0	0	0	0	7	3	0	0	0	0	0	2	0
11:45 PM	0	0	1	1	0	0	0	0	0	0	0	3	4	0	0	0	2	0	2	0

Appendix B

Projected 2040 Volumes

Baseline Scenario - Projected 2040 AM Peak Hour Volumes



Baseline Scenario - Projected 2040 PM Peak Hour Volumes



Alternate Access Scenario - Projected 2040 AM Peak Hour Volumes



Alternate Access Scenario - Projected 2040 PM Peak Hour Volumes



Alternate Access Scenario @ 50% Development **- Projected 2040 PM Peak Hour Volumes**



Alternate Access Scenario @ 55% Development - Projected 2040 PM Peak Hour Volumes



Appendix C

SimTraffic Output

3: East Point Douglas Road & New Roadway Connection Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	3.5	0.5	0.7	3.4	10.4	11.1	5.0
Total Del/Veh (s)	4.8	1.1	1.1	0.6	218.1	99.1	71.9
Vehicles Entered	89	291	287	196	372	170	1405
Vehicles Exited	89	291	288	196	355	164	1383
Hourly Exit Rate	89	291	288	196	355	164	1383
Input Volume	90	290	295	190	360	170	1395
% of Volume	99	100	98	103	99	96	99
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	3	1	4

Total Network Performance

Denied Del/Veh (s)	5.0
Total Del/Veh (s)	72.2
Vehicles Entered	1405
Vehicles Exited	1382
Hourly Exit Rate	1382
Input Volume	2790
% of Volume	50
Denied Entry Before	0
Denied Entry After	4

Intersection: 3: East Point Douglas Road & New Roadway Connection

Movement	EB	WB	SB	SB
Directions Served	L	R	L	R
Maximum Queue (ft)	62	22	1354	400
Average Queue (ft)	26	2	770	297
95th Queue (ft)	53	11	1503	568
Link Distance (ft)			1716	
Upstream Blk Time (%)			5	
Queuing Penalty (veh)			0	
Storage Bay Dist (ft)	220	220		220
Storage Blk Time (%)			84	
Queuing Penalty (veh)			144	

Network Summary

Network wide Queuing Penalty: 144

3: East Point Douglas Road & Proposed Access Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	3.5	0.6	1.0	3.5	0.8	3.3	1.7
Total Del/Veh (s)	35.5	18.5	20.2	4.4	11.4	4.8	14.4
Vehicles Entered	89	291	287	196	376	171	1410
Vehicles Exited	89	292	287	195	376	171	1410
Hourly Exit Rate	89	292	287	195	376	171	1410
Input Volume	90	290	295	190	360	170	1395
% of Volume	99	101	97	103	104	101	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	1.7
Total Del/Veh (s)	16.0
Vehicles Entered	1410
Vehicles Exited	1410
Hourly Exit Rate	1410
Input Volume	2790
% of Volume	51
Denied Entry Before	0
Denied Entry After	0

Intersection: 3: East Point Douglas Road & Proposed Access

Movement	EB	EB	WB	WB	SB	SB
Directions Served	L	T	T	R	L	R
Maximum Queue (ft)	132	204	212	86	210	99
Average Queue (ft)	56	105	109	41	106	35
95th Queue (ft)	107	174	179	70	184	72
Link Distance (ft)		406	425		560	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	220			220		220
Storage Blk Time (%)		0	0		0	
Queuing Penalty (veh)		0	0		0	

Network Summary

Network wide Queuing Penalty: 1

3: East Point Douglas Road & Proposed Access Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	3.6	0.6	1.0	3.5	1.0	3.3	1.7
Total Del/Veh (s)	10.0	15.7	18.1	5.9	23.9	6.3	15.6
Vehicles Entered	89	291	287	196	375	171	1409
Vehicles Exited	89	291	287	195	376	171	1409
Hourly Exit Rate	89	291	287	195	376	171	1409
Input Volume	90	290	295	190	360	170	1395
% of Volume	99	100	97	103	104	101	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	1.7
Total Del/Veh (s)	17.8
Vehicles Entered	1409
Vehicles Exited	1410
Hourly Exit Rate	1410
Input Volume	2790
% of Volume	51
Denied Entry Before	0
Denied Entry After	0

Intersection: 3: East Point Douglas Road & Proposed Access

Movement	EB	EB	WB	WB	SB	SB
Directions Served	L	T	T	R	L	R
Maximum Queue (ft)	67	150	167	91	272	109
Average Queue (ft)	35	74	80	45	119	38
95th Queue (ft)	58	125	137	74	242	95
Link Distance (ft)		445	426		458	
Upstream Blk Time (%)					0	
Queuing Penalty (veh)					0	
Storage Bay Dist (ft)	220			220		220
Storage Blk Time (%)		0	0		5	
Queuing Penalty (veh)		0	1		8	

Network Summary

Network wide Queuing Penalty: 9

3: East Point Douglas Road & New Roadway Connection Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	3.8	0.4	0.8	3.5	0.4	3.7	2.4
Total Del/Veh (s)	5.3	0.5	0.6	1.0	13.6	3.2	4.4
Vehicles Entered	138	63	95	295	176	70	837
Vehicles Exited	138	62	96	294	176	70	836
Hourly Exit Rate	138	62	96	294	176	70	836
Input Volume	135	65	100	290	170	70	830
% of Volume	102	95	96	101	104	100	101
Denied Entry Before	0	0	0	1	0	0	1
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	2.4
Total Del/Veh (s)	4.9
Vehicles Entered	837
Vehicles Exited	836
Hourly Exit Rate	836
Input Volume	1660
% of Volume	50
Denied Entry Before	1
Denied Entry After	0

Intersection: 3: East Point Douglas Road & New Roadway Connection

Movement	EB	WB	SB	SB
Directions Served	L	R	L	R
Maximum Queue (ft)	84	41	139	48
Average Queue (ft)	34	6	56	21
95th Queue (ft)	66	26	106	38
Link Distance (ft)			434	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	220	220		220
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty: 0

3: East Point Douglas Road & Proposed Access Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	3.8	0.4	1.0	3.6	0.4	3.7	2.4
Total Del/Veh (s)	28.7	13.9	16.5	5.0	7.8	2.2	11.2
Vehicles Entered	138	63	96	295	176	70	838
Vehicles Exited	137	63	96	294	176	70	836
Hourly Exit Rate	137	63	96	294	176	70	836
Input Volume	135	65	100	290	170	70	830
% of Volume	101	97	96	101	104	100	101
Denied Entry Before	0	0	0	1	0	0	1
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	2.4
Total Del/Veh (s)	12.2
Vehicles Entered	838
Vehicles Exited	836
Hourly Exit Rate	836
Input Volume	1660
% of Volume	50
Denied Entry Before	1
Denied Entry After	0

Intersection: 3: East Point Douglas Road & Proposed Access

Movement	EB	EB	WB	WB	SB	SB
Directions Served	L	T	T	R	L	R
Maximum Queue (ft)	152	78	87	115	124	47
Average Queue (ft)	75	29	41	53	46	16
95th Queue (ft)	131	63	80	88	98	37
Link Distance (ft)		406	425		560	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	220			220		220
Storage Blk Time (%)						
Queuing Penalty (veh)						

Network Summary

Network wide Queuing Penalty: 0

3: East Point Douglas Road & Proposed Access Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	3.8	0.4	0.9	3.6	0.4	3.7	2.4
Total Del/Veh (s)	5.9	8.2	9.1	5.3	6.4	2.9	6.1
Vehicles Entered	138	63	95	295	176	70	837
Vehicles Exited	138	62	96	295	176	70	837
Hourly Exit Rate	138	62	96	295	176	70	837
Input Volume	135	65	100	290	170	70	830
% of Volume	102	95	96	102	104	100	101
Denied Entry Before	0	0	0	1	0	0	1
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	2.4
Total Del/Veh (s)	7.3
Vehicles Entered	837
Vehicles Exited	836
Hourly Exit Rate	836
Input Volume	1660
% of Volume	50
Denied Entry Before	1
Denied Entry After	0

Intersection: 3: East Point Douglas Road & Proposed Access

Movement	EB	EB	WB	WB	SB	SB
Directions Served	L	T	T	R	L	R
Maximum Queue (ft)	71	58	64	109	89	47
Average Queue (ft)	36	30	34	54	40	20
95th Queue (ft)	57	52	55	87	69	37
Link Distance (ft)		445	426		458	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	220			220		220
Storage Blk Time (%)						
Queuing Penalty (veh)						

Network Summary

Network wide Queuing Penalty: 0

3: East Point Douglas Road & New Roadway Connection Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	3.5	0.5	1.0	3.2	1067.6	1061.3	498.0
Total Del/Veh (s)	7.7	1.1	0.9	1.2	466.8	341.0	143.2
Vehicles Entered	88	293	287	364	339	86	1457
Vehicles Exited	89	292	287	364	339	86	1457
Hourly Exit Rate	89	292	287	364	339	86	1457
Input Volume	90	290	295	360	670	170	1875
% of Volume	99	101	97	101	51	51	78
Denied Entry Before	0	0	0	0	36	8	44
Denied Entry After	0	0	0	0	385	91	476

Total Network Performance

Denied Del/Veh (s)	498.0
Total Del/Veh (s)	143.0
Vehicles Entered	1457
Vehicles Exited	1458
Hourly Exit Rate	1458
Input Volume	3750
% of Volume	39
Denied Entry Before	44
Denied Entry After	476

Intersection: 3: East Point Douglas Road & New Roadway Connection

Movement	EB	WB	SB	SB
Directions Served	L	R	L	R
Maximum Queue (ft)	73	31	1530	400
Average Queue (ft)	31	4	1497	360
95th Queue (ft)	59	18	1516	555
Link Distance (ft)			1476	
Upstream Blk Time (%)			100	
Queuing Penalty (veh)			0	
Storage Bay Dist (ft)	220	220		220
Storage Blk Time (%)			100	
Queuing Penalty (veh)			170	

Network Summary

Network wide Queuing Penalty: 170

3: East Point Douglas Road & Proposed Access Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	3.5	0.6	1.5	3.5	1.3	3.1	1.9
Total Del/Veh (s)	27.9	22.4	33.3	7.3	16.7	5.9	17.9
Vehicles Entered	88	293	288	364	688	170	1891
Vehicles Exited	89	293	287	363	689	170	1891
Hourly Exit Rate	89	293	287	363	689	170	1891
Input Volume	90	290	295	360	670	170	1875
% of Volume	99	101	97	101	103	100	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	1.9
Total Del/Veh (s)	19.6
Vehicles Entered	1891
Vehicles Exited	1893
Hourly Exit Rate	1893
Input Volume	3750
% of Volume	50
Denied Entry Before	0
Denied Entry After	0

Intersection: 3: East Point Douglas Road & Proposed Access

Movement	EB	EB	WB	WB	SB	SB
Directions Served	L	T	T	R	L	R
Maximum Queue (ft)	119	230	288	136	405	178
Average Queue (ft)	53	118	147	69	216	42
95th Queue (ft)	98	200	240	113	354	122
Link Distance (ft)		406	425		560	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	220			220		220
Storage Blk Time (%)		0	2		8	
Queuing Penalty (veh)		0	7		14	

Network Summary

Network wide Queuing Penalty: 21

3: East Point Douglas Road & Proposed Access Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	3.6	0.6	1.5	3.4	591.3	576.4	269.1
Total Del/Veh (s)	12.0	20.1	23.9	9.4	363.4	278.1	145.3
Vehicles Entered	88	293	288	364	480	118	1631
Vehicles Exited	89	293	287	363	474	118	1624
Hourly Exit Rate	89	293	287	363	474	118	1624
Input Volume	90	290	295	360	670	170	1875
% of Volume	99	101	97	101	71	69	87
Denied Entry Before	0	0	0	0	6	1	7
Denied Entry After	0	0	0	0	214	52	266

Total Network Performance

Denied Del/Veh (s)	269.1
Total Del/Veh (s)	146.6
Vehicles Entered	1631
Vehicles Exited	1624
Hourly Exit Rate	1624
Input Volume	3750
% of Volume	43
Denied Entry Before	7
Denied Entry After	266

Intersection: 3: East Point Douglas Road & Proposed Access

Movement	EB	EB	WB	WB	SB	SB
Directions Served	L	T	T	R	L	R
Maximum Queue (ft)	71	178	208	150	1700	400
Average Queue (ft)	38	87	95	76	1665	383
95th Queue (ft)	64	148	164	122	1719	514
Link Distance (ft)		445	426		1645	
Upstream Blk Time (%)					98	
Queuing Penalty (veh)					0	
Storage Bay Dist (ft)	220			220		220
Storage Blk Time (%)		0	1		100	
Queuing Penalty (veh)		0	2		170	

Network Summary

Network wide Queuing Penalty: 172

3: East Point Douglas Road & New Roadway Connection Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	3.8	0.4	1.1	3.3	0.5	3.1	2.3
Total Del/Veh (s)	13.1	0.7	0.8	2.1	46.9	5.6	14.3
Vehicles Entered	137	63	97	546	294	70	1207
Vehicles Exited	137	63	97	546	292	70	1205
Hourly Exit Rate	137	63	97	546	292	70	1205
Input Volume	135	65	100	545	280	70	1195
% of Volume	101	97	97	100	104	100	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	2.3
Total Del/Veh (s)	15.1
Vehicles Entered	1207
Vehicles Exited	1203
Hourly Exit Rate	1203
Input Volume	2390
% of Volume	50
Denied Entry Before	0
Denied Entry After	0

Intersection: 3: East Point Douglas Road & New Roadway Connection

Movement	EB	WB	SB	SB
Directions Served	L	R	L	R
Maximum Queue (ft)	125	84	435	155
Average Queue (ft)	50	15	164	33
95th Queue (ft)	92	53	377	144
Link Distance (ft)			924	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	220	220		220
Storage Blk Time (%)			9	
Queuing Penalty (veh)			7	

Network Summary

Network wide Queuing Penalty: 7

3: East Point Douglas Road & Proposed Access Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	3.8	0.4	1.6	3.5	0.5	3.5	2.5
Total Del/Veh (s)	20.7	10.8	19.4	9.2	14.9	3.1	12.4
Vehicles Entered	137	63	97	546	294	70	1207
Vehicles Exited	137	63	96	546	294	70	1206
Hourly Exit Rate	137	63	96	546	294	70	1206
Input Volume	135	65	100	545	280	70	1195
% of Volume	101	97	96	100	105	100	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	2.5
Total Del/Veh (s)	13.4
Vehicles Entered	1207
Vehicles Exited	1206
Hourly Exit Rate	1206
Input Volume	2390
% of Volume	50
Denied Entry Before	0
Denied Entry After	0

Intersection: 3: East Point Douglas Road & Proposed Access

Movement	EB	EB	WB	WB	SB	SB
Directions Served	L	T	T	R	L	R
Maximum Queue (ft)	128	67	116	226	219	51
Average Queue (ft)	62	23	46	106	97	18
95th Queue (ft)	106	57	91	182	183	42
Link Distance (ft)		406	425		560	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	220			220		220
Storage Blk Time (%)				0	0	
Queuing Penalty (veh)				0	0	

Network Summary

Network wide Queuing Penalty: 1

3: East Point Douglas Road & Proposed Access Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Del/Veh (s)	3.8	0.4	1.4	3.4	0.5	3.5	2.4
Total Del/Veh (s)	6.9	8.8	9.9	11.9	8.3	3.3	9.6
Vehicles Entered	137	63	97	546	294	70	1207
Vehicles Exited	137	63	97	545	294	70	1206
Hourly Exit Rate	137	63	97	545	294	70	1206
Input Volume	135	65	100	545	280	70	1195
% of Volume	101	97	97	100	105	100	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Denied Del/Veh (s)	2.4
Total Del/Veh (s)	10.8
Vehicles Entered	1207
Vehicles Exited	1206
Hourly Exit Rate	1206
Input Volume	2390
% of Volume	50
Denied Entry Before	0
Denied Entry After	0

Intersection: 3: East Point Douglas Road & Proposed Access

Movement	EB	EB	WB	WB	SB	SB
Directions Served	L	T	T	R	L	R
Maximum Queue (ft)	81	58	106	266	126	46
Average Queue (ft)	38	30	37	113	60	20
95th Queue (ft)	61	53	79	208	102	36
Link Distance (ft)		445	426		458	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	220			220		220
Storage Blk Time (%)				2		
Queuing Penalty (veh)				2		

Network Summary

Network wide Queuing Penalty: 2

MEMORANDUM

To: Joe Gustafson, P.E., PTOE

From: Brandon Bourdon, P.E.
William Reynolds, P.E., AICP, PTP

Date: April 27, 2016

Subject: CSAH 19 Traffic Operations Memorandum

Washington County is investigating several design and intersection control options for the intersections on CSAH 19 between Highway 10/61 and 90th Street S. in Cottage Grove, Minnesota. To determine the potential traffic volumes in the area through 2040, the Washington County Travel Demand Model was updated with revised development assumptions and the resulting daily traffic volumes were converted to estimated turning movement volumes, as documented in the **Travel Demand Forecasting Memorandum** (April 2016). The following memorandum outlines the process used for screening potential design and control options at the two closely spaced intersections north of Highway 10/Highway 61 (CSAH 19 & Highway 10/61 Westbound, CSAH 19 & East Point Douglas Road).

Forecasted Turning Movement Volumes

As detailed in the **Travel Demand Forecasting Memorandum,** the following daily traffic volumes are anticipated within the study area by 2040 (current 2015 volumes shown in parentheses):

- CSAH 19 - North of East Point Douglas 24,000 (6,100)
- East Point Douglas Road 16,400 (5,500)
- CSAH 19 - South of East Point Douglas 27,000 (8,700)
- Highway 10/61 Westbound (Off) 7,800 (2,700)
- Highway 10/61 Westbound (On) 8,200 (2,000)
- CSAH 19 - Highway 61 Overpass 24,000 (6,000)
- Highway 10/61 Eastbound (Off) 8,300 (2,100)
- Highway 10/61 Eastbound (On) 7,900 (3,000)
- CSAH 19 - South Highway 61 14,900 (2,500)

Given the significant amount of growth expected along CSAH 19 by 2040, existing turning movement percentages will largely no longer apply under a Full-Build scenario. Procedures outlined in NCHRP Report 765 were therefore used to generate future peak hour turning movement volumes, relying on forecasted daily traffic volumes, K-factors to estimate AM and PM peak hour volumes, D-factors to estimate peak hour approach volumes, and initial turning movement estimates to arrive at balanced peak hour volumes through an iterative process. These forecasted turning movement volumes are presented in an attachment to this memo (**Attachment A**).

Growth Rates and Volume Adjustment Factor

Traffic volumes on CSAH 19 are currently around 25% to 35% of the forecasted 2040 daily volumes, indicating a general compound growth rate of 4.6% to 5.8%, depending on the year in which Full-Build volumes are assumed. **Figure** 1 shows these growth rates for CSAH 19 between East Point Douglas Road and the Highway 10/61 westbound ramps, expressed in terms of a **Volume Adjustment Factor** applied to the Full-Build volumes for the segment. For the traffic analysis discussed in subsequent sections, this Volume Adjustment Factor was used to reduce Full-Build turning movement volumes to interim year scenarios.



Figure 1: Assumed Growth Rates and Resultant Volume Adjustment Factors

Screening of Design Alternatives

CSAH 19 is currently a four-lane undivided roadway north of Highway 10/61, dropping to two lanes at the highway overpass. All intersections in the study area are stop-controlled on the minor street approach. Recent development on East Point Douglas Road has significantly increased traffic volumes in the area. Increased volumes combined with an increase in crashes in the area has led to the desire to implement a design solution at the westbound Highway 10/61 ramp intersection as well

as the East Point Douglas Road intersection that can improve existing conditions while accommodating future growth.

In order to advance a single preferred alternative to a more detailed operational analysis, a screening process was used to identify the key issues associated with the No Build option, a 4-legged roundabout alternative, and a 6-legged roundabout alternative. Signals were not advanced for consideration due to safety concerns and the inefficiencies associated with operating two closely spaced signalized intersections (less than 300 feet) with very limited turn lane storage capacity.

By 2030, it was assumed that a new roadway connection to CSAH 19 will be established north of Highway 10/61. Volumes on this approach were developed by adjusting the volumes shown for East Point Douglas Road in the attachment, assuming 80 percent of vehicles would utilize the first access point encountered (for traffic bound for East Point Douglas Road), or the access closest to their destination (for traffic bound for CSAH 19).

For the 2030 scenario, a volume adjustment factor of 0.75 was assumed, which would indicate daily volumes on CSAH 19 of around 20,000 vehicles per day, or 5.8% growth over 15 years. This factor also corresponds to approximately 18,000 vehicles per day on the overpass, which is likely the upper limit for a two-lane bridge. It should be noted that this analysis assumes improvements would be made at the ramp intersection on the south side of Highway 10/61, but a detailed analysis was not performed. In order to process the demands expected by 2030, the eastbound ramps would likely need to be shifted to the south in order to accommodate a roundabout or a signalized intersection with turn lanes.

Preliminary layouts for each of the design alternatives are provided in **Attachment G**. The alternatives include No Build, a 4-legged roundabout, and a 6-legged roundabout. A comparison of the operations of each alternative is summarized in **Table 1** for 2030 and 2040.

Table 1: Screening Analysis

	Accommodates Traffic Growth Through 2030? (Two-Lane Bridge)	Accommodates Traffic Growth Through 2040? (Four-Lane Bridge)	Notes
No Build	X	X	• E. Point Douglas Rd. likely to exceed v/c = 0.9 within 5-10 years (**see Attachment B**) • By 2040, volumes too high for two-way stop control
4-Leg Roundabout	X	X	• Left turns from the Highway 10 westbound exits ramps would need to be restricted (southbound vehicles would need to turn right and travel through the roundabout to make a U-turn), and the roundabout could generate queuing on the freeway ramps in both scenarios (see **Attachment C** and **D**)
6-Leg Roundabout	✓	✓	• Option allows ramps and E. Pt. Douglas Road to operate as a single intersection, allowing full movements • Roundabout could be designed for the Full-Build scenario, and restriped after bridge construction (see **Attachment E** and **F**)

Preferred alternative shown in gray

As shown in the table, a single-lane 6-leg roundabout is likely to accommodate demands through approximately 2030, and a dual-lane 6-leg roundabout with a 4-lane bridge will accommodate all growth expected in the area through 2040.

Maintaining two-way stop control is likely not an option for the volumes projected on CSAH 19. With a small increase in left turning traffic from E. Pt. Douglas Road and some expected background growth, two-way stop control is likely to exceed capacity within the next 5 to 10 years.

The 4-lane roundabout would operate very near capacity under each of the scenarios, and given the potential for ramp queuing, the 6-leg roundabout is preferred.

For these reasons, the 6-leg roundabout alternative was advanced as the preferred option for additional analysis.

Preferred Alternative

The preferred 6-leg roundabout combines two closely spaced intersection into one control point while allowing full movements from each approach. By slowing traffic through the roundabout, the potential for severe crashes is greatly reduced. Additionally, the roundabout can be designed in a way to allow for expansion from one to two lanes when needed.

Interim Year

There is significant uncertainty inherit in long-range forecasting, and traffic volumes in future years depend on economic conditions and development activity over time. Although CSAH 19 does provide a connection between Highway 10/61 and Woodbury, many parallel routes are available, and traffic growth is likely more related to local development patterns rather than through traffic from surrounding areas. Because of this, the 2040 forecasts presented in the memo largely represent traffic volumes when the development assumptions established within the Cottage Grove Comprehensive Plan and the East Ravine AUAR are achieved.

In order to assess the longevity of an interim single-lane 6-leg roundabout assuming a two-lane bridge, a sensitivity analysis was performed in Rodel. Future Full-Build volumes were reduced incrementally to the point at which no approach exceeded a volume to capacity (v/c) ratio of 0.9, which is generally the demand at which recurring congestion can be expected. Assuming a growth rate around 4.6% to 5.8%, a single-lane 6-leg roundabout is likely to serve demands through around 2030 to 2033. **Table 2** presents the results of this interim year analysis for the PM peak period, showing estimated volumes, delays, and level of service (LOS). Note that the results assume a new connection to CSAH 19 north of the proposed roundabout, which serves a portion of the anticipated demand for E. Pt. Douglas Road. Additionally, improvements to the ramp intersection south of Highway 10/61 would be needed to serve anticipated demands.

Table 2: Interim Year Analysis

Interim Conditions Rodel Summary - PM - Single-Lane 6-Leg Roundabout with a 2-Lane Bridge (v/c > 0.9 at 2030-2033)																
Intersection	Control	Approach	Operations by Movement												Overall Intersection	
			Left				Through				Right					
			Demand	v/c	Delay (sec/veh)	LOS	Demand	v/c	Delay (sec/veh)	LOS	Demand	v/c	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Innovation Rd & E Point Douglas Rd & US 61 WB Exit	Round-about	EB	55	0.67	15	B	10	0.67	15	B	225/110	0.67	15	B	18	C
		WB	7/4	0.08	8	A	10	0.08	8	A	15	0.08	8	A		
		NB	265/135	0.82	13	B	465	0.82	13	B	9	0.82	13	B		
		SB	15	0.90	24	C	425	0.90	24	C	215/40	0.90	24	C		
		NEB	-	-	-	-	-	-	-	-	-	-	-	-		
		NWB	210/4	0.84	22	C	80	0.84	22	C	269/5	0.84	22	C		

Full-Build Analysis

When the development assumptions for the area are realized (both north and south of Highway 10/61), the existing two-lane bridge will need to be expanded to four lanes. With the bridge expansion, the roundabout would need to be reconstructed to two lanes, and two entering and two exiting lanes would been needed on the approaches along CSAH 19. With these improvements, the two-lane, 6-leg roundabout is likely to have adequate capacity to serve all forecasted demands through 2040. **Table 3** presents the results of the Full-Build analysis for the PM peak period.

Table 3: Full-Build Analysis

Full-Build Conditions Rodel Summary - PM - Multi-Lane 6-Leg Roundabout with a 4-Lane Bridge																
Intersection	Control	Approach	Operations by Movement												Overall Intersection	
			Left				Through				Right					
			Demand	v/c	Delay (sec/veh)	LOS	Demand	v/c	Delay (sec/veh)	LOS	Demand	v/c	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
Innovation Rd & E Point Douglas Rd & US 61 WB Exit	Round-about	EB	75	0.45	7	A	15	0.45	7	A	307/153	0.45	7	A	8	A
		WB	10/5	0.07	5	A	15	0.07	5	A	20	0.07	5	A		
		NB	365/187	0.56	6	A	636	0.56	6	A	13	0.56	6	A		
		SB	20	0.59	8	A	583	0.59	8	A	292/55	0.59	8	A		
		NEB	-	-	-	-	-	-	-	-	-	-	-	-		
		NWB	285/5	0.56	10	B	108	0.56	10	B	369/7	0.56	10	B		

Recommendation

The roundabout design alternatives presented in this memo will accommodate a significant amount of growth in the area compared to existing conditions. Given the amount of growth forecasted along CSAH 19, however, there is a desire to implement a solution now that can be easily modified to accommodate the long-term growth potential. The 6-leg roundabout alternative is likely to be the most costly solution in the near term. However, it can be easily expanded to accommodate future needs and therefore best serves the long-term needs on CSAH 19. Additionally, by slowing traffic, eliminating left turn conflict points, and removing two closely spaced intersections, the 6-lane roundabout alternative will reduce the potential for severe crashes and queue spillback between intersections.

Kimley»Horn

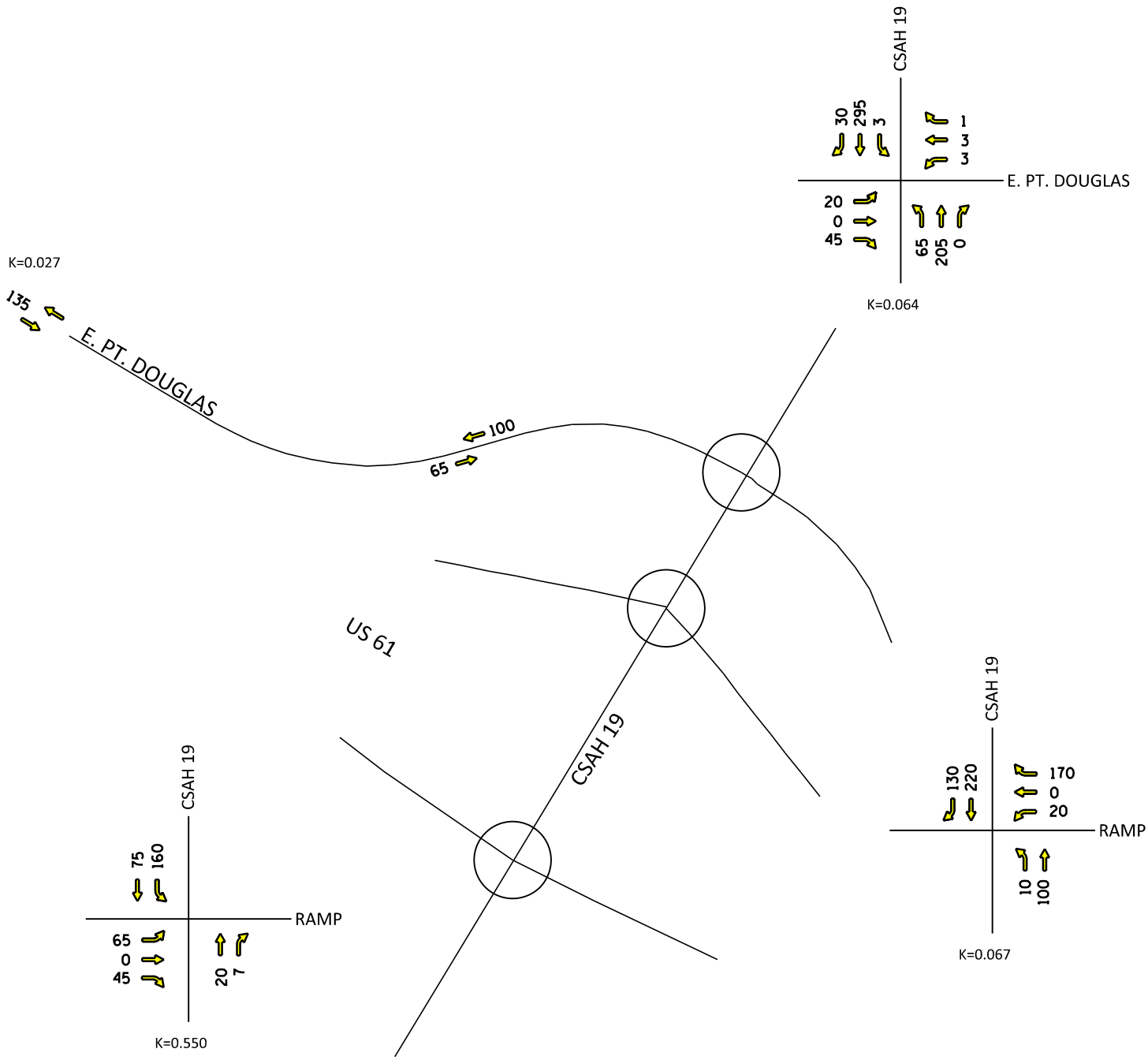
Attachment A

Existing and Forecasted Traffic Volumes

(Shown Without Proposed New Access North of East Point Douglas Road)

AM PEAK HOUR: 7:00 AM

Existing Conditions (2015)



Kimley»Horn

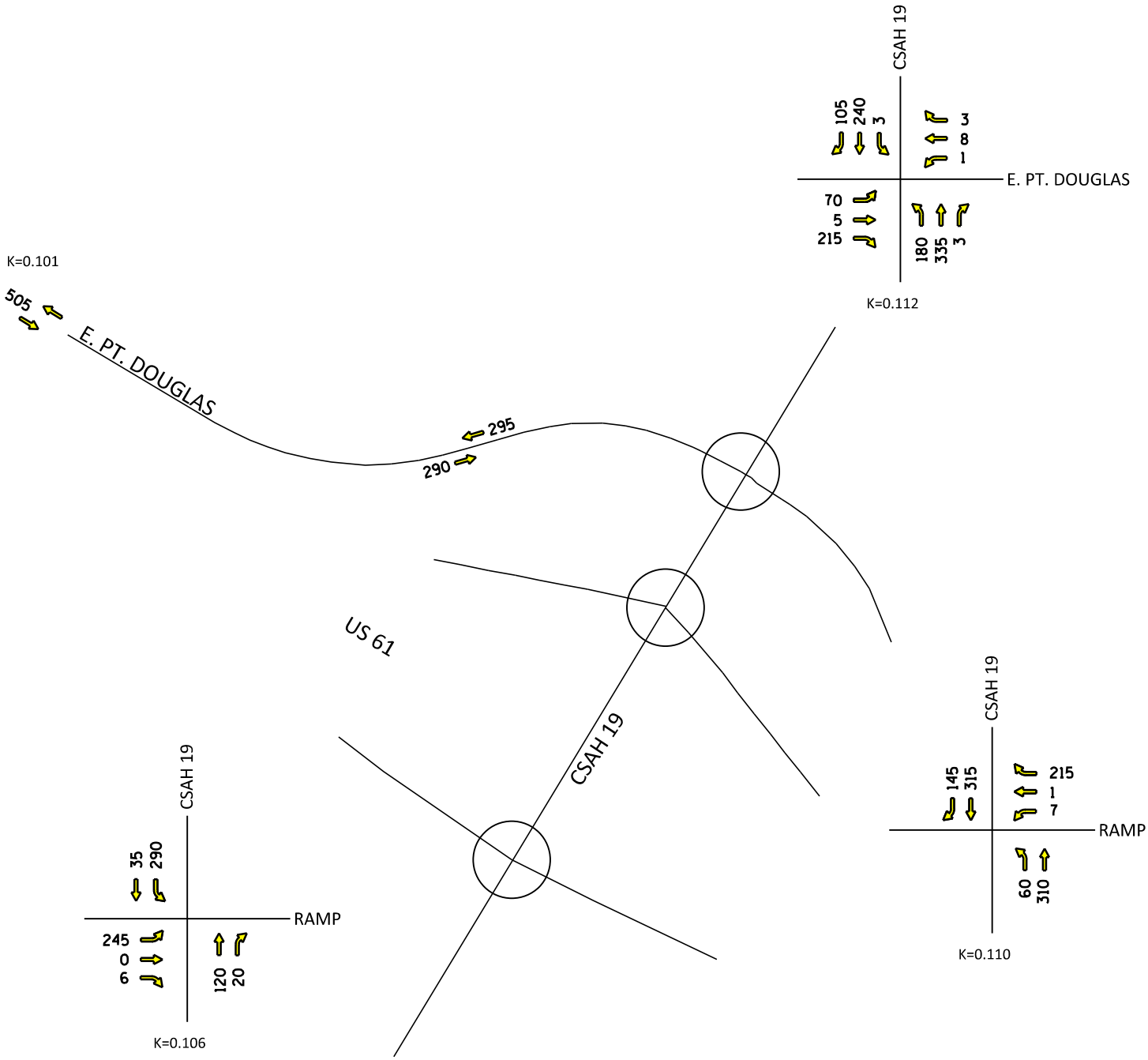
Washington County

WASHINGTON COUNTY
COUNTY ROAD 19/US HIGHWAY 61
IMPROVEMENTS

11906-AM PEAK TRAF.dgn

PM PEAK HOUR: 4:15 PM

Existing Conditions (2015)



Kimley»Horn

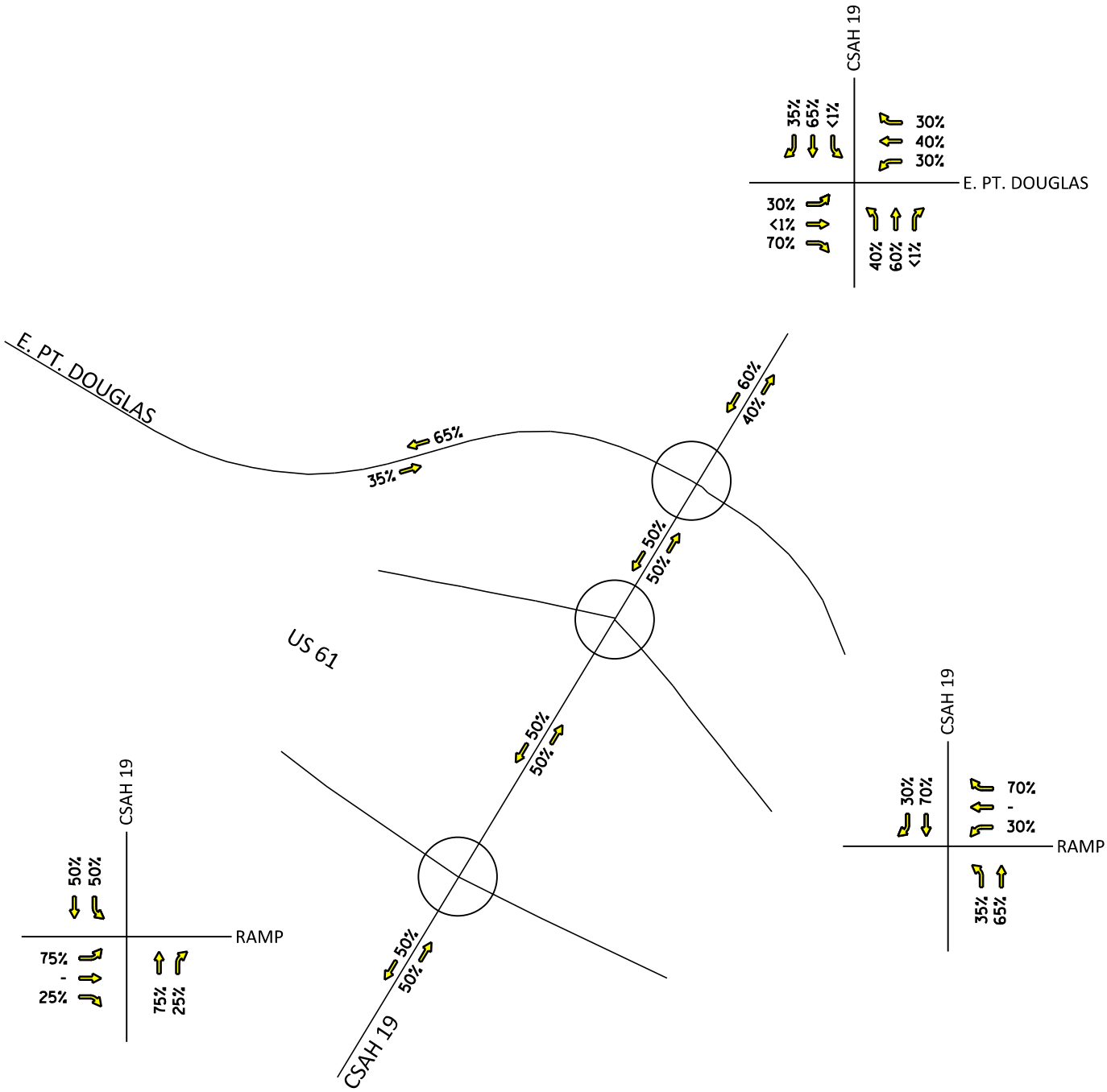
Washington County

WASHINGTON COUNTY
COUNTY ROAD 19/US HIGHWAY 61
IMPROVEMENTS

11906-PM PEAK TRAF.dgn

2040 AM PEAK HOUR

FORECASTED TURNING
MOVEMENT PERCENTAGES



DATE: MARCH 18, 2016

ASSUMED K-FACTOR: 0.06

Kimley»Horn

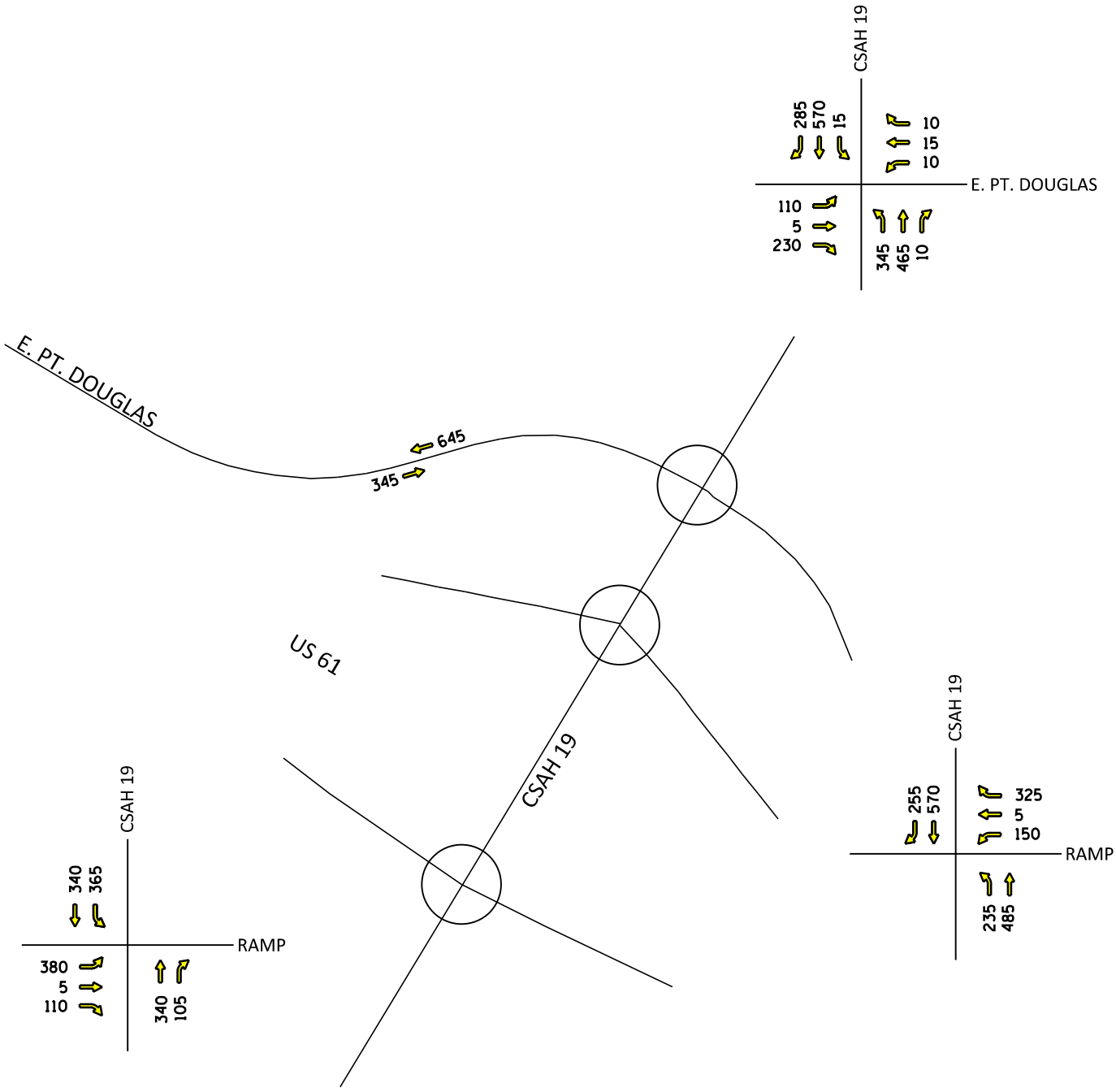
Washington County

WASHINGTON COUNTY
COUNTY ROAD 19/US HIGHWAY 61
IMPROVEMENTS

11906-AM PEAK TRAF-PCT.dgn

2040 AM PEAK HOUR

FORECASTED TURNING
MOVEMENT VOLUMES



DATE: MARCH 18, 2016

Kimley»Horn

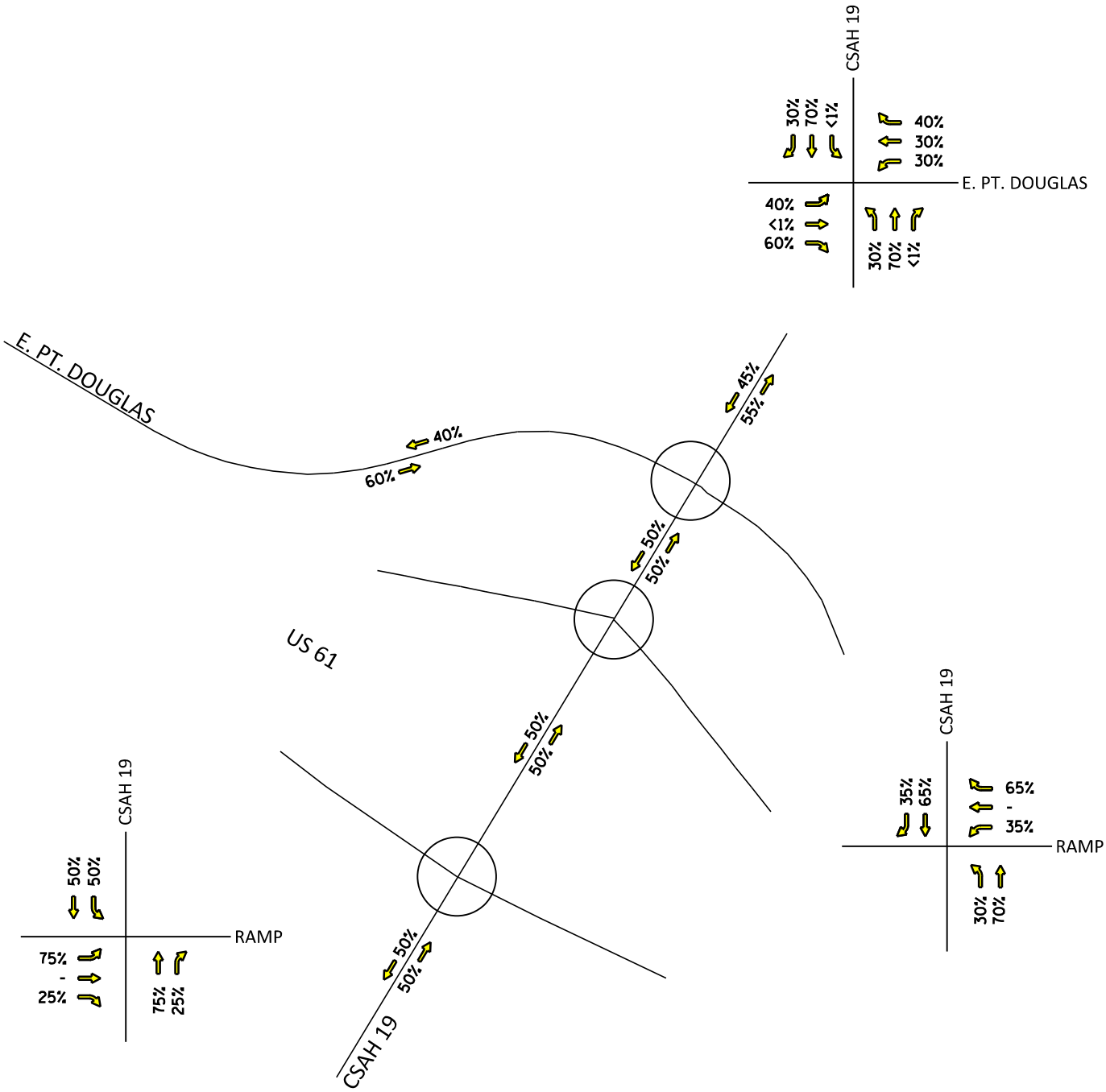
Washington County

WASHINGTON COUNTY
COUNTY ROAD 19/US HIGHWAY 61
IMPROVEMENTS

11906-AM PEAK TRAF-2030.dgn

2040 PM PEAK HOUR

FORECASTED TURNING
MOVEMENT PERCENTAGES



DATE: MARCH 18, 2016

ASSUMED K-FACTOR: 0.10

Kimley»Horn

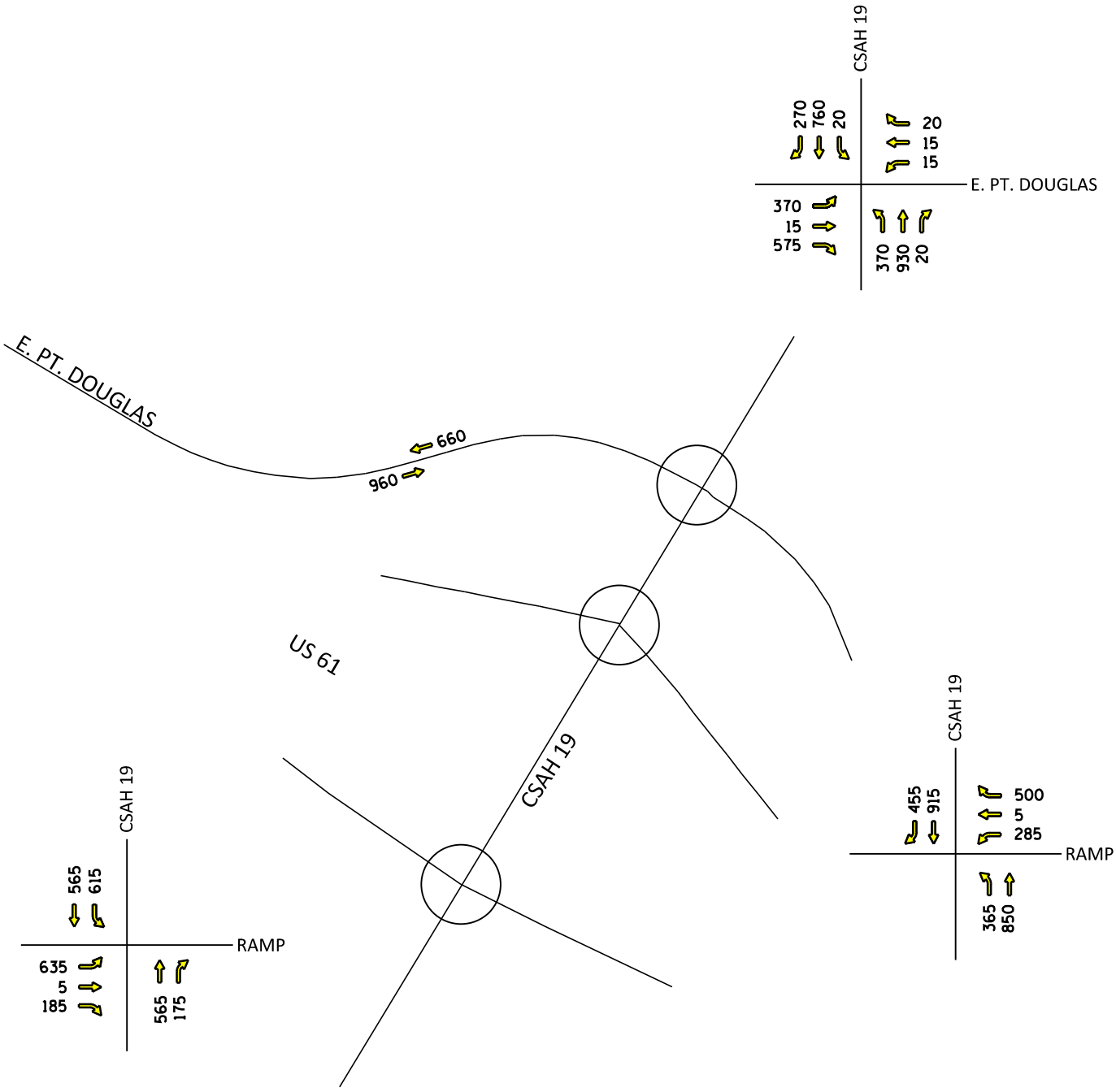
Washington County

WASHINGTON COUNTY
COUNTY ROAD 19/US HIGHWAY 61
IMPROVEMENTS

11906-PM PEAK TRAF-PCT.dgn

2040 PM PEAK HOUR

FORECASTED TURNING
MOVEMENT VOLUMES



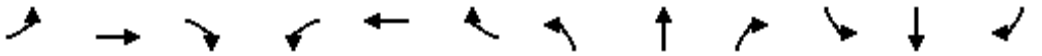
DATE: MARCH 18, 2016

Kimley»Horn	Washington County	WASHINGTON COUNTY COUNTY ROAD 19/US HIGHWAY 61 IMPROVEMENTS

11906-PM PEAK TRAF-2030.dgn

No Build – 2020

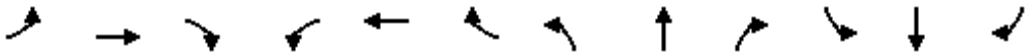
(Assuming Existing Volumes Grown @ 5.8%)



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	7	1	215	60	310	0	0	315	145
Future Volume (Veh/h)	0	0	0	7	1	215	60	310	0	0	315	145
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			1%			-2%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	0	0	0	10	1	307	86	443	0	0	450	207
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1372	1065	450	1065	1272	443	657			443		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1372	1065	450	1065	1272	443	657			443		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	95	99	50	91			100		
cM capacity (veh/h)	56	201	607	185	151	613	926			1112		

Direction, Lane #	WB 1	WB 2	NB 1	SB 1	SB 2
Volume Total	10	308	529	450	207
Volume Left	10	0	86	0	0
Volume Right	0	307	0	0	207
cSH	185	607	926	1700	1700
Volume to Capacity	0.05	0.51	0.09	0.26	0.12
Queue Length 95th (ft)	4	72	8	0	0
Control Delay (s)	25.5	16.9	2.5	0.0	0.0
Lane LOS	D	C	A		
Approach Delay (s)	17.2		2.5	0.0	
Approach LOS	C				

Intersection Summary				
Average Delay	4.5			
Intersection Capacity Utilization	75.9%	ICU Level of Service	D	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	5	215	1	8	3	180	335	3	3	240	105
Future Volume (Veh/h)	70	5	215	1	8	3	180	335	3	3	240	105
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			3%			-3%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	100	7	307	1	11	4	257	479	4	4	343	150
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			4									
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											1256	
pX, platoon unblocked												
vC, conflicting volume	1189	1419	246	1178	1346	242	343			479		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1189	1419	246	1178	1346	242	343			479		
tC, single (s)	7.6	6.6	7.0	7.6	6.6	7.0	4.2			4.2		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	9	93	59	99	91	99	79			100		
cM capacity (veh/h)	110	105	751	68	117	756	1206			1073		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	414	16	496	244	176	322
Volume Left	100	1	257	0	4	0
Volume Right	307	4	0	4	0	150
cSH	382	140	1206	1700	1073	1700
Volume to Capacity	1.08	0.11	0.21	0.14	0.00	0.19
Queue Length 95th (ft)	366	9	20	0	0	0
Control Delay (s)	103.8	34.0	5.6	0.0	0.2	0.0
Lane LOS	F	D	A		A	
Approach Delay (s)	103.8	34.0	3.8		0.1	
Approach LOS	F	D				

Intersection Summary				
Average Delay	27.8			
Intersection Capacity Utilization	55.0%	ICU Level of Service	A	
Analysis Period (min)	15			

4-Leg Roundabout (2-Lane Bridge) - 2030

(Assuming Future (2040) Volumes Adjusted by 0.75)

Scheme Summary

Control Data

Control Data and Model Parameters

CSAH 19 at CSAH 61	2030 PHF Flow Profile (veh)
Alt 2a (4-leg 1-lane, right-only)	7.5 min Time Slice
Rodel-Win1	Queuing Delays (sec)
Right Hand Drive	Daylight conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle ?
1	Innovation Rd SB	0	0	12.00	1	18.00	1	164.00	66.00	30.00
2	Douglas Rd EB	90	0	12.00	1	18.00	1	164.00	66.00	30.00
3	Innovation Rd NB	180	0	12.00	1	18.00	1	164.00	66.00	30.00
4	Douglas Rd WB	270	0	12.00	1	18.00	1	164.00	66.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Innovation Rd SB	164.00	20.00	1	18.00	1	12.00	1
2	Douglas Rd EB	164.00	20.00	1	18.00	1	12.00	1
3	Innovation Rd NB	164.00	20.00	1	18.00	1	12.00	1
4	Douglas Rd WB	164.00	20.00	1	18.00	1	12.00	1

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	Innovation Rd SB	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
2	Douglas Rd EB	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
3	Innovation Rd NB	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	Douglas Rd WB	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0

Traffic Flow Data (veh/hr)

2030 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	Innovation Rd SB	0	15	656	41	0	3.0	1.00	0.9
2	Douglas Rd EB	0	56	11	345	0	3.0	1.00	0.9
3	Innovation Rd NB	491	221	754	15	0	3.0	1.00	0.9
4	Douglas Rd WB	0	11	11	15	0	3.0	1.00	0.9

Operational Results

2030 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Innovation Rd SB	None	712		551		631	865		0.8594	
2	Douglas Rd EB	None	412		1045		216	617		0.6935	
3	Innovation Rd NB	None	1481		82		1375	1100		2.8111	
4	Douglas Rd WB	None	37		1144		37	567		0.0663	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Innovation Rd SB	None	19.30		19.30	12.10		C		C
2	Douglas Rd EB	None	15.78		15.78	6.03		C		C
3	Innovation Rd NB	None	541.73		541.73	774.38		F		F
4	Douglas Rd WB	None	6.51		6.51	0.19		A		A

2030 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Innovation Rd SB	None	766		551		634	865		0.9230	
2	Douglas Rd EB	None	443		1090		219	595		0.7711	
3	Innovation Rd NB	None	1592		87		1442	1097		2.8663	
4	Douglas Rd WB	None	40		1146		39	567		0.0712	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Innovation Rd SB	None	21.35		21.35	12.10		C		C
2	Douglas Rd EB	None	17.55		17.55	6.03		C		C
3	Innovation Rd NB	None	503.79		503.79	547.39		F		F
4	Douglas Rd WB	None	6.38		6.38	0.19		A		A

Approach Flow Profile

2030 PM Peak - Approach Flows (Veh / Hour)

Time Slice	Innovation Rd SB	Douglas Rd EB	Innovation Rd NB	Douglas Rd WB
0.0 - 7.5	86.77	50.21	180.48	4.51
7.5 - 15.0	86.77	50.21	180.48	4.51
15.0 - 22.5	86.77	50.21	180.48	4.51
22.5 - 30.0	95.70	55.38	199.06	4.97
30.0 - 37.5	95.70	55.38	199.06	4.97
37.5 - 45.0	86.77	50.21	180.48	4.51
45.0 - 52.5	86.77	50.21	180.48	4.51
52.5 - 60.0	86.77	50.21	180.48	4.51
Peak 15 min	95.70	55.38	199.06	4.97
Peak 60 min	89.00	51.50	185.12	4.63

Exit Flow Profile

2030 PM Peak - Exit Flows (Veh / Hour)

Time Slice	Innovation Rd SB	Douglas Rd EB	Innovation Rd NB	Douglas Rd WB
0.0 - 7.5	78.66	26.82	167.86	4.53
7.5 - 15.0	78.69	26.86	168.84	4.56
15.0 - 22.5	78.70	26.87	168.90	4.56
22.5 - 30.0	79.27	27.37	179.58	4.83
30.0 - 37.5	79.31	27.42	180.94	4.87
37.5 - 45.0	78.75	26.93	170.60	4.60
45.0 - 52.5	78.70	26.87	169.06	4.57
52.5 - 60.0	78.70	26.87	168.99	4.56
0-60	631	216	1375	37
%Trucks	3.00	3.00	3.00	3.00

Economics

Economic Input Data

2030 - Vehicle Delay Parameters

Peaks	Peak / Day	Days / Year	Delay Cost ($ / hour)
AM Peak	1	325	15.00
OFF Peak	14	325	15.00
PM Peak	1	325	15.00

2030 - Accident Severity Proportions and Costs

Accident Type	Proportion (%)	Cost ($)
Fatal Vehicle Accident	0.3	0
Incapacitating Vehicle Accident	17.7	0
Non-incapacitating Vehicle Accident	82	0
Damage Only Vehicle Accident	100	0
Pedestrian Injury Accident	100	0

Economics - Results Data

2030 Delay and Accident Costs

Delay Costs			Accident Costs			Total Costs	
Peak	Delays Veh.hrs	Costs ($)	Accident Types	Annual Accidents	Accident Costs	Cost Type	Costs ($/year)
AM	0.00	0	Vehicles Injury	0.00	0	Vehicle Delay Cost	1114190
OFF	0.00	0	Vehicles DO	0.00	0	Vehicle Injury Acc Cost	0
PM	74279.35	1114190	Pedestrians	0.00	0	Vehicle DO Acc Cost	0
						Pedestrian Accident Cost	0
						Total Accident Cost	0
Total	74279.35	1114190	Totals	0.00	0	TOTAL COST	1114190

Global Results

Performance and Accidents

2030 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	2642		2642
Capacity	veh/hr	3149		3149
Average Delay	sec/veh	311.43		311.43
L.O.S. (Signal)	A – F	F		F
L.O.S. (Unsig)	A – F	F		F
Total Delay	veh.hrs	228.55		228.55

4-Leg Roundabout (4-Lane Bridge) – 2040

Scheme Summary

Control Data

Control Data and Model Parameters

CSAH 19 at CSAH 61	2040 PHF Flow Profile (veh)
Alternative 2b - 4-leg 2-lane PM	7.5 min Time Slice
Rodel-Win1	Queuing Delays (sec)
Right Hand Drive	Daylight conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle ?
1	Innovation Rd SB	0	0	24.00	2	28.00	2	164.00	66.00	30.00
2	Douglas Rd EB	90	0	24.00	2	28.00	2	164.00	66.00	30.00
3	Innovation Rd NB	180	0	24.00	2	28.00	2	164.00	66.00	30.00
4	Douglas Rd WB	270	0	12.00	1	18.00	1	164.00	66.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Innovation Rd SB	164.00	20.00	1	28.00	2	24.00	2
2	Douglas Rd EB	164.00	30.00	2	28.00	2	24.00	2
3	Innovation Rd NB	164.00	20.00	1	28.00	2	24.00	2
4	Douglas Rd WB	164.00	30.00	2	18.00	1	12.00	1

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	Innovation Rd SB	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
2	Douglas Rd EB	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
3	Innovation Rd NB	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
4	Douglas Rd WB	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	Innovation Rd SB	0	20	875	55	0	3.0	1.00	0.9
2	Douglas Rd EB	0	75	15	460	0	3.0	1.00	0.9
3	Innovation Rd NB	655	295	1005	20	0	3.0	1.00	0.9
4	Douglas Rd WB	0	15	15	20	0	3.0	1.00	0.9

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Innovation Rd SB	None	950		977		1096	1300		0.7503	
2	Douglas Rd EB	None	550		1562		364	1019		0.5535	
3	Innovation Rd NB	None	1975		110		2001	2167		0.9625	
4	Douglas Rd WB	None	50		2023		55	409		0.1263	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Innovation Rd SB	None	9.87		9.87	9.35		A		A
2	Douglas Rd EB	None	8.56		8.56	4.48		A		A
3	Innovation Rd NB	None	25.07		25.07	44.64		D		D
4	Douglas Rd WB	None	9.59		9.59	0.43		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Innovation Rd SB	None	1022		1031		1159	1245		0.8393	
2	Douglas Rd EB	None	591		1660		385	952		0.6335	
3	Innovation Rd NB	None	2124		118		2132	2160		1.0379	
4	Douglas Rd WB	None	54		2137		58	368		0.1492	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Innovation Rd SB	None	11.74		11.74	9.35		B		B
2	Douglas Rd EB	None	9.66		9.66	4.48		A		A
3	Innovation Rd NB	None	29.83		29.83	44.64		D		D
4	Douglas Rd WB	None	10.14		10.14	0.43		B		B

Approach Flow Profile

2040 PM Peak - Approach Flows (Veh / Hour)

Time Slice	Innovation Rd SB	Douglas Rd EB	Innovation Rd NB	Douglas Rd WB
0.0 - 7.5	115.77	67.03	240.68	6.09
7.5 - 15.0	115.77	67.03	240.68	6.09
15.0 - 22.5	115.77	67.03	240.68	6.09
22.5 - 30.0	127.69	73.92	265.46	6.72
30.0 - 37.5	127.69	73.92	265.46	6.72
37.5 - 45.0	115.77	67.03	240.68	6.09
45.0 - 52.5	115.77	67.03	240.68	6.09
52.5 - 60.0	115.77	67.03	240.68	6.09
Peak 15 min	127.69	73.92	265.46	6.72
Peak 60 min	118.75	68.75	246.87	6.25

Exit Flow Profile

2040 PM Peak - Exit Flows (Veh / Hour)

Time Slice	Innovation Rd SB	Douglas Rd EB	Innovation Rd NB	Douglas Rd WB
0.0 - 7.5	132.30	43.94	242.34	6.65
7.5 - 15.0	133.62	44.35	243.95	6.69
15.0 - 22.5	133.95	44.45	244.25	6.70
22.5 - 30.0	143.84	47.81	265.11	7.27
30.0 - 37.5	145.88	48.46	267.78	7.34
37.5 - 45.0	138.06	45.72	248.62	6.82
45.0 - 52.5	134.61	44.65	244.93	6.72
52.5 - 60.0	134.17	44.52	244.45	6.71
0-60	1096	364	2001	55
%Trucks	3.00	3.00	3.00	3.00

Economics

Economic Input Data

2040 - Vehicle Delay Parameters

Peaks	Peak / Day	Days / Year	Delay Cost ($ / hour)
AM Peak	1	325	15.00
OFF Peak	14	325	15.00
PM Peak	1	325	15.00

2040 - Accident Severity Proportions and Costs

Accident Type	Proportion (%)	Cost ($)
Fatal Vehicle Accident	0.3	0
Incapacitating Vehicle Accident	17.7	0
Non-incapacitating Vehicle Accident	82	0
Damage Only Vehicle Accident	100	0
Pedestrian Injury Accident	100	0

Economics - Results Data

2040 Delay and Accident Costs

Delay Costs			Accident Costs			Total Costs	
Peak	Delays Veh.hrs	Costs ($)	Accident Types	Annual Accidents	Accident Costs	Cost Type	Costs ($/year)
AM	0.00	0	Vehicles Injury	0.00	0	Vehicle Delay Cost	86779
OFF	0.00	0	Vehicles DO	0.00	0	Vehicle Injury Acc Cost	0
PM	5785.24	86779	Pedestrians	0.00	0	Vehicle DO Acc Cost	0
						Pedestrian Accident Cost	0
						Total Accident Cost	0
Total	5785.24	86779	Totals	0.00	0	TOTAL COST	86779

Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3525		3525
Capacity	veh/hr	4896		4896
Average Delay	sec/veh	18.18		18.18
L.O.S. (Signal)	A – F	B		B
L.O.S. (Unsig)	A – F	C		C
Total Delay	veh.hrs	17.80		17.80

6-Leg Roundabout (2-Lane Bridge) - 2030

(Assuming Future (2040) Volumes Adjusted by 0.75)

Scheme Summary

Control Data

Control Data and Model Parameters

CSAH 19 at CSAH 61	2030 PHF Flow Profile (veh)
Alternative 3a 6-leg single-lane	7.5 min Time Slice
Rodel-Win1	Queuing Delays (sec)
Right Hand Drive	Daylight conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle ?
1	Innovation Rd SB	0	0	12.00	1	18.00	1	164.00	66.00	30.00
2	Douglas Rd EB	90	0	12.00	1	18.00	1	164.00	66.00	30.00
3	WB TH 61 on ramp	135	0	12.00	1	18.00	1	164.00	66.00	30.00
4	Innovation Rd NB	180	0	12.00	1	18.00	1	164.00	66.00	30.00
5	WB TH 61 off ramp	225	0	12.00	1	18.00	1	164.00	66.00	30.00
6	Douglas Rd WB	270	0	12.00	1	18.00	1	164.00	66.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Innovation Rd SB	200.00	20.00	1	18.00	1	12.00	1
2	Douglas Rd EB	200.00	20.00	1	18.00	1	12.00	1
3	WB TH 61 on ramp	200.00	20.00	1	18.00	1	12.00	1
4	Innovation Rd NB	200.00	20.00	1	18.00	1	12.00	1
5	WB TH 61 off ramp	200.00	20.00	1	18.00	1	12.00	1
6	Douglas Rd WB	200.00	20.00	1	18.00	1	12.00	1

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	Innovation Rd SB	0	1.000	0	1.000	24.00	1792	0	12.00	1792	0
2	Douglas Rd EB	0	1.000	0	1.000	24.00	1792	0	12.00	1792	0
3	WB TH 61 on ramp	0	1.000	0	1.000	24.00	1792	0	12.00	1792	0
4	Innovation Rd NB	0	1.000	0	1.000	24.00	1792	0	12.00	1792	0
5	WB TH 61 off ramp	0	1.000	0	1.000	24.00	1792	0	12.00	1792	0
6	Douglas Rd WB	0	1.000	0	1.000	24.00	1792	0	12.00	1792	0

Traffic Flow Data (veh/hr)

2030 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows							Flow Modifiers		
		U-Turn	Exit-5	Exit-4	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	Innovation Rd SB	0	15	0	426	213	40	0	3.0	1.00	0.9
2	Douglas Rd EB	0	55	11	0	224	112	0	3.0	1.00	0.9
3	WB TH 61 on ramp	0	0	0	0	0	0	0	3.0	1.00	0.9
4	Innovation Rd NB	0	266	137	464	9	0	0	3.0	1.00	0.9
5	WB TH 61 off ramp	0	208	4	79	269	5	0	3.0	1.00	0.9
6	Douglas Rd WB	0	0	7	4	11	15	0	3.0	1.00	0.9

Operational Results

2030 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Innovation Rd SB	None	694		715		802	816		0.8972	
2	Douglas Rd EB	None	402		1140		267	623		0.6700	
3	WB TH 61 on ramp	None	0		0		598	0		0.0000	
4	Innovation Rd NB	None	876		81		863	1104		0.8184	
5	WB TH 61 off ramp	None	565		956		0	707		0.8413	
6	Douglas Rd WB	None	37		1480		40	469		0.0811	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Innovation Rd SB	None	23.71		23.71	16.44		C		C
2	Douglas Rd EB	None	14.83		14.83	5.71		B		B
3	WB TH 61 on ramp	None	0.00		0.00	0.00		A		A
4	Innovation Rd NB	None	13.43		13.43	10.45		B		B
5	WB TH 61 off ramp	None	21.70		21.70	12.54		C		C
6	Douglas Rd WB	None	7.99		7.99	0.26		A		A

2030 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Innovation Rd SB	None	746		762		855	795		0.9888	
2	Douglas Rd EB	None	432		1209		284	592		0.7550	
3	WB TH 61 on ramp	None	0		0		585	0		0.0000	
4	Innovation Rd NB	None	942		86		915	1102		0.8808	
5	WB TH 61 off ramp	None	608		1022		0	677		0.9424	
6	Douglas Rd WB	None	40		1576		42	425		0.0953	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Innovation Rd SB	None	28.40		28.40	16.44		D		D
2	Douglas Rd EB	None	16.72		16.72	5.71		C		C
3	WB TH 61 on ramp	None	0.00		0.00	0.00		A		A
4	Innovation Rd NB	None	14.98		14.98	10.45		B		B
5	WB TH 61 off ramp	None	26.20		26.20	12.54		D		D
6	Douglas Rd WB	None	8.39		8.39	0.26		A		A

Approach Flow Profile

2030 PM Peak - Approach Flows (Veh / Hour)

Time Slice	Innovation Rd SB	Douglas Rd EB	WB TH 61 on ramp	Innovation Rd NB	WB TH 61 off ramp	Douglas Rd WB
0.0 - 7.5	84.57	48.99	0.00	106.75	68.85	4.51
7.5 - 15.0	84.57	48.99	0.00	106.75	68.85	4.51
15.0 - 22.5	84.57	48.99	0.00	106.75	68.85	4.51
22.5 - 30.0	93.28	54.03	0.00	117.74	75.94	4.97
30.0 - 37.5	93.28	54.03	0.00	117.74	75.94	4.97
37.5 - 45.0	84.57	48.99	0.00	106.75	68.85	4.51
45.0 - 52.5	84.57	48.99	0.00	106.75	68.85	4.51
52.5 - 60.0	84.57	48.99	0.00	106.75	68.85	4.51
Peak 15 min	93.28	54.03	0.00	117.74	75.94	4.97
Peak 60 min	86.75	50.25	0.00	109.50	70.63	4.63

Exit Flow Profile

2030 PM Peak - Exit Flows (Veh / Hour)

Time Slice	Innovation Rd SB	Douglas Rd EB	WB TH 61 on ramp	Innovation Rd NB	WB TH 61 off ramp	Douglas Rd WB
0.0 - 7.5	97.01	32.24	72.31	104.18	0.00	4.82
7.5 - 15.0	97.79	32.51	72.93	105.29	0.00	4.87
15.0 - 22.5	97.83	32.53	72.97	105.36	0.00	4.87
22.5 - 30.0	106.24	35.26	79.14	113.59	0.00	5.27
30.0 - 37.5	107.41	35.68	80.02	115.19	0.00	5.34
37.5 - 45.0	99.54	33.16	74.36	108.15	0.00	4.98
45.0 - 52.5	98.05	32.61	73.19	105.81	0.00	4.89
52.5 - 60.0	97.89	32.55	73.03	105.48	0.00	4.88
0-60	802	267	598	863	0	40
%Trucks	3.00	3.00	3.00	3.00	0.00	3.00

Economics

Economic Input Data

2030 - Vehicle Delay Parameters

Peaks	Peak / Day	Days / Year	Delay Cost ($ / hour)
AM Peak	1	325	15.00
OFF Peak	14	325	15.00
PM Peak	1	325	15.00

2030 - Accident Severity Proportions and Costs

Accident Type	Proportion (%)	Cost ($)
Fatal Vehicle Accident	0.3	0
Incapacitating Vehicle Accident	17.7	0
Non-incapacitating Vehicle Accident	82	0
Damage Only Vehicle Accident	100	0
Pedestrian Injury Accident	100	0

Economics - Results Data

2030 Delay and Accident Costs

Delay Costs			Accident Costs			Total Costs	
Peak	Delays Veh.hrs	Costs ($)	Accident Types	Annual Accidents	Accident Costs	Cost Type	Costs ($/year)
AM	0.00	0	Vehicles Injury	0.00	0	Vehicle Delay Cost	63295
OFF	0.00	0	Vehicles DO	0.00	0	Vehicle Injury Acc Cost	0
PM	4219.64	63295	Pedestrians	0.00	0	Vehicle DO Acc Cost	0
						Pedestrian Accident Cost	0
						Total Accident Cost	0
Total	4219.64	63295	Totals	0.00	0	TOTAL COST	63295

Global Results

Performance and Accidents

2030 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	2574		2574
Capacity	veh/hr	3718		3718
Average Delay	sec/veh	18.16		18.16
L.O.S. (Signal)	A – F	B		B
L.O.S. (Unsig)	A – F	C		C
Total Delay	veh.hrs	12.98		12.98

6-Leg Roundabout (4-Lane Bridge) – 2040

Scheme Summary

Control Data

Control Data and Model Parameters

CSAH 19 at CSAH 61	2040 PHF Flow Profile (veh)
Alternative 3b 6-leg multi-lane	7.5 min Time Slice
Rodel-Win1	Queuing Delays (sec)
Right Hand Drive	Daylight conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle ?
1	Innovation Rd SB	0	0	24.00	2	28.00	2	164.00	66.00	30.00
2	Douglas Rd EB	90	0	24.00	2	28.00	2	164.00	66.00	30.00
3	WB TH 61 on ramp	135	0	12.00	1	18.00	1	164.00	66.00	30.00
4	Innovation Rd NB	180	0	24.00	2	28.00	2	164.00	66.00	30.00
5	WB TH 61 off ramp	225	0	24.00	2	28.00	2	164.00	66.00	30.00
6	Douglas Rd WB	270	0	12.00	1	18.00	1	164.00	66.00	30.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	Innovation Rd SB	200.00	30.00	2	28.00	2	24.00	2
2	Douglas Rd EB	200.00	30.00	2	28.00	2	24.00	2
3	WB TH 61 on ramp	200.00	30.00	2	18.00	1	12.00	1
4	Innovation Rd NB	200.00	20.00	1	28.00	2	24.00	2
5	WB TH 61 off ramp	200.00	30.00	2	18.00	1	12.00	1
6	Douglas Rd WB	200.00	30.00	2	18.00	1	12.00	1

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	Innovation Rd SB	0	1.000	0	1.000	24.00	3584	0	24.00	3584	0
2	Douglas Rd EB	0	1.000	0	1.000	24.00	3584	0	24.00	3584	0
3	WB TH 61 on ramp	0	1.000	0	1.000	24.00	1792	0	12.00	1792	0
4	Innovation Rd NB	0	1.000	0	1.000	24.00	3584	0	24.00	3584	0
5	WB TH 61 off ramp	0	1.000	0	1.000	24.00	3584	0	12.00	1792	0
6	Douglas Rd WB	0	1.000	0	1.000	24.00	1792	0	12.00	1792	0

Traffic Flow Data (veh/hr)

2040 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows							Flow Modifiers		
		U-Turn	Exit-5	Exit-4	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	Innovation Rd SB	0	20	0	583	292	55	0	3.0	1.00	0.9
2	Douglas Rd EB	0	75	15	0	307	153	0	3.0	1.00	0.9
3	WB TH 61 on ramp	0	0	0	0	0	0	0	3.0	1.00	0.9
4	Innovation Rd NB	0	365	187	636	13	0	0	3.0	1.00	0.9
5	WB TH 61 off ramp	0	285	5	108	369	7	0	3.0	1.00	0.9
6	Douglas Rd WB	0	0	10	5	15	20	0	3.0	1.00	0.9

Operational Results

2040 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Innovation Rd SB	None	950		979		1099	1636		0.5926	
2	Douglas Rd EB	None	550		1564		365	1253		0.4482	
3	WB TH 61 on ramp	None	0		0		820	0		0.0000	
4	Innovation Rd NB	None	1201		110		1184	2178		0.5603	
5	WB TH 61 off ramp	None	774		1311		0	1419		0.5602	
6	Douglas Rd WB	None	50		2029		55	715		0.0714	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Innovation Rd SB	None	7.63		7.63	6.28		A		A
2	Douglas Rd EB	None	6.68		6.68	3.31		A		A
3	WB TH 61 on ramp	None	0.00		0.00	0.00		A		A
4	Innovation Rd NB	None	6.31		6.31	6.13		A		A
5	WB TH 61 off ramp	None	10.06		10.06	6.81		B		B
6	Douglas Rd WB	None	5.20		5.20	0.23		A		A

2040 PM Peak - 15 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	Innovation Rd SB	None	1022		1051		1180	1589		0.6539	
2	Douglas Rd EB	None	591		1679		392	1178		0.5096	
3	WB TH 61 on ramp	None	0		0		799	0		0.0000	
4	Innovation Rd NB	None	1291		118		1271	2170		0.6032	
5	WB TH 61 off ramp	None	832		1408		0	1355		0.6278	
6	Douglas Rd WB	None	54		2178		59	656		0.0829	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	Innovation Rd SB	None	8.28		8.28	6.28		A		A
2	Douglas Rd EB	None	7.28		7.28	3.31		A		A
3	WB TH 61 on ramp	None	0.00		0.00	0.00		A		A
4	Innovation Rd NB	None	6.55		6.55	6.13		A		A
5	WB TH 61 off ramp	None	11.01		11.01	6.81		B		B
6	Douglas Rd WB	None	5.44		5.44	0.23		A		A

Approach Flow Profile

2040 PM Peak - Approach Flows (Veh / Hour)

Time Slice	Innovation Rd SB	Douglas Rd EB	WB TH 61 on ramp	Innovation Rd NB	WB TH 61 off ramp	Douglas Rd WB
0.0 - 7.5	115.77	67.03	0.00	146.36	94.32	6.09
7.5 - 15.0	115.77	67.03	0.00	146.36	94.32	6.09
15.0 - 22.5	115.77	67.03	0.00	146.36	94.32	6.09
22.5 - 30.0	127.69	73.92	0.00	161.42	104.03	6.72
30.0 - 37.5	127.69	73.92	0.00	161.42	104.03	6.72
37.5 - 45.0	115.77	67.03	0.00	146.36	94.32	6.09
45.0 - 52.5	115.77	67.03	0.00	146.36	94.32	6.09
52.5 - 60.0	115.77	67.03	0.00	146.36	94.32	6.09
Peak 15 min	127.69	73.92	0.00	161.42	104.03	6.72
Peak 60 min	118.75	68.75	0.00	150.13	96.75	6.25

Exit Flow Profile

2040 PM Peak - Exit Flows (Veh / Hour)

Time Slice	Innovation Rd SB	Douglas Rd EB	WB TH 61 on ramp	Innovation Rd NB	WB TH 61 off ramp	Douglas Rd WB
0.0 - 7.5	133.84	44.41	99.78	144.14	0.00	6.69
7.5 - 15.0	134.03	44.48	99.92	144.39	0.00	6.70
15.0 - 22.5	134.04	44.48	99.92	144.40	0.00	6.70
22.5 - 30.0	147.21	48.85	109.78	158.43	0.00	7.36
30.0 - 37.5	147.82	49.05	110.20	159.23	0.00	7.39
37.5 - 45.0	134.35	44.58	100.13	144.82	0.00	6.72
45.0 - 52.5	134.07	44.49	99.94	144.43	0.00	6.70
52.5 - 60.0	134.06	44.48	99.93	144.42	0.00	6.70
0-60	1099	365	820	1184	0	55
%Trucks	3.00	3.00	3.00	3.00	0.00	3.00

Economics

Economic Input Data

2040 - Vehicle Delay Parameters

Peaks	Peak / Day	Days / Year	Delay Cost ($ / hour)
AM Peak	1	325	15.00
OFF Peak	14	325	15.00
PM Peak	1	325	15.00

2040 - Accident Severity Proportions and Costs

Accident Type	Proportion (%)	Cost ($)
Fatal Vehicle Accident	0.3	0
Incapacitating Vehicle Accident	17.7	0
Non-incapacitating Vehicle Accident	82	0
Damage Only Vehicle Accident	100	0
Pedestrian Injury Accident	100	0

Economics - Results Data

2040 Delay and Accident Costs

Delay Costs			Accident Costs			Total Costs	
Peak	Delays Veh.hrs	Costs ($)	Accident Types	Annual Accidents	Accident Costs	Cost Type	Costs ($/year)
AM	0.00	0	Vehicles Injury	0.00	0	Vehicle Delay Cost	35950
OFF	0.00	0	Vehicles DO	0.00	0	Vehicle Injury Acc Cost	0
PM	2396.65	35950	Pedestrians	0.00	0	Vehicle DO Acc Cost	0
						Pedestrian Accident Cost	0
						Total Accident Cost	0
Total	2396.65	35950	Totals	0.00	0	TOTAL COST	35950

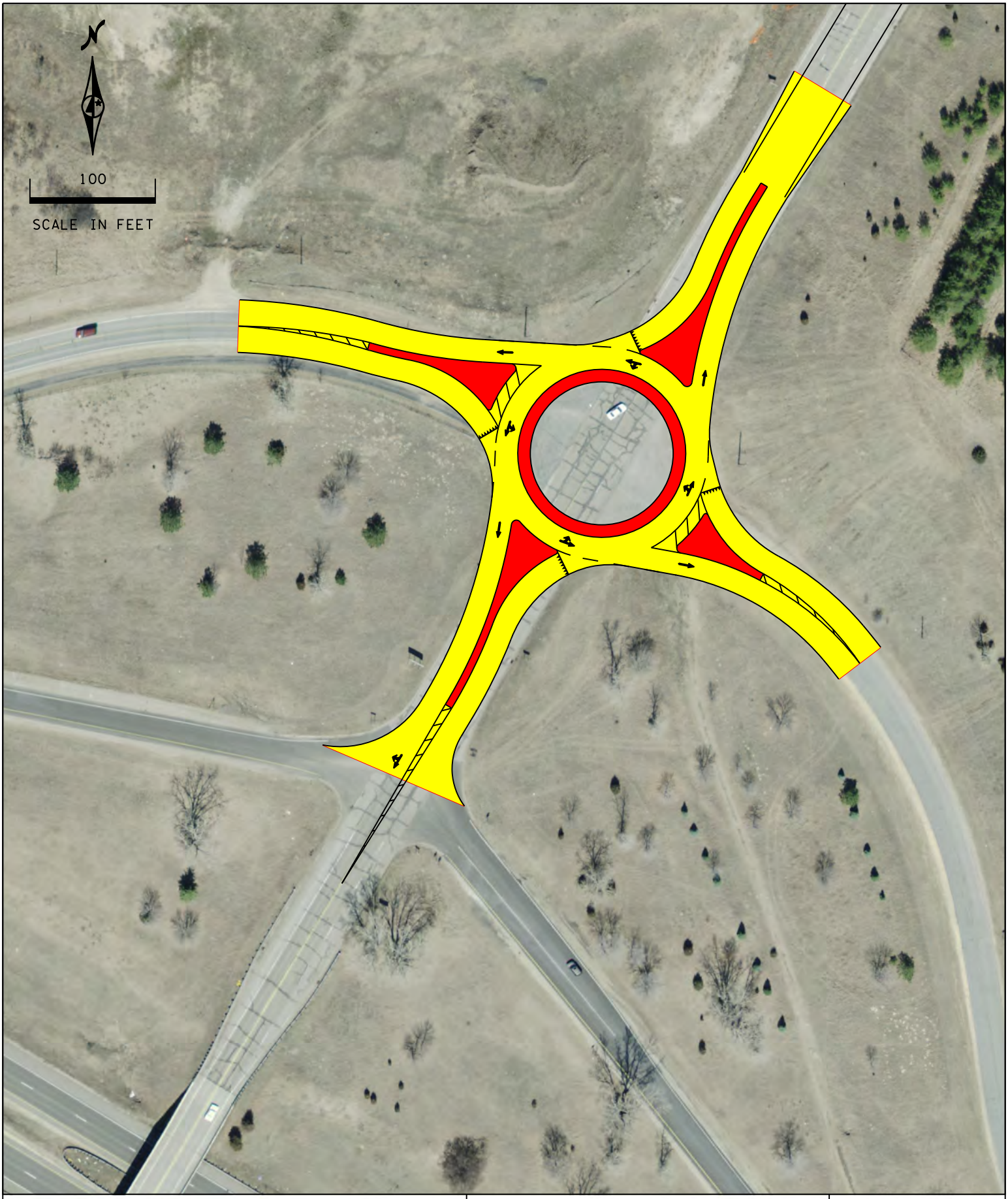
Global Results

Performance and Accidents

2040 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	3525		3525
Capacity	veh/hr	7200		7200
Average Delay	sec/veh	7.53		7.53
L.O.S. (Signal)	A – F	A		A
L.O.S. (Unsig)	A – F	A		A
Total Delay	veh.hrs	7.37		7.37

Preliminary Layouts

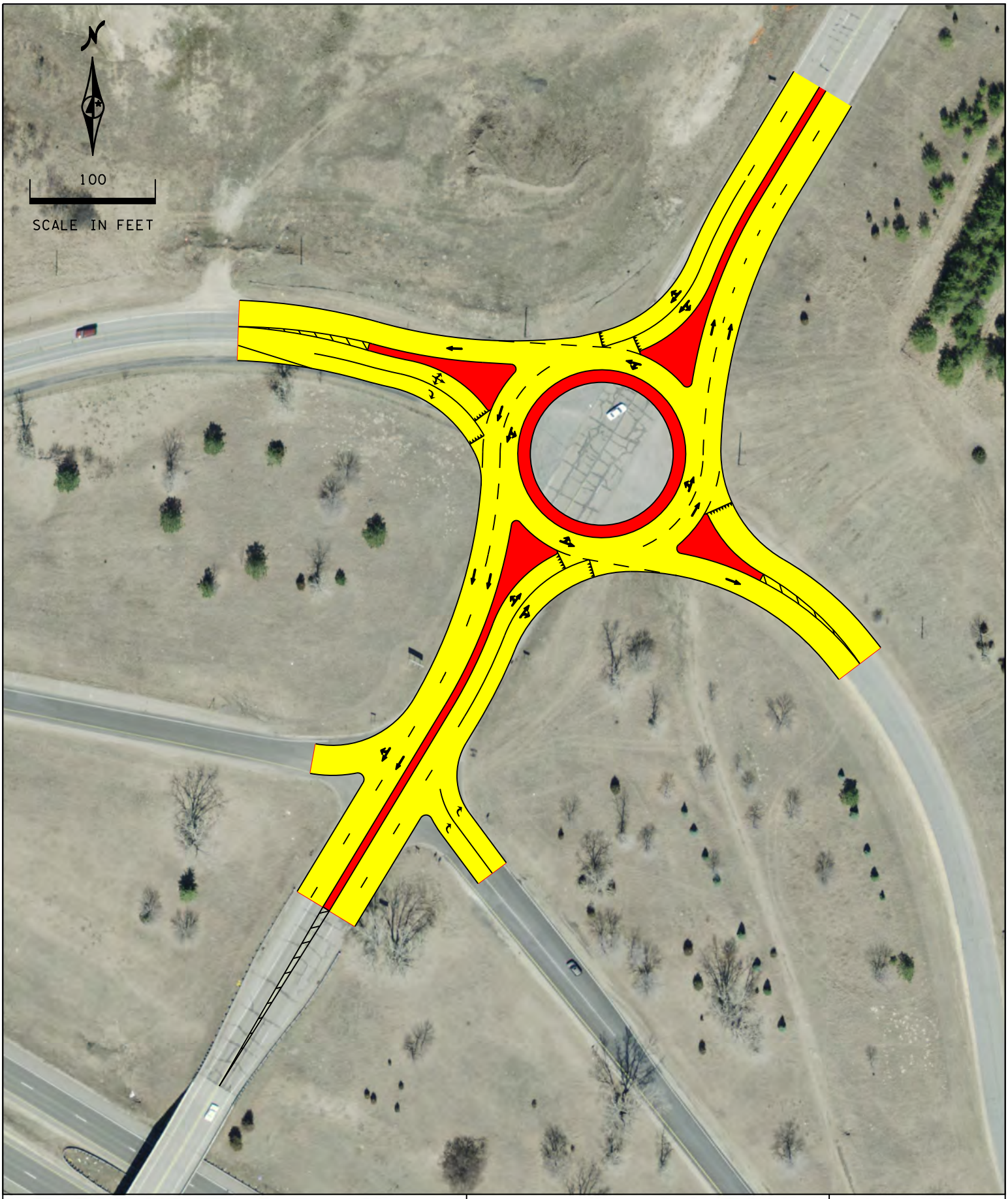


Washington County

Kimley»Horn

COUNTY HIGHWAY 19 AND TH 61
COTTAGE GROVE, MN
4/27/2016

4 LEGGED
SINGLE LANE
ROUNDABOUT

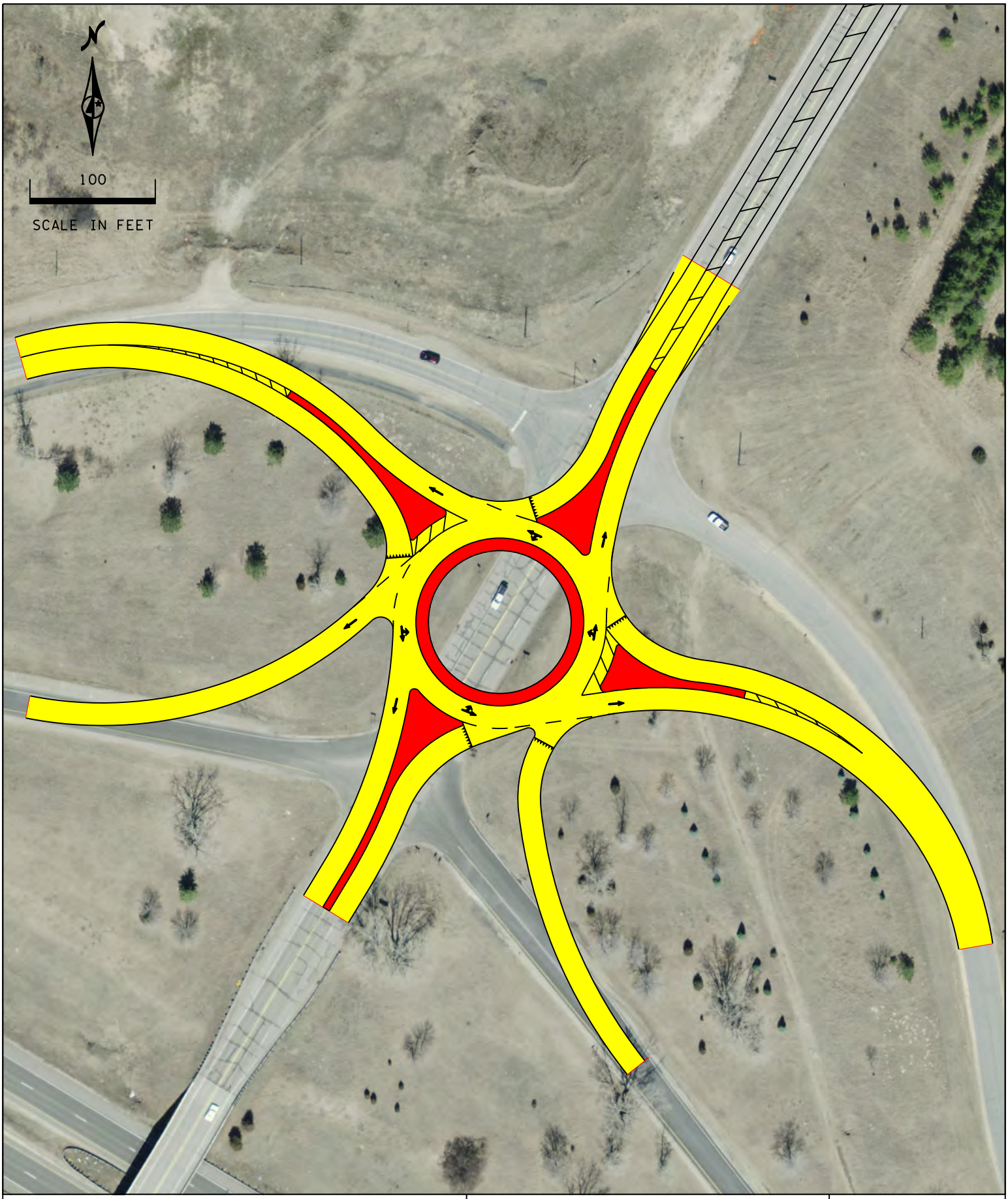


Washington County

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COUNTY HIGHWAY 19 AND TH 61
COTTAGE GROVE, MN
4/27/2016

4 LEGGED
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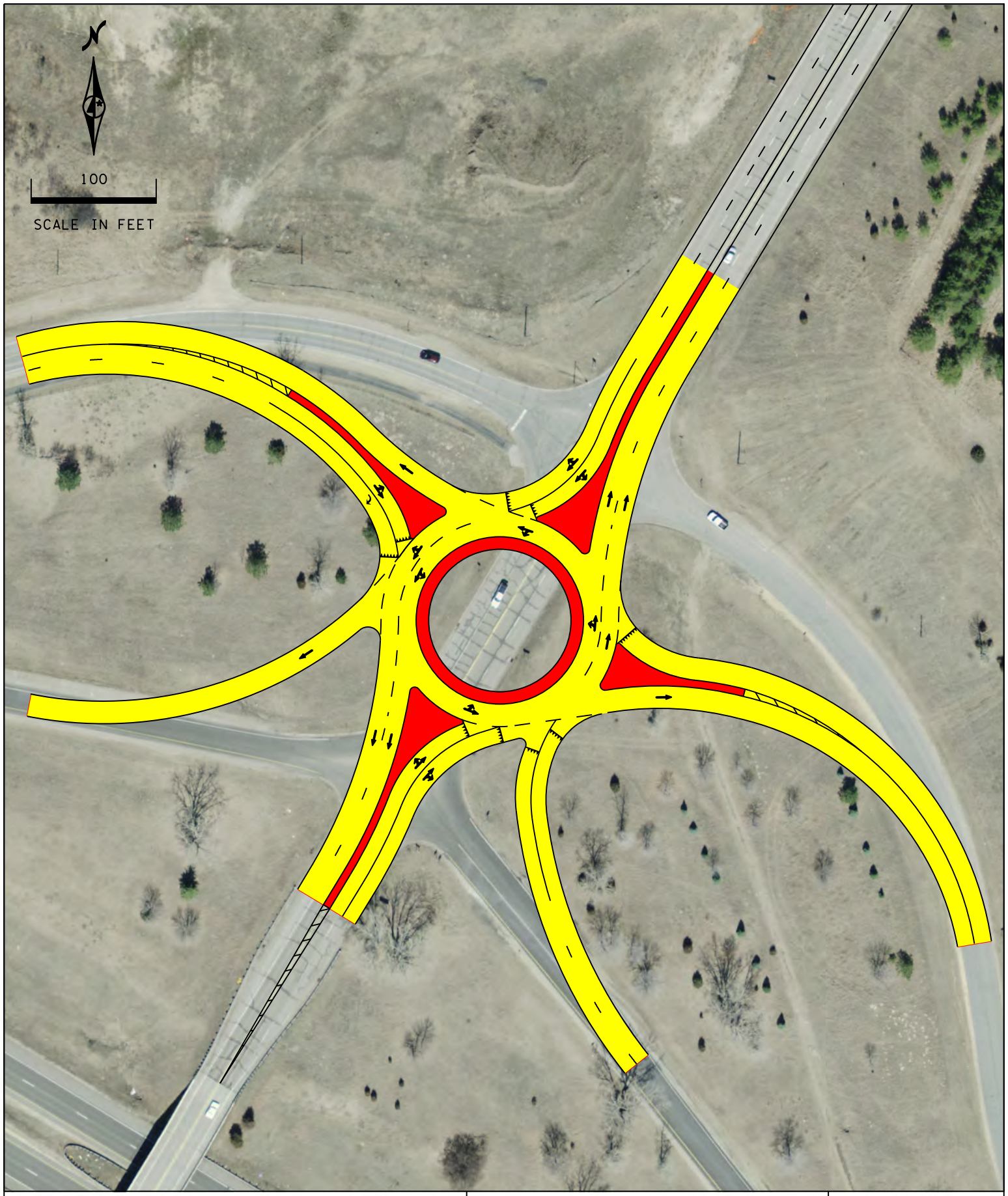


Washington County

Kimley»Horn

COUNTY HIGHWAY 19 AND TH 61
COTTAGE GROVE, MN
4/27/2016

6 LEGGED
SINGLE LANE
ROUNDABOUT



Washington County

Kimley»Horn

COUNTY HIGHWAY 19 AND TH 61
COTTAGE GROVE, MN
4/27/2016

6 LEGGED
MULTI LANE
ROUNDABOUT

Cottage Grove
Where Pride and Prosperity Meet

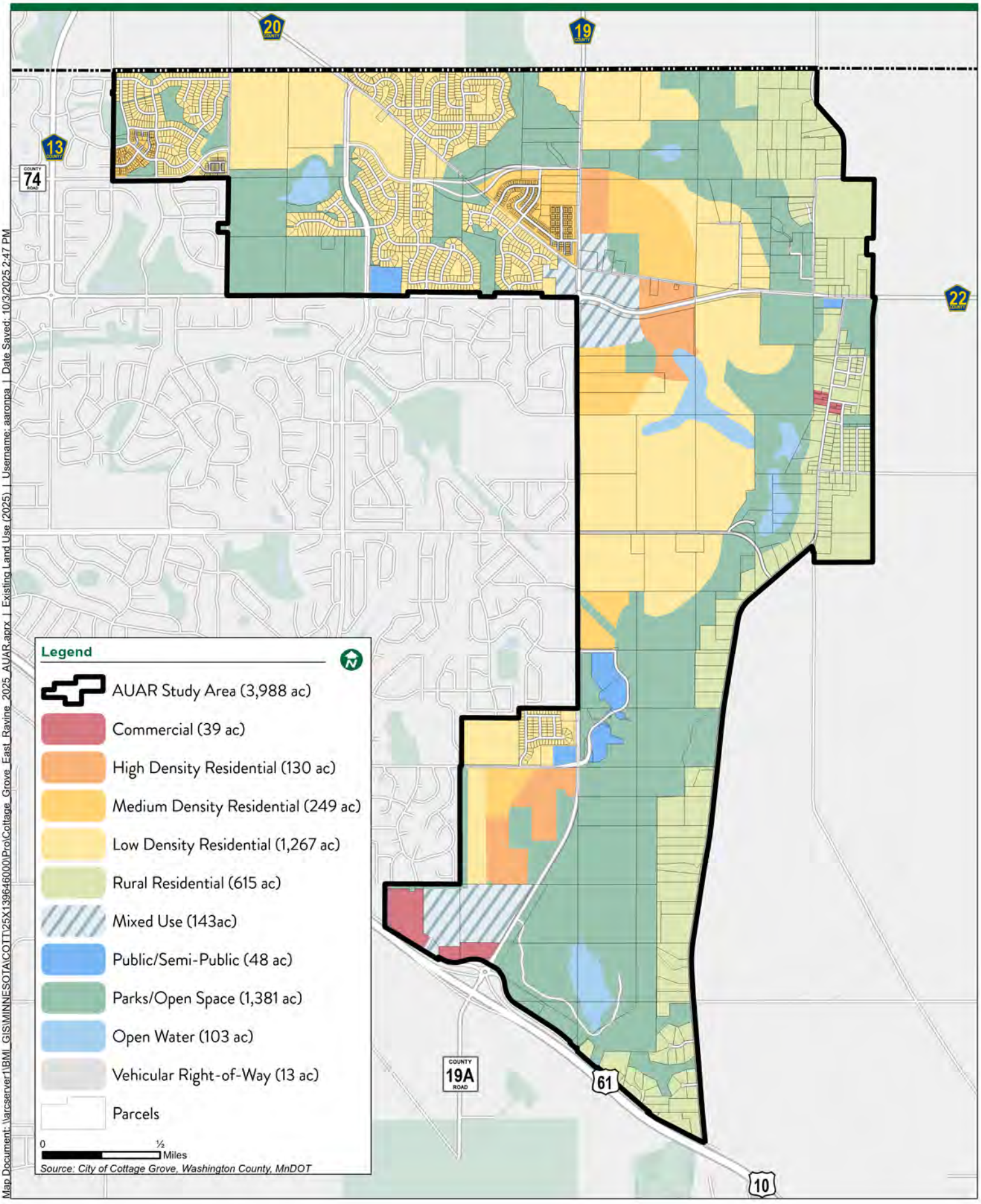
East River Ravine AUAR

City of Cottage Grove, Minnesota

Planned Land Use

October 2025

BOLTON & MENK



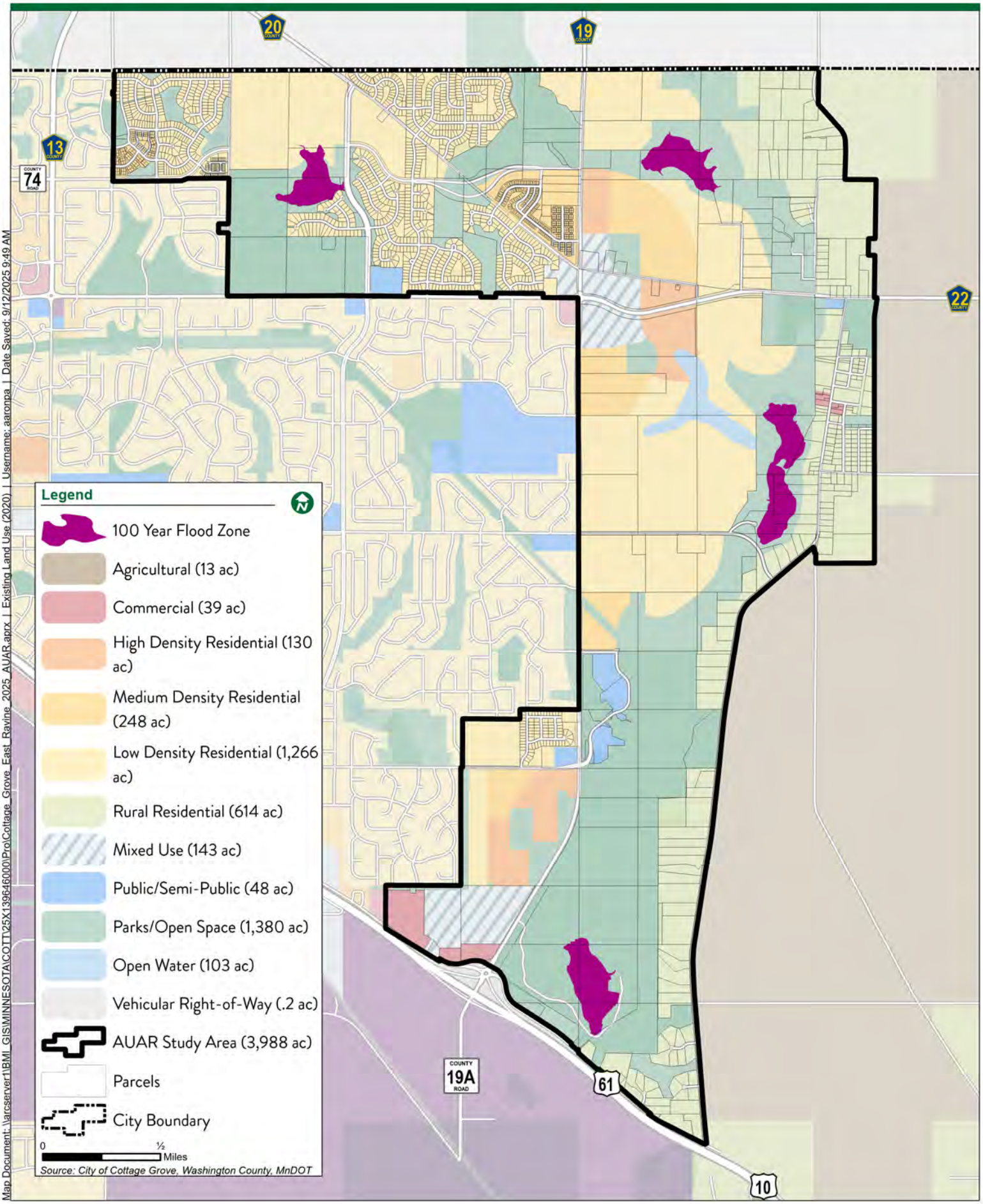
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East River Ravine AUAR

City of Cottage Grove, Minnesota

Water-Related Land Use Management

September 2025



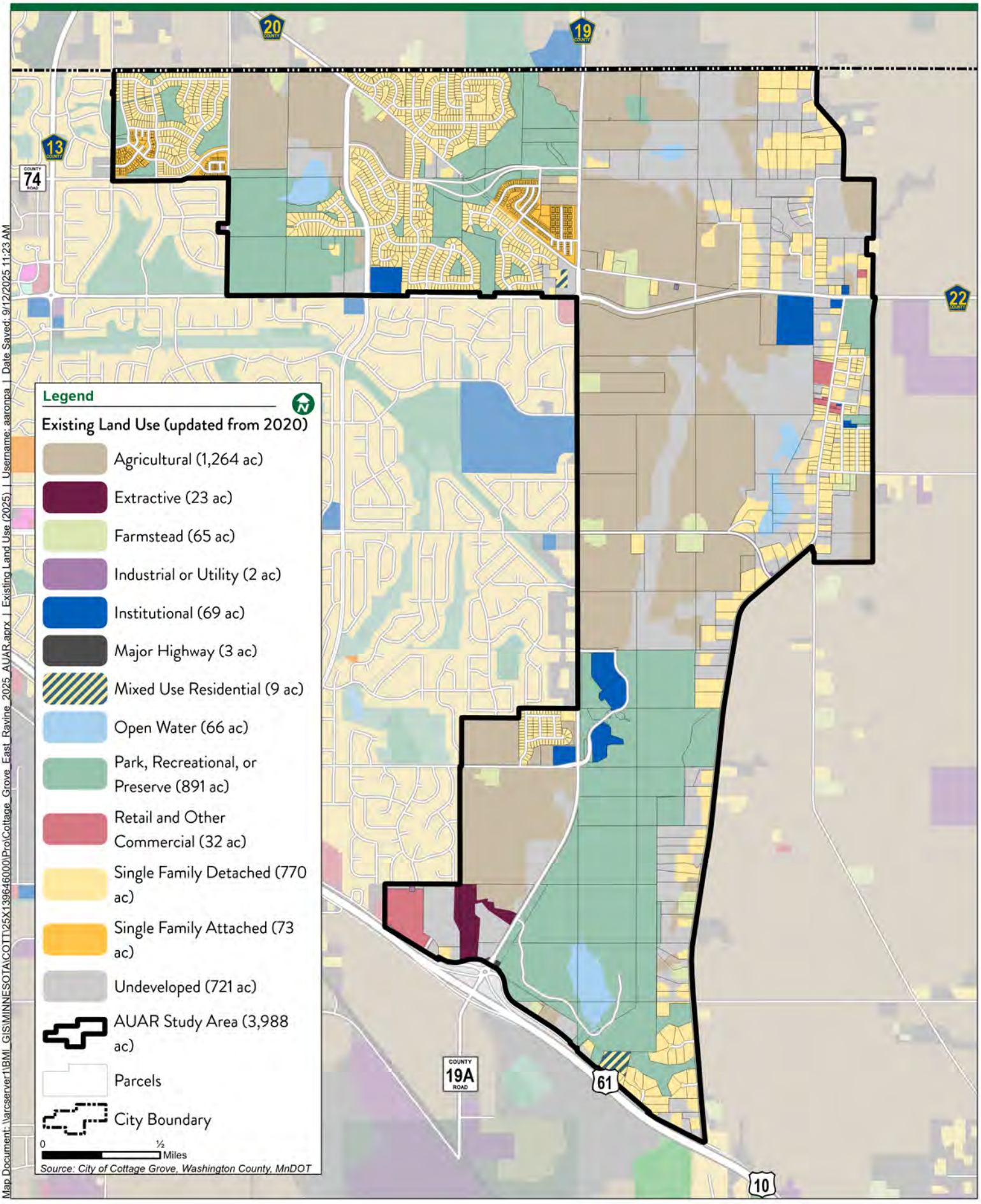
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East River Ravine AUAR

City of Cottage Grove, Minnesota

Existing Land Use (2025)

September 2025



Map Document: \\arcserver1\BMI_GIS\MINNESOTA\COTT\25X139646000\Pro\Cottage_Grove_East_Ravine_2025_AUAR.aprx | Existing Land Use (2025) | Username: aaronpa | Date Saved: 9/12/2025 11:23 AM

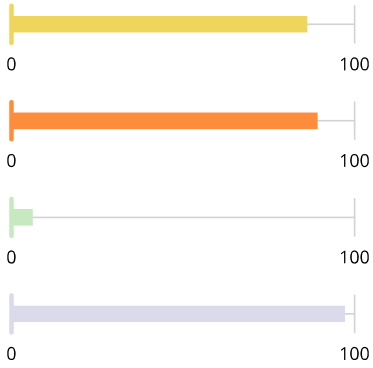
National Risk Index

July 17, 2025

Washington County, Minnesota

Summary

Risk Index is **Relatively Moderate**	Score **86.8**
Expected Annual Loss is **Relatively Moderate**	Score **89.7**
Social Vulnerability is **Very Low**	Score **6.7**
Community Resilience is **Very High**	Score **97.3**

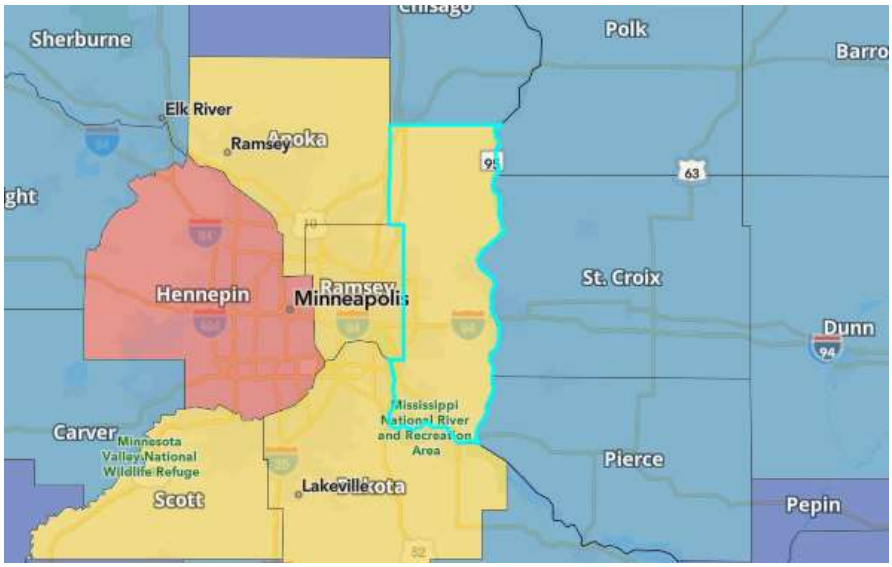


While reviewing this report, keep in mind that low risk is driven by lower loss due to natural hazards, lower social vulnerability, and higher community resilience.

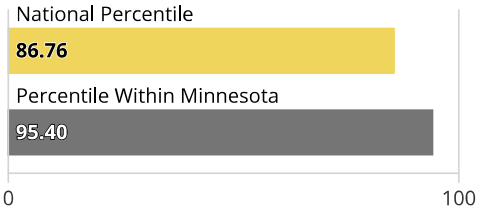
For more information about the National Risk Index, its data, and how to interpret the information it provides, please review the **About the National Risk Index** and **How to Take Action** sections at the end of this report. Or, visit the National Risk Index website at hazards.fema.gov/nri/learn-more to access supporting documentation and links.

Risk Index

The Risk Index rating is **Relatively Moderate** for **Washington County, MN** when compared to the rest of the U.S.



Score	86.76



87% of U.S. counties have a lower Risk Index

95% of counties in Minnesota have a lower Risk Index

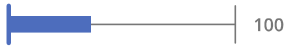
Risk Index Legend

Very High | Relatively High | Relatively Moderate | Relatively Low | Very Low

No Rating | Not Applicable | Insufficient Data

Hazard Type Risk Index

Hazard type Risk Index scores are calculated using data for only a single hazard type, and reflect a community's Expected Annual Loss value, community risk factors, and the adjustment factor used to calculate the risk value.

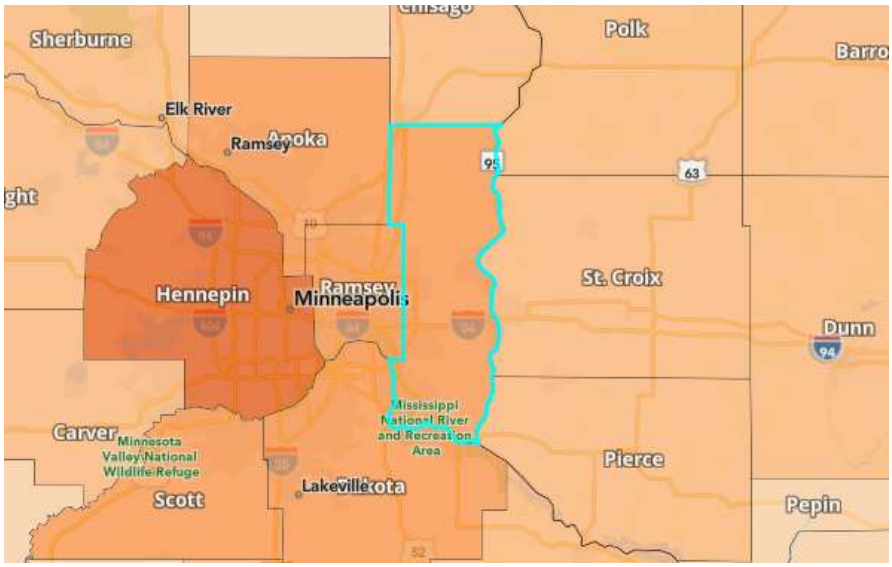
Hazard Type	Risk Index Rating	Risk Index Score	National Percentile
Avalanche	Not Applicable	--	
Coastal Flooding	Not Applicable	--	
Cold Wave	Relatively High	88.8	
Drought	Very Low	36.8	
Earthquake	Very Low	21	
Hail	Relatively Moderate	90.2	
Heat Wave	Relatively High	97.2	
Hurricane	Not Applicable	--	
Ice Storm	Very High	97.2	
Landslide	Relatively Moderate	78.2	
Lightning	Relatively High	91.9	
Riverine Flooding	Relatively Low	51.2	
Strong Wind	Very High	98.9	
Tornado	Relatively High	96	
Tsunami	Not Applicable	--	
Volcanic Activity	Not Applicable	--	
Wildfire	Relatively Low	82.7	
Winter Weather	Relatively Moderate	74.3	

Risk Factor Breakdown

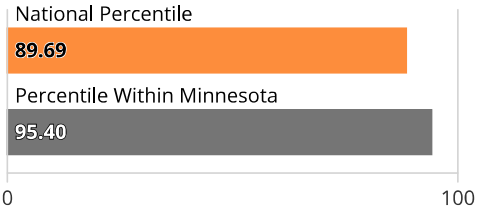
Hazard Type	EAL Value	Social Vulnerability	Community Resilience	CRF	Risk Value	Risk Index Score
Tornado	$17,357,624	Very Low	Very High	0.85	$14,687,117	96
Strong Wind	$7,700,061	Very Low	Very High	0.85	$6,493,240	98.9
Heat Wave	$5,024,374	Very Low	Very High	0.85	$4,305,080	97.2
Ice Storm	$2,334,730	Very Low	Very High	0.85	$2,019,735	97.2
Hail	$1,410,805	Very Low	Very High	0.85	$1,186,383	90.2
Lightning	$889,650	Very Low	Very High	0.85	$760,110	91.9
Cold Wave	$813,367	Very Low	Very High	0.85	$691,708	88.8
Wildfire	$865,046	Very Low	Very High	0.85	$644,429	82.7
Riverine Flooding	$578,964	Very Low	Very High	0.85	$492,786	51.2
Winter Weather	$183,884	Very Low	Very High	0.85	$154,843	74.3
Landslide	$122,400	Very Low	Very High	0.85	$97,787	78.2
Earthquake	$17,119	Very Low	Very High	0.85	$15,323	21
Drought	$10,414	Very Low	Very High	0.85	$7,913	36.8
Avalanche	--	Very Low	Very High	0.85	--	--
Coastal Flooding	--	Very Low	Very High	0.85	--	--
Hurricane	--	Very Low	Very High	0.85	--	--
Tsunami	--	Very Low	Very High	0.85	--	--
Volcanic Activity	--	Very Low	Very High	0.85	--	--

Expected Annual Loss

In **Washington County, MN**, expected loss each year due to natural hazards is **Relatively Moderate** when compared to the rest of the U.S.



Score	89.69



90% of U.S. counties have a lower Expected Annual Loss

95% of counties in Minnesota have a lower Expected Annual Loss

Expected Annual Loss Legend

Very High | Relatively High | Relatively Moderate | Relatively Low | Very Low

No Expected Annual Losses | Not Applicable | Insufficient Data

Composite Expected Annual Loss	**$37,308,437.41**
Composite Expected Annual Loss Rate National Percentile	**32.8**

Building EAL	**$17,617,208.93**	Population EAL	**1.68** fatalities
Building EAL Rate	**$1 per $3.03K of building value**	Population EAL Rate	**1 per 158.81K people**
Agriculture EAL	**$151,191.48**	Population Equivalence EAL	**$19,540,037.00**
Agriculture EAL Rate	**$1 per $453.53 of agriculture value**		

Expected Annual Loss for Hazard Types

Expected Annual Loss scores for hazard types are calculated using data for only a single hazard type, and reflect a community's relative expected annual loss for only that hazard type.

13 of 18 hazard types contribute to the expected annual loss for **Washington County, MN**.

Hazard Type	Expected Annual Loss Rating	EAL Value	Score
Tornado	Relatively High	$17,357,624	97.1
Strong Wind	Very High	$7,700,061	99.2

Hazard Type	Expected Annual Loss Rating	EAL Value	Score
Heat Wave	Relatively High	$5,024,374	98.0
Ice Storm	Very High	$2,334,730	98.4
Hail	Relatively Moderate	$1,410,805	93.1
Lightning	Relatively High	$889,650	94.4
Wildfire	Relatively Moderate	$865,046	85.8
Cold Wave	Relatively High	$813,367	92.0
Riverine Flooding	Relatively Low	$578,964	58.3
Winter Weather	Relatively Moderate	$183,884	81.1
Landslide	Relatively Moderate	$122,400	87.1
Earthquake	Very Low	$17,119	23.1
Drought	Very Low	$10,414	42.1
Avalanche	Not Applicable	--	--
Coastal Flooding	Not Applicable	--	--
Hurricane	Not Applicable	--	--
Tsunami	Not Applicable	--	--
Volcanic Activity	Not Applicable	--	--

Expected Annual Loss Values

Hazard Type	Total	Building Value	Population Equivalence	Population	Agriculture Value
Avalanche	--	--	--	--	--
Coastal Flooding	--	--	--	--	--
Cold Wave	$813,367	$13,938	$761,153	0.07	$38,276
Drought	$10,414	n/a	n/a	n/a	$10,414
Earthquake	$17,119	$13,610	$3,510	0.00	n/a
Hail	$1,410,805	$1,021,085	$318,776	0.03	$70,943
Heat Wave	$5,024,374	$2,683	$5,014,188	0.43	$7,503
Hurricane	--	--	--	--	--
Ice Storm	$2,334,730	$40,139	$2,294,590	0.20	n/a
Landslide	$122,400	$105,000	$17,400	0.00	n/a
Lightning	$889,650	$92,074	$797,577	0.07	n/a
Riverine Flooding	$578,964	$469,824	$103,831	0.01	$5,308

Hazard Type	Total	Building Value	Population Equivalence	Population	Agriculture Value
Strong Wind	$7,700,061	$7,281,539	$401,351	0.03	$17,172
Tornado	$17,357,624	$7,807,613	$9,548,956	0.82	$1,055
Tsunami	--	--	--	--	--
Volcanic Activity	--	--	--	--	--
Wildfire	$865,046	$599,332	$265,654	0.02	$59
Winter Weather	$183,884	$170,371	$13,051	0.00	$462

Exposure Values

Hazard Type	Total	Building Value	Population Equivalence	Population	Agriculture Value
Avalanche	--	--	--	--	--
Coastal Flooding	--	--	--	--	--
Cold Wave	$3,156,497,618,151	$53,359,448,105	$3,103,069,600,000	267,506.00	$68,570,046
Drought	$19,591,412	n/a	n/a	n/a	$19,591,412
Earthquake	$3,157,147,669,000	$53,358,869,000	$3,103,788,800,000	267,568.00	n/a
Hail	$3,156,497,618,151	$53,359,448,105	$3,103,069,600,000	267,506.00	$68,570,046
Heat Wave	$3,156,497,618,151	$53,359,448,105	$3,103,069,600,000	267,506.00	$68,570,046
Hurricane	--	--	--	--	--
Ice Storm	$3,155,485,927,286	$53,331,864,284	$3,102,154,063,002	267,427.07	n/a
Landslide	$728,943,860,647	$12,165,906,009	$716,777,954,637	61,791.20	n/a
Lightning	$3,156,429,048,105	$53,359,448,105	$3,103,069,600,000	267,506.00	n/a
Riverine Flooding	$23,284,036,040	$562,953,790	$22,720,025,570	1,958.62	$1,056,679
Strong Wind	$3,156,497,618,151	$53,359,448,105	$3,103,069,600,000	267,506.00	$68,570,046
Tornado	$3,156,497,618,151	$53,359,448,105	$3,103,069,600,000	267,506.00	$68,570,046
Tsunami	--	--	--	--	--
Volcanic Activity	--	--	--	--	--
Wildfire	$428,492,250,601	$7,379,573,198	$421,099,346,291	36,301.67	$13,331,112
Winter Weather	$3,156,497,618,151	$53,359,448,105	$3,103,069,600,000	267,506.00	$68,570,046

Annualized Frequency Values

Hazard Type	Annualized Frequency	Events on Record	Period of Record
Avalanche	--	--	--

Hazard Type	Annualized Frequency	Events on Record	Period of Record
Coastal Flooding	--	--	--
Cold Wave	1.5 events per year	24	2005-2021 (16 years)
Drought	0.8 events per year	35	2000-2021 (22 years)
Earthquake	0.005% chance per year	n/a	2021 dataset
Hail	6 events per year	205	1986-2021 (34 years)
Heat Wave	2 events per year	32	2005-2021 (16 years)
Hurricane	--	--	--
Ice Storm	0.4 events per year	27	1946-2014 (67 years)
Landslide	0 events per year	0	2010-2021 (12 years)
Lightning	38.1 events per year	839	1991-2012 (22 years)
Riverine Flooding	0.5 events per year	12	1996-2019 (24 years)
Strong Wind	4.6 events per year	158	1986-2021 (34 years)
Tornado	0.3 events per year	26	1950-2021 (72 years)
Tsunami	--	--	--
Volcanic Activity	--	--	--
Wildfire	0.034% chance per year	n/a	2021 dataset
Winter Weather	5.8 events per year	94	2005-2021 (16 years)

Historic Loss Ratios

Hazard Type	Overall Rating
Avalanche	--
Coastal Flooding	--
Cold Wave	Very Low
Drought	Relatively Moderate
Earthquake	Very Low
Hail	Relatively Low
Heat Wave	Relatively Low
Hurricane	--
Ice Storm	Relatively Moderate
Landslide	Very Low
Lightning	Relatively Moderate

Hazard Type	Overall Rating
Riverine Flooding	Relatively Low
Strong Wind	Relatively Moderate
Tornado	Relatively Moderate
Tsunami	--
Volcanic Activity	--
Wildfire	Relatively Low
Winter Weather	Very Low

Expected Annual Loss Rate

Hazard Type	Building EAL Rate (per building value)	Population EAL Rate (per population)	Agriculture EAL Rate (per agriculture value)
Avalanche	--	--	--
Coastal Flooding	--	--	--
Cold Wave	$1 per $3.83M	1 per 4.08M	$1 per $1.79K
Drought	--	--	$1 per $6.58K
Earthquake	$1 per $3.92M	1 per 884.11M	--
Hail	$1 per $52.26K	1 per 9.73M	$1 per $966.55
Heat Wave	$1 per $19.88M	1 per 618.86K	$1 per $9.14K
Hurricane	--	--	--
Ice Storm	$1 per $1.33M	1 per 1.35M	--
Landslide	$1 per $508.19K	1 per 178.34M	--
Lightning	$1 per $579.53K	1 per 3.89M	--
Riverine Flooding	$1 per $113.57K	1 per 29.89M	$1 per $12.92K
Strong Wind	$1 per $7.33K	1 per 7.73M	$1 per $3.99K
Tornado	$1 per $6.83K	1 per 324.96K	$1 per $65.02K
Tsunami	--	--	--
Volcanic Activity	--	--	--
Wildfire	$1 per $89.03K	1 per 11.68M	$1 per $1.16M
Winter Weather	$1 per $313.20K	1 per 237.77M	$1 per $148.44K

Social Vulnerability

Social groups in **Washington County, MN** have a **Very Low** susceptibility to the adverse impacts of natural hazards when compared to the rest of the U.S.



Score	6.68

National Percentile
6.68

Percentile Within Minnesota
11.50

0 100

7% of U.S. counties have a lower Social Vulnerability

11% of counties in Minnesota have a lower Social Vulnerability

Social Vulnerability Legend

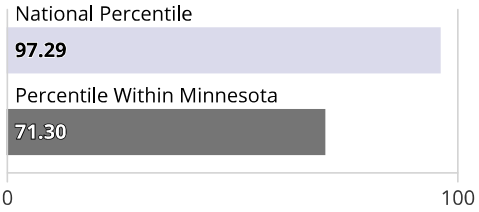
Very High | Relatively High | Relatively Moderate | Relatively Low | Very Low | Data Unavailable

Community Resilience

Communities in **Washington County, MN** have a **Very High** ability to prepare for anticipated natural hazards, adapt to changing conditions, and withstand and recover rapidly from disruptions when compared to the rest of the U.S.



Score	97.29



3% of U.S. counties have a higher Community Resilience

29% of counties in Minnesota have a higher Community Resilience

Community Resilience Legend

Very High | Relatively High | Relatively Moderate | Relatively Low | Very Low | Data Unavailable

About the National Risk Index

The National Risk Index is a dataset and online tool to help illustrate the United States communities most at risk for 18 natural hazards: Avalanche, Coastal Flooding, Cold Wave, Drought, Earthquake, Hail, Heat Wave, Hurricane, Ice Storm, Landslide, Lightning, Riverine Flooding, Strong Wind, Tornado, Tsunami, Volcanic Activity, Wildfire, and Winter Weather.

The National Risk Index leverages available source data for Expected Annual Loss due to these 18 hazard types, Social Vulnerability, and Community Resilience to develop a baseline relative risk measurement for each United States county and Census tract. These measurements are calculated using average past conditions, but they cannot be used to predict future outcomes for a community. The National Risk Index is intended to fill gaps in available data and analyses to better inform federal, state, local, tribal, and territorial decision makers as they develop risk reduction strategies.

Explore the National Risk Index Map at **hazards.fema.gov/nri/map**.

Visit the National Risk Index website at **hazards.fema.gov/nri/learn-more** to access supporting documentation and links.

Calculating the Risk Index

Risk Index values are calculated using an equation* that combines values for Expected Annual Loss (EAL) due to natural hazards, with the Community Risk Factor (CRF), which is a function of Social Vulnerability and Community Resilience:

$$\text{Risk Index} = \text{Expected Annual Loss} \times \text{Community Risk Factor}$$

$$\text{where Community Risk Factor} = f\left(\frac{\text{Social Vulnerability}}{\text{Community Resilience}}\right)$$

*County-level risk values are derived by summing the risk values of all Census tracts within that county.

Risk is presented as a composite value and score for all 18 hazard types, as well as individual values and scores for each hazard type.

For more information, visit **hazards.fema.gov/nri/determining-risk**.

Calculating Expected Annual Loss

Expected Annual Loss values are calculated using an equation* that combines values for exposure, annualized frequency, and historic loss ratios for 18 hazard types:

$$\text{Expected Annual Loss} = \text{Exposure} \times \text{Annualized Frequency} \times \text{Historic Loss Ratio}$$

*Excluding Avalanche, Drought, Earthquake, and Tornado, EAL values for each hazard are calculated at the Census block level and summed together to determine Census tract and county-level hazard type EAL values.

Expected Annual Loss is presented as a composite value and score for all 18 hazard types, as well as individual values and scores for each hazard type.

For more information, visit **hazards.fema.gov/nri/expected-annual-loss**.

Calculating Social Vulnerability

Social Vulnerability is measured using the Social Vulnerability Index (SVI) published by the Centers for Disease Control and Prevention (CDC).

For more information, visit **hazards.fema.gov/nri/social-vulnerability**.

Calculating Community Resilience

Community Resilience is measured at the County level using the Baseline Resilience Indicators for Communities (HVRI BRIC) published by the University of South Carolina's Hazards and Vulnerability Research Institute (HVRI).

For more information, visit **hazards.fema.gov/nri/community-resilience**.

Values, Scores, and Ratings

The National Risk Index provides three different types of results for Risk and each component used to derive Risk: EAL, Social Vulnerability, and Community Resilience:

Values. Values for Risk and EAL are in units of dollars, representing the community's average economic loss from natural hazards each year. For Social Vulnerability and Community Resilience, values are the index values for the community provided by the source data sets.

Scores. Scores represent the national percentile ranking of the community's component value compared to all other communities at the same level (county or Census tract).

Ratings. Ratings refer to the qualitative terms that describe the relative risk of an area within the same geographic level. These rating categories range from "Very Low" to "Very High". Ratings for Social Vulnerability and Community Resilience are based on quintiles of those components' scores, while Risk and EAL ratings are based on more advanced statistical calculations on values . As a result, there is no fixed range of scores or values that correspond to the rating categories.

How to Take Action

There are many ways to reduce natural hazard risk through mitigation. Communities with high National Risk Index scores can take action to reduce risk by decreasing Expected Annual Loss due to natural hazards, decreasing Social Vulnerability, and increasing Community Resilience.

For information about how to take action and reduce your risk, visit **hazards.fema.gov/nri/take-action**.

Disclaimer

The National Risk Index (the Risk Index or the Index) and its associated data are meant for planning purposes only. This tool was created for broad nationwide comparisons and is not a substitute for localized risk assessment analysis. Nationwide datasets used as inputs for the National Risk Index are, in many cases, not as accurate as available local data. Users with access to local data for each National Risk Index risk factor should consider substituting the Risk Index data with local data to recalculate a more accurate risk index. If you decide to download the National Risk Index data and substitute it with local data, you assume responsibility for the accuracy of the data and any resulting data index. Please visit the **Contact Us** page if you would like to discuss this process further.

The methodology used by the National Risk Index has been reviewed by subject matter experts in the fields of natural hazard risk research, risk analysis, mitigation planning, and emergency management. The processing methods used to create the National Risk Index have produced results similar to those from other natural hazard risk analyses conducted on a smaller scale. The breadth and combination of geographic information systems (GIS) and data processing techniques leveraged by the National Risk Index enable it to incorporate multiple hazard types and risk factors, manage its nationwide scope, and capture what might have been missed using other methods.

The National Risk Index does not consider the intricate economic and physical interdependencies that exist across geographic regions. Keep in mind that hazard impacts in surrounding counties or Census tracts can cause indirect losses in your community regardless of your community's risk profile.

Nationwide data available for some risk factors are rudimentary at this time. The risk profiles for the vast majority of hazard types are based on historical frequency and loss data. They represent risk and expected annual loss based on average past conditions, not future predictions. The National Risk Index will be continuously updated as new data become available and improved methodologies are identified.

For comprehensive details about how the Risk Index can help you and its limitations, see the **National Risk Index Technical Documentation**

Assumption of Risk

In view of the identified limitations of the National Risk Index associated data, by using the data, you acknowledge and agree that FEMA makes no representations or warranties about the accuracy, completeness, or fitness for any particular purpose of the data; that the data is provided "as is" without warranty of any kind; that you assume full responsibility for any consequences that may arise, including financial losses, legal disputes, or other adverse outcomes; and that you release FEMA and the federal government from any liability that may arise to the extent allowable by law.

Attribution, No Endorsement

Please attribute your use of the National Risk Index and its associated data to the Federal Emergency Management Agency.

However, you acknowledge and agree that nothing herein constitutes and endorsement of you or your work by FEMA or the federal government, and you shall not imply through use of the National Risk Index or its associated data or through providing attribution, that FEMA or the federal government endorses you.

Preferred citation for the National Risk Index:

Zuzak, C., E. Goodenough, C. Stanton, M. Mowrer, A. Sheehan, B. Roberts, P. McGuire, and J. Rozelle. 2023. National Risk Index Technical Documentation. Federal Emergency Management Agency, Washington, DC.

The National Risk Index Contact Us page is available at **hazards.fema.gov/nri/contact-us**.

Cottage Grove
Where Pride and Prosperity Meet

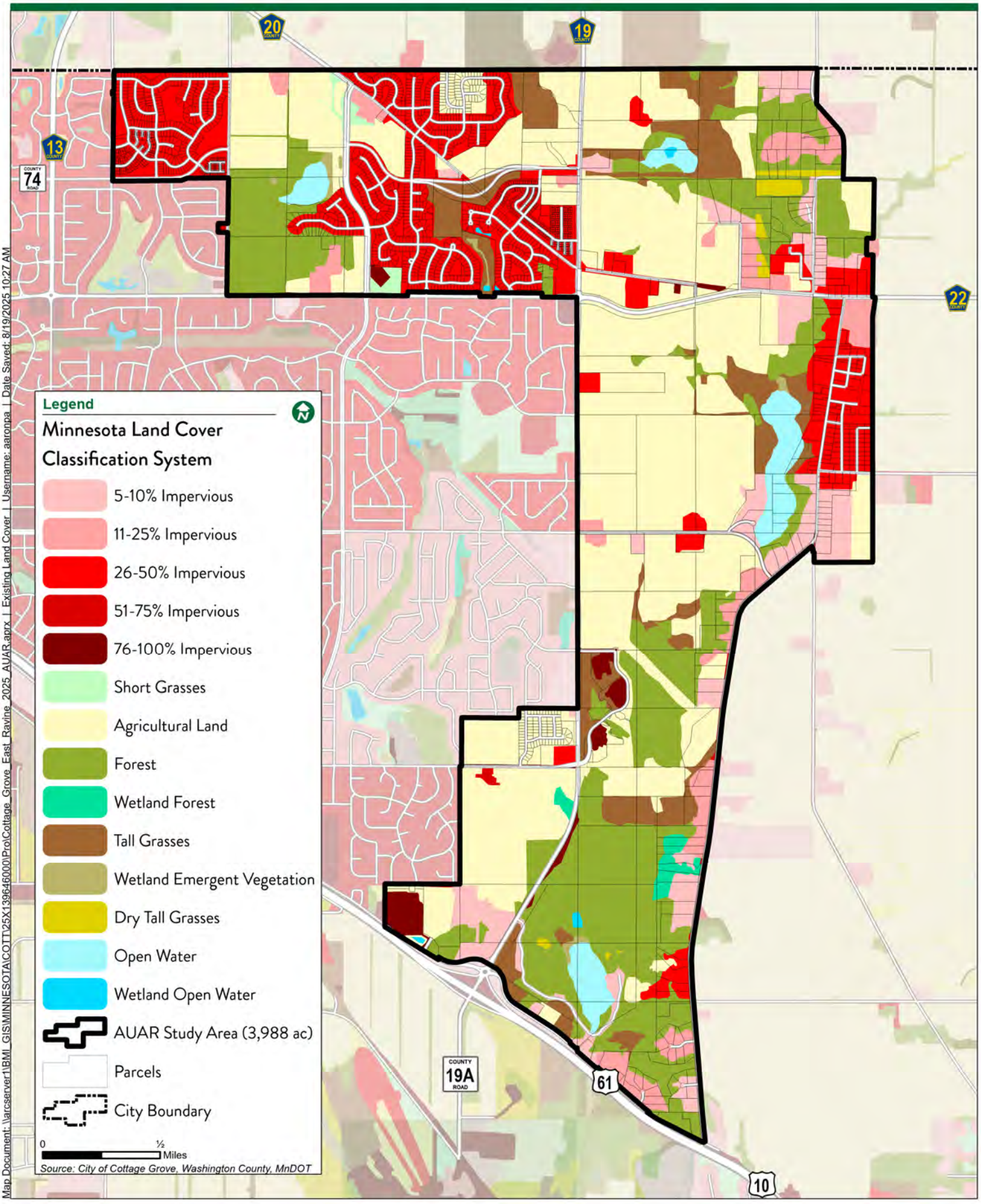
East River Ravine AUAR

City of Cottage Grove, Minnesota

Existing Land Cover

August 2025

BOLTON & MENK



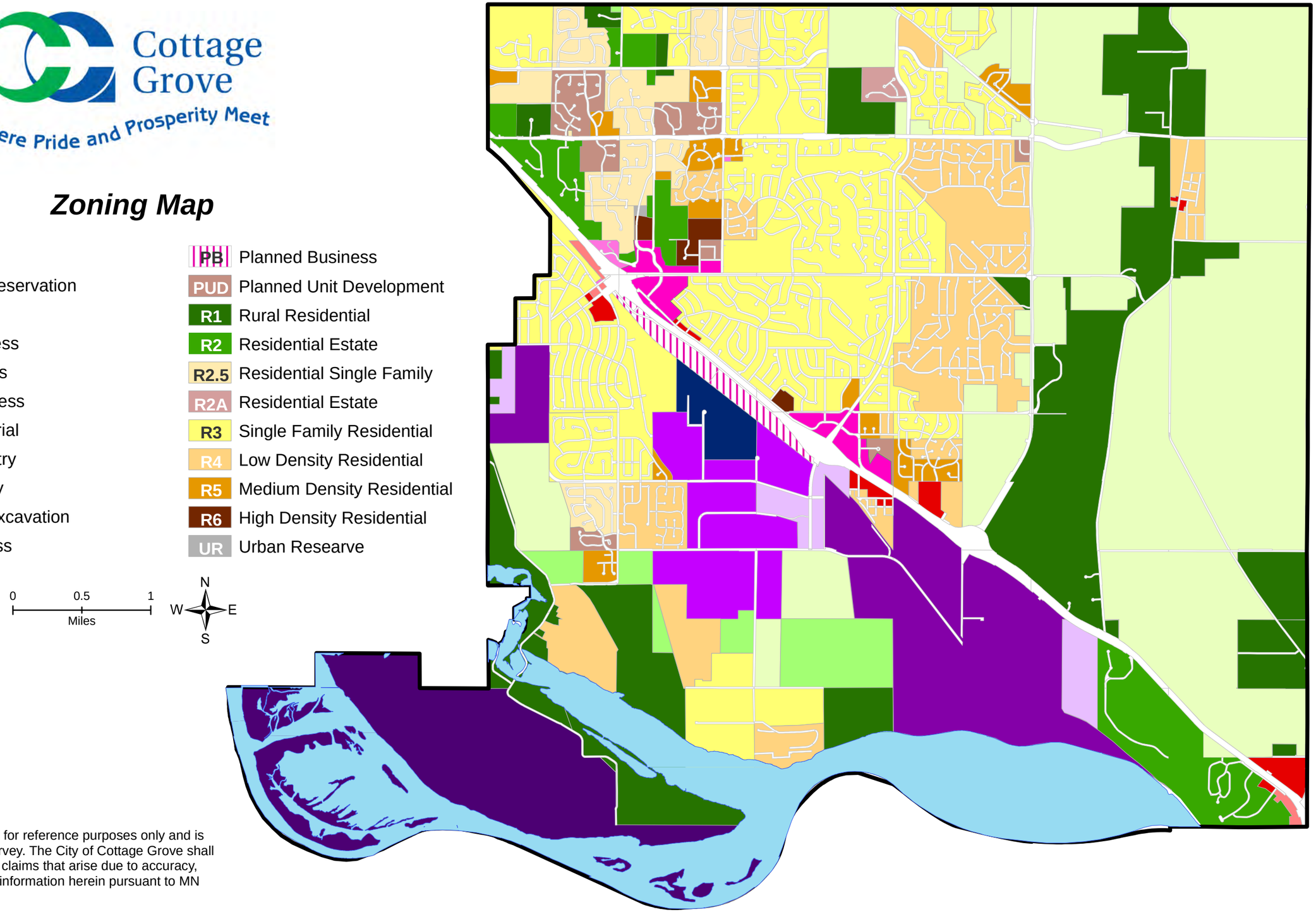
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Cottage Grove

Where Pride and Prosperity Meet

Zoning Map

- MU Mixed Use
- AG1 Agricultural Preservation
- AG2 Agricultural
- B1 Limited Business
- B2 Retail Business
- B3 General Business
- I1 Limited Industrial
- I2 General Industry
- I3 Heavy Industry
- I4 Commercial Excavation
- I5 Railroad Access
- PB Planned Business
- PUD Planned Unit Development
- R1 Rural Residential
- R2 Residential Estate
- R2.5 Residential Single Family
- R2A Residential Estate
- R3 Single Family Residential
- R4 Low Density Residential
- R5 Medium Density Residential
- R6 High Density Residential
- UR Urban Researve



Disclaimer: This map is intended for reference purposes only and is not a legally recorded map or survey. The City of Cottage Grove shall not be liable for any damages or claims that arise due to accuracy, availability, use or misuse of the information herein pursuant to MN Statute 466.03 Subd 21.

*Some of the rezoning shown are contingent on Comprehensive Plan amendment approval.

Updated May 2022

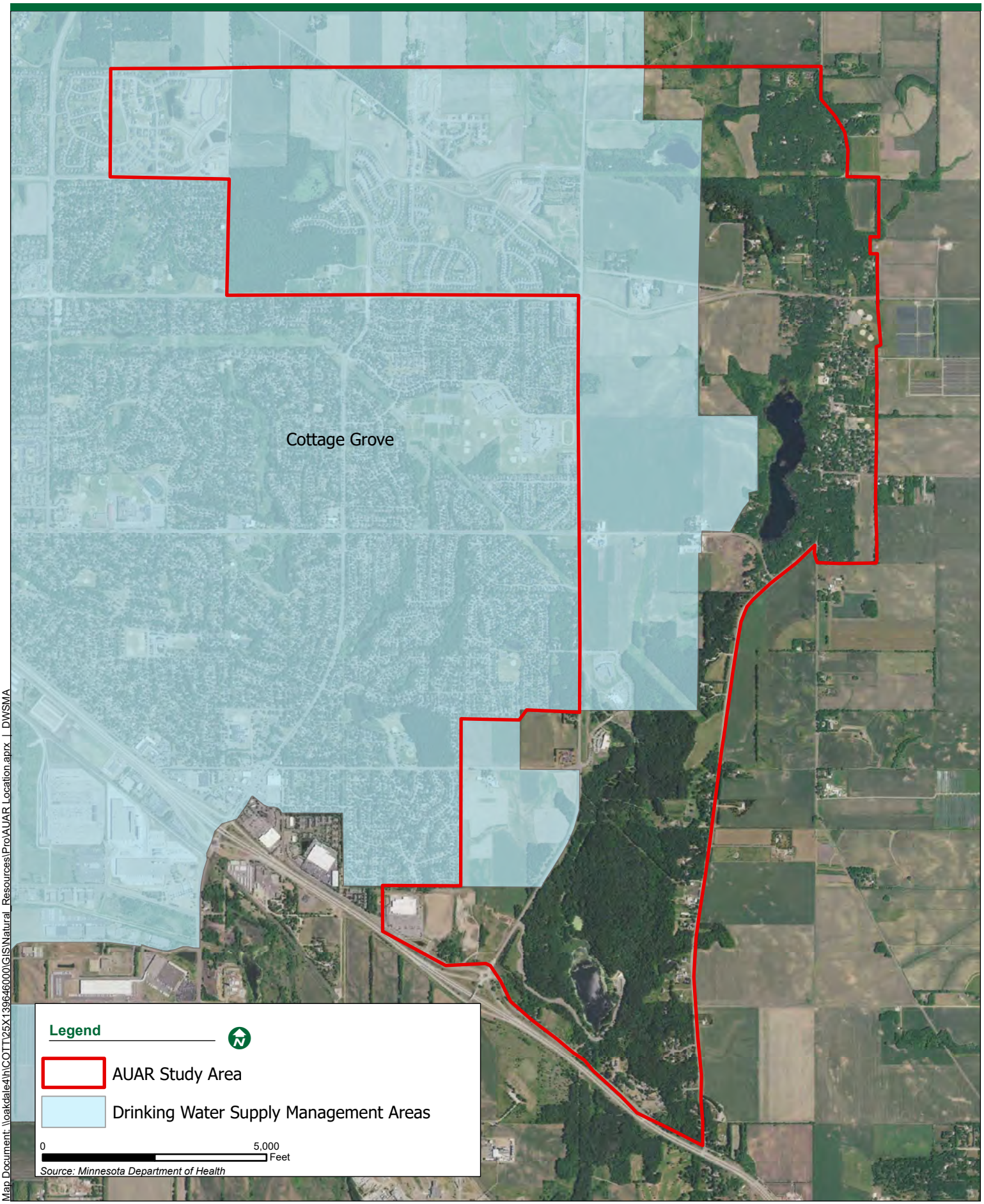
Cottage Grove East Ravine AUAR Update 2025

City of Cottage Grove, MN

DWSMA

July 2025

BOLTON & MENK



Map Document: \\oakdale4\h\COTT\25X139646000\GIS\Natural_Resources\Pro\AUAR Location.aprx | DWSMA

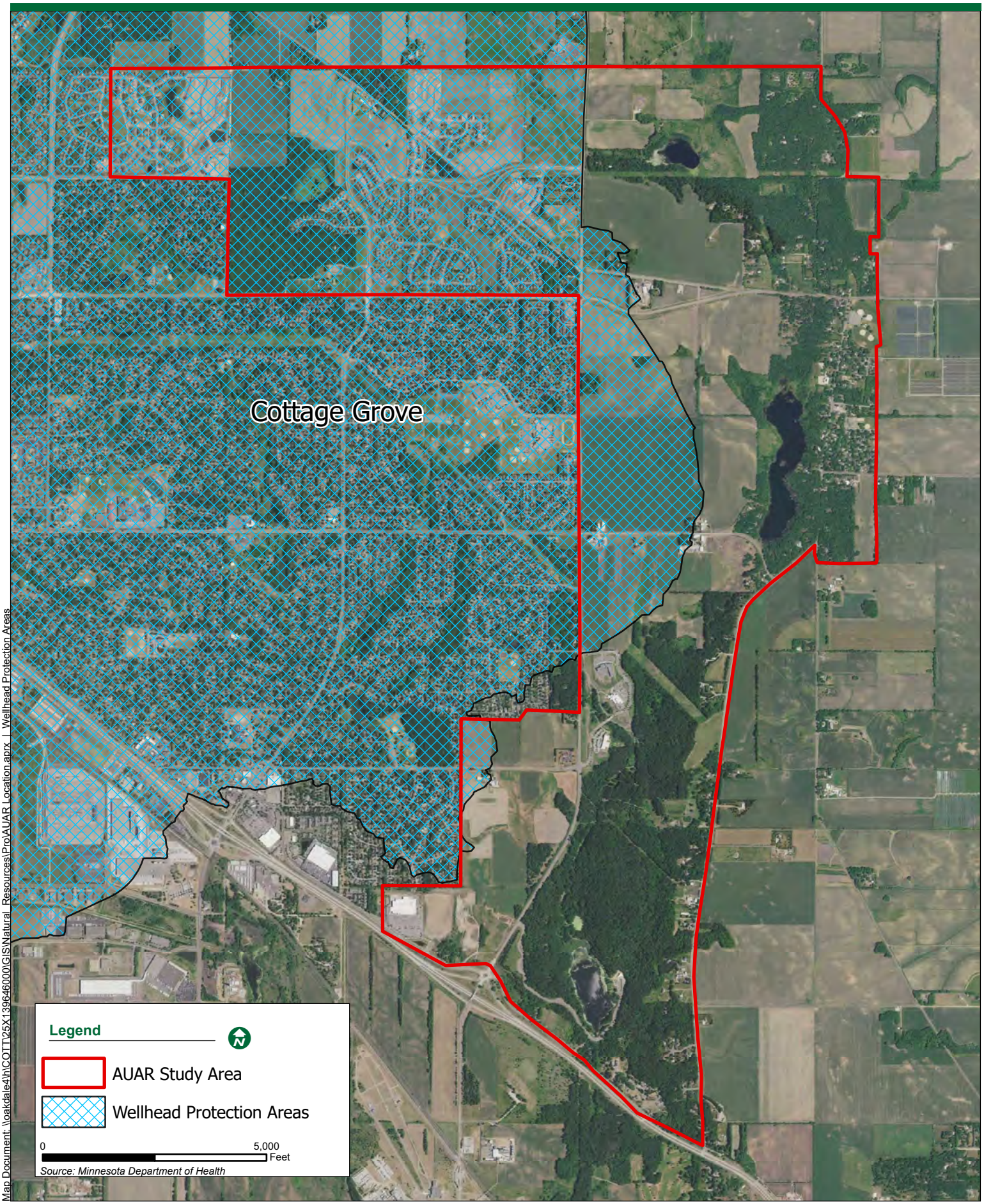
Cottage Grove East Ravine AUAR Update 2025

City of Cottage Grove, MN

Wellhead Protection Areas

July 2025

BOLTON & MENK



Map Document: \\oakdale4\h\COTT\25X139646000\GIS\Natural Resources\Pro\AUAR Location.aprx | Wellhead Protection Areas

NOTES TO USERS

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To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

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Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 15. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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Spatial Reference System Division
National Geodetic Survey, NOAA
Silver Spring Metro Center
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3191

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

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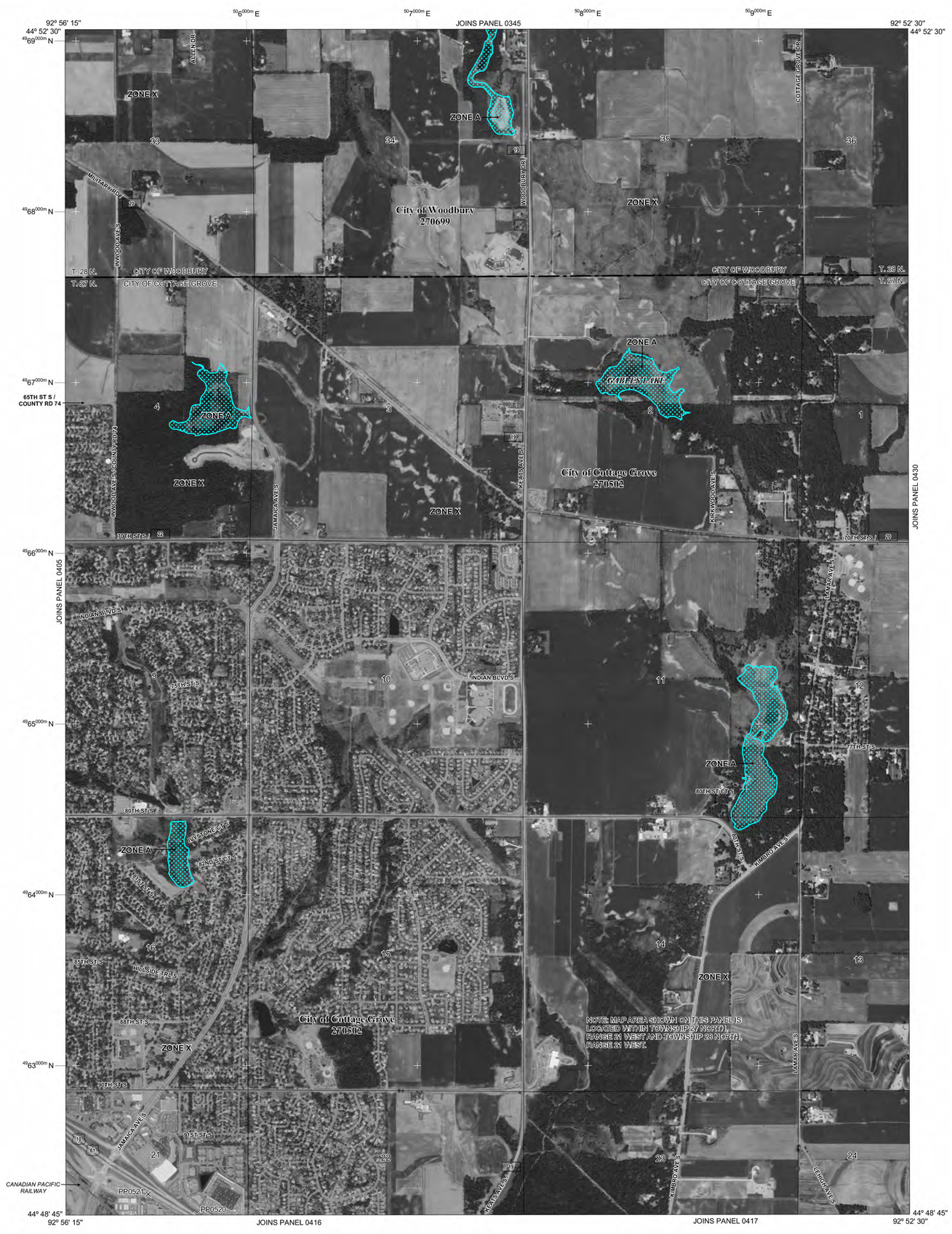
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If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1- 877- FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4989000m N — 1000-meter Universal Transverse Mercator grid values, zone 15
- ML5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
FEBRUARY 3, 2010

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'

500 0 1000 2000 FEET

300 0 300 600 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0410E

FIRM

FLOOD INSURANCE RATE MAP

WASHINGTON COUNTY, MINNESOTA AND INCORPORATED AREAS

PANEL 410 OF 456

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COTTAGE GROVE, CITY OF	270502	0410	E
WOODBURY, CITY OF	270699	0410	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
27163C0410E

EFFECTIVE DATE
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Federal Emergency Management Agency

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150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0417E

FIRM

FLOOD INSURANCE RATE MAP

WASHINGTON COUNTY, MINNESOTA
AND INCORPORATED AREAS

PANEL 417 OF 456

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
COTTAGE GROVE, CITY OF	270502	0417	E

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MAP NUMBER
27163C0417E
EFFECTIVE DATE
FEBRUARY 3, 2010

Federal Emergency Management Agency

City of Cottage Grove

November 2019

SURFACE WATER **MANAGEMENT PLAN**

Cottage Grove

Where Pride and Prosperity Meet



BOLTON & MENK

Real People. Real Solutions.

Certification

Surface Water Management Plan

City of Cottage Grove

BMI No. N14.117158

November 2019

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

By: Brent H. Johnson

Brent Johnson, P.E.
License No. 20378

Date: 11-20-2019

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

By: Dustin deFelice

Dustin deFelice, P.E.
License No. 54157

Date: 11/20/2019

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EXECUTIVE SUMMARY

This Surface Water Management Plan (SWMP) has been developed to serve as a comprehensive planning document to guide the City of Cottage Grove in conserving, protecting, and managing its surface water resources. The SWMP has been updated to meet the requirements as established in Minnesota Rules 8410, Metropolitan Council's SWMP Guidelines, and the rules and regulations of the South Washington Watershed District.

In general, local surface water plans need to include a summary of the priorities and problems in the community; structural, nonstructural and programmatic actions to take to address the priorities and problems; and clearly identified funding mechanisms to fix the problems.

The plan identifies the stormwater quantity and quality improvements, and infrastructure installations, necessary to allow future development to take place and minimize its impact to downstream waterbodies.

The plan is organized as follows:

- Section 1 offers an introduction and describes the purpose of the Plan.
- Section 2 describes the physical environment including watersheds and drainage patterns, dominant land uses, and significant water bodies within the City.
- Section 3 lists the City's goals and policies along with public agency requirements affecting surface water management in the City. This section also includes general information regarding the roles of the South Washington Watershed District, as well as those of other state and federal regulatory agencies influencing surface water management in the City.
- Section 4 outlines the City's approach to wetland management, in accordance with the standards and requirements of the watershed district.
- Section 5 presents an assessment of surface water quality issues in Cottage Grove. The section includes discussion regarding the NPDES permitting process, impaired waters and TMDL implementation.
- Section 6 provides a current assessment of surface water quantity management in Cottage Grove, including stormwater modeling, various design parameters, and identification of issues and corrective actions.
- Section 7 covers regulatory responsibilities, priority implementation items, educational programs, operation and maintenance, and financing considerations. A plan amendment process is also identified and the distinction between major and minor amendment outlined.
- Section 8 contains a summary of the SWMP and makes recommendations for implementing the Plan.
- Sections 9 and 10 include the list of reference documents and a glossary of terms, respectively.

SECTION I - INTRODUCTION

1.1 OVERVIEW

This report provides the City of Cottage Grove with an update to the Surface Water Management Plan (SWMP) that was adopted in 2008. This plan will serve as a guide to managing the City's surface water system and comply with Minnesota Statutes. This SWMP will guide surface water and storm water activities in the City for the 10-year period 2019-2028 and serve the City as a tool to protect, preserve and enhance its water resources. Periodic amendment to the Plan will likely occur in the intervening 10 years so that the Plan remains current to watershed plan amendments and Metropolitan Council requirements.

The plan identifies the stormwater quantity and quality improvements, and infrastructure installations, necessary to allow future development to take place and minimize its impact to downstream waterbodies.

The City of Cottage Grove must update its local water plan as part of the comprehensive plan update. In general, local surface water plans need to include a summary of the priorities and problems in the community; structural, nonstructural and programmatic actions to take to address the priorities and problems; and clearly identified funding mechanisms to fix the problems.

The City of Cottage Grove is located in the southeastern portion of the Twin Cities Metropolitan Area in Washington County (see **Figure 1**). The City occupies an area of approximately 37.5 square miles (33.6 square miles of land and 3.9 square miles of water). The major natural surface water features of Cottage Grove are the Mississippi River and the lakes, wetlands and draws that drain to the Mississippi. Cottage Grove is bounded on the north by the City of Woodbury; on the east by Denmark Township; on the south by the Mississippi River; and on the west by Grey Cloud Township, St. Paul Park, and Newport.

Settled in the 1840's with the creation of the Langdon and "Old Cottage Grove" villages, Cottage Grove experienced relatively slow growth as a rural community until the early 1950's. Since the 1950's, the City has experienced steady growth with a current population of greater than 35,000 residents. As the City continues to grow, the importance of adequate surface water management also grows.

1.2 PURPOSE

The Cottage Grove SWMP will serve as a comprehensive planning document to guide the City in conserving, protecting, and managing its surface water resources. The SWMP has been updated to meet the requirements as established in Minnesota Rules 8410, Metropolitan Council's SWMP Guidelines, and the rules and regulations of the South Washington Watershed District.

1.3 ORGANIZATION

This report is organized as follows:

- Section 2, Land and Water Resources - describes the physical environment including watersheds and drainage patterns, dominant land uses, and significant water bodies within the City.
- Section 3, Goals and Policies - lists the City's goals and policies along with public agency requirements affecting surface water management in the City.
- Section 4, Wetland Protection and Management - Outlines the results of the wetland inventory and assessment for portions of the City within the South Washington Watershed District and identifies applicable wetland protection and buffer standards.
- Section 5, Water Quality Assessment - Identifies high priority water bodies on which protection efforts should focus and identifies important water quality-related state and federal programs with which the City needs to comply.
- Section 6, Water Quantity Assessment - For each of the City's 13 major drainage districts, it presents an overview of the district as well as recommendations to address the major surface water management issues in that district, and presents the technical background on the stormwater

modeling methods and design of the system.

- Section 7, Implementation - covers regulatory responsibilities, priority implementation items, educational programs, operation and maintenance, the capital improvement program, and financing considerations. A plan amendment process is also identified and the distinction between major and minor amendment outlined.
- Section 8, Summary and Recommendations - contains a summary of the SWMP and makes recommendations for implementing the Plan.
- Sections 9 and 10 include the list of reference documents and a glossary of terms, respectively.

SECTION 2 - LAND AND WATER RESOURCES

2.1 TOPOGRAPHY AND WATERSHEDS

The City of Cottage Grove is located in southern Washington County, about 10 miles southeast of St. Paul. The history of the city's landscape begins around 500 million years ago, when much of Minnesota was covered by water, and the sedimentary rock layers that lie under the city were formed. Small areas of these layers are exposed on the Mississippi River bluffs today and remain in resistant bedrock knobs scattered among later glacial deposits in the West Draw area.

Before the last advance of the glaciers into the Twin Cities area, the ancestral Mississippi River flowed in a deep, wide gorge that passed beneath Lower Grey Cloud Island before turning south. This ancient valley, known as the Phalen Channel, eroded downward through sedimentary rock layers, and was eventually buried by glacial deposits. The Grey Cloud channel, which separates the Upper and Lower islands, marks the northern limit of this ancient Mississippi Channel. This buried valley filled with sand and gravel and is now mined on Lower Grey Cloud Island.

With the exception of these ancient features, most of the topography of Cottage Grove was shaped by the last period of glaciation in the Twin Cities Area, which occurred about 10,000 years ago, and was called the "Wisconsin Stage." The glaciers sculpted the landscape and left behind a variety of glacial drift deposits (primarily sand and gravel, and windblown deposits, called loess). At the same time, as the ice melted in northern Minnesota, enormous amounts of water flowed through the Minnesota and Mississippi River valleys (called the glacial River Warren), and formed broad, bench-like terraces of sand and gravel along the river corridor. The Trunk Highway 61 corridor roughly separates these two glacial features with the flat sandy terraces to the south along the river and the rolling uplands to the north. Resistant knobs of bedrock and kettle-shaped depressions formed by melting ice blocks are also scattered throughout the uplands.

The City generally drains from north to south, with topography within the study area varying from very flat to fairly steep slopes. The majority of the City is well drained via numerous main ravines or draws (namely West Draw, Central Draw, East Ravine, and Seeger Creek), ultimately discharging to the Mississippi River. Land surface elevations range from a high of 1,000 feet above sea level to a low of 687 feet, which is the normal pool elevation of the Mississippi River. Major and minor drainage districts, delineating drainage divides in the City, are identified on **Map 1** in Appendix A.

2.2 LANDUSE

Figure 2 shows existing landuse in the City**.** **Figures 3** and **4** show existing zoning districts and land cover, respectively. The proposed land use for Cottage Grove is shown on **Figure 5**. This land use is based on the City's 2040 comprehensive plan. The City's comprehensive plan provides a significant amount of narrative and statistical detail on existing and proposed land use and the reader is referred to that document for more information on land use planning. **Figure 6** shows natural areas and regionally significant ecological areas. The City lies within the jurisdiction of the South Washington Watershed District (SWWD) (see **Figure 7**).

2.3 GEOLOGY AND GROUNDWATER

The Geologic Atlas of Washington County, Minnesota[1] has detailed descriptions of the surficial geologic deposits and formations underlying Cottage Grove. A review of this data reveals that the majority of the City is underlain by either unconsolidated St. Peter Sandstone or the soluble Prairie du Chein group. Both of these bedrock units can develop sinkholes and other active karst features. Active karst is defined: "…as a terrain having distinctive landforms and hydrology created primarily from the dissolution of soluble rocks within 50 feet of the land surface."[2] Constructed stormwater pond or infiltration BMPs in active

[1] https://conservancy.umn.edu/handle/11299/178852 accessed December 5, 2018

[2] https://stormwater.pca.state.mn.us/index.php?title=Karst accessed December 5, 2018

karst areas can fail due to inadvertent sinkhole creation. Coordination with the watershed district and other local agencies is recommended to verify the location of karst sensitive areas and active karst features within the City. The South Washington Watershed District rules require applicants to investigate sites to identify areas with active karst and report any known karst features such as sinkholes, springs and caves. Proposed stormwater management BMPs such as infiltration basins and ponds within karst sensitive areas will require appropriate location and design.

There are five aquifers underlying all or portions of Cottage Grove. The Quaternary aquifer has been created by glacial meltwater that has generated outwash plains throughout much of the City, creating regionally valuable sand and gravel deposits. The thickness of these sediments ranges from less than 10 feet to greater than 300 feet in the central buried bedrock valley cutting through the City's center. This aquifer is generally un-confined and recharged through direct infiltration from precipitation and leakage from surface water bodies. It has not been a major source for groundwater development yet.

The Prairie du Chein-Jordan aquifer is the main source for all high capacity wells in the watershed. In most areas of Cottage Grove, this aquifer lies directly below the surficial deposits. Fractures, joints, faults, and solution cavities largely control the flow in this aquifer. The combined Franconia-Ironton-Galesville aquifer is only used to a minor degree for groundwater supply. However, both aquifer units provide regional groundwater discharge to the St. Croix and Mississippi River. The other bedrock aquifers, the Mt. Simon and the Eau Claire, are not significant sources of drinking water in the watershed.

In many areas of the City, the sensitivity to groundwater impacts is high or very high due to the soil and bedrock characteristics (Washington County Groundwater Plan 2014-2024). This groundwater impact sensitivity is because water infiltrating within the City can reach the water table in a short period of time, leaving little opportunity for attenuation of pollutants through degradation (SWWD 2007).

2.4 SOILS

The soils information in this section is taken from the United States Department of Agriculture Natural Resources Conservation Service (NRCS) Soil Survey of Washington and Ramsey Counties. The soils maps in that report are general and intended for broad planning purposes. The soils of Cottage Grove are shown in **Figure 8a**. Table 2.4 shows the drainage characteristics of each soil series.

Table 2.4 - Soil Drainage Characteristics

Soil Series	Draining Characteristic	Hydrologic Soil Group
Antigo	Well Drained	B
Ostrander	Well Drained	B
Sparta	Excessively Drained	A
Waukegan	Well Drained	B
Zimmerman	Excessively Drained	A

The drainage nature of the soil is important for determining the surface water runoff from a given area. If the soil is well-drained, a significant portion of the precipitation will be infiltrated into the ground, whereas if a soil is very poorly drained, most of the precipitation will flow from the site of impact.

The Hydrologic Soil Group (HSG) defines a soil's propensity to generate runoff for a given rainfall event. Four HSG groups area identified: A, B, C, D. HSG A soils have the lowest potential to generate runoff and are typically sandy or gravelly soils. HSG D soils have the highest potential to generate runoff and typically consist of muck, peaty muck, and tight clay soils. The associations found within the Cottage Grove SWMP study area fall primarily into HSG A to B, indicating a low to moderate potential to generate runoff. The soil series located within the City (identified by the soil HSG) have been mapped and are shown on **Figure 8b** (located in Appendix A).

Hydric soils are those characteristic soils found in wetland areas. A wetland must possess three technical criteria in order for it to be identified as a wetland. These three are: 1) hydrophytic vegetation, 2) hydric soils, and 3) wetland hydrology. The definition of a hydric soil is: "a soil that is saturated, flooded, or

ponded long enough during the growing season to develop anaerobic conditions in the upper part."

2.5 KEY WATER RESOURCES

The following paragraphs provide a general description of key water resources in the City of Cottage Grove. The reader is also directed to the 2016 Watershed Management Plan of the South Washington Watershed District for additional details on the lakes, wetlands, rivers and draws of Cottage Grove and the neighboring communities.

2.5.1 WETLANDS

Cottage Grove contains relatively few wetlands. This is due to the presence of well drained to excessively drained soils and undulating terrain and steep ravines covering the majority of the City.

The natural habitat quality of these wetlands is highly variable depending on past and present land use. Some wetlands are entirely surrounded by urban development while others are located in areas which are, for the most part, rural and undeveloped. This diversity in wetland surroundings poses a challenge for regulatory policy development. Protection of wetland functions and values in urbanized areas should not preclude continued growth of the City. Key wetland features can be found in Cottage Grove Ravine, the central draw, within Grey Cloud Dunes SNA, and in the north-central portion of the city. These complexes are described briefly below. The locations of the wetland complexes referred to are shown on **Figure 9** and **Map 1 in Appendix A**.

East Ravine

All of the following sites are within the SWWD Greenways Corridor, in Cottage Grove Ravine Regional Park.

Wetland RL-2-3: Ravine Park Lake

This good quality lake supports a diverse population of native, submerged aquatic plants with a high quality mixed emergent marsh community around the perimeter. There are records for the state-threatened Blanding's turtle at the lake, and most of the adjacent upland is mapped as high-quality oak forest on the MnDNR Map of Rare Features and Natural Communities. Other features in the vicinity of the lake include high quality dry prairie remnants, other good quality wetlands, and a population of the state listed threatened plant species kitten-tails.

Wetland RL-2-2

This small basin is just north of Ravine Park Lake. It provides exceptional wildlife habitat, due to its overall good quality and location within the MnDNR-mapped good quality forest and dry prairie remnants of the Cottage Grove Ravine Regional Park.

Wetland EW 1-1

Wetland EW 1-1 is a mix of lowland hardwood forest and good to high quality emergent marsh on the east branch of the East Ravine. The adjacent upland supports fallow pastureland with remnant good quality dry prairie, and populations of the state listed threatened plant species kitten-tails.

CP2-2

This large marsh complex is of good to high quality and is part of a complex of good quality natural communities. The entire oak forest around the basin is mapped by the MnDNR as a site of biodiversity significance, and the northern portion of the woods, adjacent to the wetland, is also included on the MnDNR's map of Rare Features and Native Communities for Washington County.

Langdon District

This old river channel that forms the core of this area is part of the SWWD Greenway Corridor. The grassy uplands have provided nesting habitat for the state listed endangered species loggerhead shrike. Important wetlands include MR-3-1 and MR-3-A.

MR-3-1

Wetland MR-3-1 is a complex of open water, emergent marsh, and wet meadow, all of medium to high quality. In addition to the site's inherent quality, it has added value as shrike habitat.

MR-3-A

This wetland on the 3M property was not evaluated during the survey due to lack of property access. It appears to be of moderate quality and may also provide shrike habitat.

South District

Several good quality wetlands occur within the Grey Cloud Dunes Scientific and Natural Area (SNA). These include MR-6-8 and MR-6-11.

MR-6-8

This site is a mix of high-quality sedge meadow, and medium to high quality shallow marsh and shrub wetland.

MR-6-11

MR-6-11 is a small basin dominated by a high-quality sedge meadow, with floodplain forest and shallow open water making up the rest of the site.

2.5.2 LAKES

Gables Lake

Gables Lake is located in the northeast corner of the City, within the Gables Lake District. Gables Lake is approximately 5 acres in size and has an estimated maximum depth of about 5 feet. Its drainage area is approximately 1,470 acres. The drainage area is largely undeveloped and extends into the southeast portion of the City of Woodbury. The drainage area to Gables Lake consists mainly of undevelopable wooded and agricultural areas. Gables Lake has no natural outlet but maintains a fairly constant water level by a combination of evaporation and infiltration.

Lake Robert (Shepard's Woods Pond)

Lake Robert (Shepard's Woods Pond) is located in the north-central portion of the City, within the East Ravine District. The drainage area to this pond (approximately 560 acres) includes the surrounding undeveloped and agricultural areas, including a portion of agricultural area within the City of Woodbury. The pond is approximately 15 acres in size and has no natural outlet near the elevation of the Ordinary High Water Level (OHW 921.53 NAVD88), but has maintained a fairly constant water level over the years by a combination of evaporation and infiltration. The City is planning to install a 36-inch diameter RCP outlet with invert elevation of 920.0 feet (NAVD88) in order to convey the runoff expected from a 7.4 inch 100-year Atlas 14 rainstorm and maintain water levels within an acceptable range. DNR and Watershed District permits will be required to install the outlet pipe.

Ravine Park Lake

Ravine Park Lake is approximately 16 acres in size, has a maximum depth of about 19 feet and a mean depth of about 5 feet, and is located within Cottage Grove Ravine Regional Park, north of TH 61. This lake receives drainage from a largely undeveloped drainage area, including the entire undevelopable park area and surrounding agricultural areas.

2.5.3 DRAWS AND RAVINES

The most prominent topographic feature for the majority of the City is the numerous draws and ravines that have been worn into the landscape, providing natural stormwater conveyance from the northern reaches of the City toward the Mississippi River in the south. As development occurs adjacent to the many draws and ravines, these features provide opportunities for not only wonderful aesthetic benefits to development, but natural stormwater storage and conveyance routes as well.

West Draw

The West Draw runs from the northwest corner of Cottage Grove to TH 61 and the Hamlet Park area, incorporating approximately 1,450 acres of drainage area. An additional 620 acres of drainage area from the City of Woodbury drains overland through the West Draw into Cottage Grove. In addition to the overland drainage area, the 1979 Woodbury Stormwater Plan proposed that 850 acres draining to a land locked basin just north of the Cottage Grove/Woodbury border be pumped into Cottage Grove via a lift station. A lift station has been constructed to pump flows into an existing land-locked depression on the border of Woodbury and Cottage Grove, but at this time flows are pumped no further. If in the future it becomes necessary to connect this existing land locked depression into the Cottage Grove stormwater conveyance system in the West Draw, in accordance with the South Washington Watershed District Watershed Management Plan, this lift station will be operated during off-peak times.

The stormwater infrastructure within the West Draw has proceeded according to the City's 1984 SWMP and subsequent drainage studies. This plan sets forth a framework for utilizing the topography within the West Draw to provide substantial rate control measures due to the limited downstream stormwater storage and conveyance capacity at TH 61.

Central and East Draws

The Central and East Draws have subwatersheds of approximately 1,140 and 1,080 acres, respectively. The contributing drainage areas to these draws are almost completely developed and the draws appear to be relatively stable. Both of these draws are integral to the regional stormwater system within the Central and East Draw Districts. The natural stormwater conveyance within both draws is utilized, behind constructed berms or roadways providing regional ponding areas at various points within the draws.

East Ravine

The East Ravine is the most prominent ravine within the City of Cottage Grove. This major geographic feature extends from the north to south end of the City, conveying roughly 25% of the drainage area within the City to the Mississippi River. With the construction of the Met Council Interceptor along County Road 19, the East Ravine has begun to develop. The proposed regional stormwater system within the East Ravine will take advantage of the many existing depression areas and natural conveyance routes. The East Ravine is a valuable resource within the City of Cottage Grove that the regional stormwater system will seek to protect and enhance.

2.5.4 STREAMS AND THE MISSISSIPPI RIVER

The headwaters of O'Connor's Creek lie along the eastern margin of the City of Cottage Grove. The Creek discharges to O'Connor's Lake, a land-locked basin in Denmark Township. Because of its landlocked nature, this lake will be extremely sensitive to increases in runoff volume.

Seeger Creek and its tributary branches are located in the southeast corner of the City. This creek drains approximately 3,600 acres of primarily agricultural drainage area from both Cottage Grove and Denmark Township, directly to the Mississippi River.

The City of Cottage Grove is bordered to the south by the Mississippi River. Apart from a few areas within the river floodplain, the majority of the City is located well above the river elevation. A large percentage of the City drains directly to the river, therefore, the City desires to minimize the impact of pollutants generated from development within the City.

SECTION 3 - GOALS AND POLICIES

3.1 PURPOSE

The primary purpose of the SWMP is to provide guidance on how the City of Cottage Grove intends to manage its surface water. Over time, significant advancement has been made in our understanding of how natural and manmade systems function in the context of rainfall, infiltration and runoff. New regulations have been created that reflect increased protection for water bodies and emphasize treatment of stormwater to protect downstream resources and groundwater.

A number of the City's goals and policies are guided by federal, state, regional and local mandates, while others arise out of the City's own desire to protect its natural resources in light of its unique character and circumstances.

A number of regulations, strategies and tools have emerged to manage the City's land and water resources effectively.

Together these regulations, initiatives and programs provide the basis for the strategies and requirements set forth by the City to guide the protection and management of the water resources within the City. This section of the SWMP specifically outlines the City's goals and policies related to surface water management. The goals and policies are consistent with the requirements of the South Washington Watershed District Watershed Management Plan, Minnesota Rules 8410 and Minnesota Statute 103B.235 (Local Water Management Plans), and demonstrate a desire, willingness, and commitment by the City to reach and sustain a high quality of life for its residents.

3.2 CITY OF COTTAGE GROVE

Surface water management is a strong component of the City's overall approach to protecting and preserving the community's natural resources. The City of Cottage Grove recognizes both the value and impact that surface water can have on the quality of life in the community. In this plan, the term surface water is used broadly to refer to:

- Wetlands
- Lakes and ponds, either natural or artificial
- The overland runoff resulting from rainfall or snow melt events
- Streams and other natural channels
- The Mississippi River
- Features constructed to temporarily or permanently store runoff such as infiltration areas

Surface water management also includes the infrastructure designed and constructed to collect, convey, store, treat, control and protect surface water resources. The goals and policies form the framework of the stormwater management strategies of the City of Cottage Grove. A goal is a desired end toward which the City's policies, standards, criteria and rules are directed. A policy is a governing principle, a means of achieving an established goal. Policies prescribe a general course of conduct that leads toward goal achievement.

Goal 1: Manage surface and groundwater resources using approaches that meet or exceed regulatory requirements.

> **Policy 1.1** – The City will meet, or if required, exceed the adopted surface and groundwater protection and management standards and requirements of the South Washington Watershed District (SWWD) as well as those adopted by the Metropolitan Council and the State of Minnesota, including the Total Maximum Daily Load (TMDL) program and the National Pollutant Discharge Elimination System (NPDES) Phase 2 requirements.

The South Washington Watershed District rules are attached in **Appendix F.** The City will comply with the South Washington Watershed District's updated Plan (adopted by the SWWD in October 2016) and the Standards Manual (Volume 1). As per past discussion and agreement with the SWWD, however, the City will interpret the runoff volume control requirements and wetland impacts in regional stormwater conveyance corridors according to Policies 6.1-6.2 and 5.4, respectively, of this Plan.

Policy 1.2 – The City is committed to the goal of nondegradation to area water resources.

Policy 1.3 – The City will adhere to the following policies relating to groundwater protection as contained in the Washington County 2003-2013 Groundwater Plan:

- Work to coordinate with other local government units for groundwater sensitive areas, wellhead protection areas, water use contingency and allocation plans and other groundwater issues where the plans may affect other jurisdictions.
- Adopt a wellhead protection plan; where necessary, create overlay districts and standards and incorporate into zoning ordinances and other related land use regulations.
- Develop land use regulations to protect groundwater resources based on completed studies and rankings of groundwater recharge areas.
- Consider requiring a groundwater monitoring plan or groundwater protection plan as part of a permit application for businesses that store, use, or transport hazardous materials and for properties formerly used as waste disposal sites or transfer facilities. Where available, use wellhead protection plans to support this process.

The City will also take into account the recommendations of the completed Part 2 Wellhead Protection Plan (approved by Minnesota Department of Health February 16, 2017) in its management of land use activities. The Wellhead Protection Plan is intended to prevent human-caused contaminants from entering the public water supply wells and to protect all who use the water supply system from adverse health effects associated with groundwater contamination.

Policy 1.4 – The City will complete either site specific or regional hydrogeologic assessments of stormwater infiltration within the high vulnerability Drinking Water Supply Management Area (DWSMA) prior to authorizing stormwater infiltration in these areas of concern. These assessments will conform to the "*higher level of engineering review*" required within the 2018 NPDES Construction Stormwater Permit or current standards regarding infiltration of stormwater within a DWSMA.

- The City of Cottage Grove stormwater rules require a uniform volume control treatment equal to 1" of runoff from the net increase in impervious areas. The City does not allow infiltration within potential problem areas outlined by the MN Department of Health, or the MPCA Stormwater Manual. The City also prohibits all infiltration within the 10-year groundwater capture zone of the City wells.
- The NPDES 2018 Construction Stormwater General Permit prohibits infiltration… outside an Emergency Response Area (ERA) within a high vulnerability DWSMA, unless the *"...MS4 Permittee performed or approved a higher level of engineering review sufficient to provide a functioning treatment system and to prevent adverse impacts to groundwater.*"
- The Cottage Grove DWSMA is classed as "high vulnerability" (**Figure 10**)
    - The City will allow infiltration within those areas of the high vulnerability DWSMA lying outside of the 10-year groundwater capture zone of the City wells if supported by the findings of a higher engineering review (Note: The groundwater management area is the area of the 10-year groundwater capture zone rounded out to parcel boundaries).

Goal 2: Provide adequate flood protection for residents and structures and protect the integrity of conveyance channels and stormwater detention areas.

Policy 2.1 – Adopt appropriate precipitation events for design of system components.

Storm sewers will be sized/designed using intensity-duration-frequency curves for the 5- year 24-hour precipitation event. Use the precipitation intensities from Atlas 14 for the project location to develop a project Intensity- Duration-Frequency (IDF) curve, or use the Atlas 14 regionalized IDF values developed by MnDOT with the Rational Method to calculate flow. Lake, natural pond/wetland, and detention pond high water levels will be based on an Atlas 14 100-year 7.4 inch 24-hour MSE3 distribution rainfall event.

Policy 2.2 – Establish freeboard standards to minimize the potential for flooding of critical structures, such as buildings.

High water levels shall be established as an area develops or when drainage facilities are constructed for an area. For stormwater facilities with emergency overflows, the low adjacent grade elevation for all new structures must be a minimum of 3 feet above both the peak surface water elevation for the 100-year precipitation event and 2 feet above the emergency overflow elevation of any immediately adjacent new stormwater basin. The submitted grading plan for this basin must identify the direction of overflow and provide adequate flowage easements for the overflow. For backyard and side-yard conveyance and temporary ponding areas, there must be at least 1 foot between the overland overflow elevation and the low adjacent grade elevation of the adjacent structure.

In land-locked areas with no practical emergency overflow, the low adjacent grade elevation of new structures shall be a minimum of 2 feet above the peak water level elevation of back-to-back 100-year recurrence interval precipitation events, and at least 5 feet above the peak water surface elevation generated by the critical 100-year recurrence interval precipitation event.

Policy 2.3 – Establish peak flow limits to avoid increases in downstream rates caused by development and protect channel integrity. At a minimum, peak flow rates after development shall not exceed pre-development peak flow rates for the critical 2-year, 10-year, and 100-year recurrence interval precipitation events. More restrictive rate control criteria may be required in order to protect the integrity of downstream conveyance channels and regional ponds. For example, project applicants and developers may be required by the City to restrict site outflow rates to less than the per acre inflow or outflow rates listed in the Appendix D Pond Table.

The SWWD provides guidance as to the acceptable runoff parameters for characterizing an existing condition, particularly for agricultural runoff. The City adopts the defined parameters of the SWWD.

Policy 2.4 – Follow watershed authority rules and guidelines in siting detention ponds and other stormwater management features in karst-sensitive areas.

Guidance from the watershed authorities will be used to determine karst-sensitive areas. Watershed authority technical guidance and rules as well as the Minnesota Stormwater Manual and guidance from the Minnesota Department of Health will be followed in determining the suitability of specific sites for certain stormwater management features and only those features for which the site is suitable will be approved for installation by the City.

Policy 2.5 – The City will preserve flood storage.

The City shall maintain a policy of "no net loss of storage capacity" in designated stormwater ponding areas.

Policy 2.6 – Maintain and improve the City's Regional Stormwater Models. These models are important for use in ongoing analysis and design of rainfall, runoff, storage and conveyance

through the natural and built drainage systems in the city. The City will periodically coordinate with the SWWD to monitor flows and runoff volumes and to calibrate the regional stormwater models to observed conditions within the city.

17 stormwater ponds were recently identified as having 100-year highwater levels increasing by 2 feet or more as a result of the Atlas 14 7.4 inch 24-hour rainfall depth and distribution. These 17 ponds will be analyzed further regarding highwater levels and outflows through the pipe spillways and emergency overflows. Stormwater ponding and conveyance features including emergency overflow spillways and open channel conveyance routes provide a measure of resilience to the effects of climate change since small increases in depth provide large increases in capacity.

Goal 3: Pursue the reduction of Total Phosphorus (TP) and Total Suspended Solids (TSS) loading to water bodies by compliance, municipal management activities, and public education.

Policy 3.1 – Encourage the incorporation of acceptable Low Impact Development (LID) techniques.

The City recognizes the water quantity and quality benefits provided by incorporating LID techniques into development within the City. The City is committed to working with developers to incorporate suitable LID techniques into future development.

Policy 3.2 – Minimum Best Management Practices (BMPs) performance criteria.

The City requires that new development projects include BMPs that, at a minimum, achieve post-development reductions in TP and TSS by 50% and 80%, respectively.

Watershed rules call for a TP loading rate of 0.22 lbs./acre/year or existing loading rates, whichever is less, for projects that drain to the Mississippi River; and a TP loading rate of 0.075 lbs./acre/year or existing loading rates, whichever is less, for projects that drain to Ravine Lake.

Policy 3.3 – Comply with the NPDES Phase II program administered by the Minnesota Pollution Control Agency (MPCA).

This program is focused on regulating stormwater runoff. The City of Cottage Grove will comply with this program by developing and submitting appropriate documentation as required by the program and performing related tasks as appropriate.

Policy 3.4 – Promote compliance with zero-phosphorus content fertilizer legislation.

Minnesota's Phosphorus Lawn Fertilizer Law was enacted to reduce over-enrichment of rivers, lakes, and wetlands with the nutrient phosphorus. Excessive phosphorus in surface water leads to an overabundance of algae and other aquatic plants.

The law was enacted over a period of years starting in 2002. Restriction on phosphorus fertilizer use on lawns and turf started in 2004 in the seven-county Twin Cities metro area and in Minnesota's other 80 counties in 2005. Minnesota was the first state in the nation to regulate phosphorus fertilizer use on lawns and turf. As of 2012, ten other states have similar laws.[3]

The City will promote awareness of this law in public education efforts.

Policy 3.5 – Reduce the use of sand in street de-icing procedures.

The City strives to tailor applications of sand for ice control in a way which balances public safety with environmental quality. The City recognizes that excessive application of sand on impervious surfaces results in significant sedimentation of downstream ponds and basins.

Policy 3.6 – Street sweeping to protect water quality will, at a minimum, be carried out in the

[3] https://www.mda.state.mn.us/phosphorus-lawn-fertilizer-law accessed December 7, 2018

spring and fall.

The City undertakes two seasonal street sweeping efforts. Streets are swept once in the spring as soon as practical. Streets are swept once in the autumn, generally after most leaves have fallen and targeting mature tree areas. Sweeping operations are conducted as necessary throughout the year.

The City intends to keep informed of street sweeping technologies and evaluate replacing obsolete equipment with more efficient updated equipment, subject to available funding and according to capital improvement priorities.

Policy 3.7 – Implement a storm system maintenance program based on objective standards.

The City will continue to be actively engaged in stormwater inspection, operation and maintenance, and repair of the stormwater system on a day-to-day basis. The City will follow a formal inspection, cleaning, and repair schedule. As required under the City's NPDES Municipal Separate Storm Sewer System (MS4) permit, at least 20% of the system will be inspected annually. Frequency of maintenance is event-based and driven by experience and inspection results.

Policy 3.8 – Dumping of wastes into the storm drainage system is illegal.

The City prohibits, through ordinance, the discharge of foreign material into the stormwater system, including refuse, yard wastes, sewage, industrial waste or other substances. Examples of other substances include materials such as oil, gasoline, antifreeze, paint, solvent, herbicides/pesticides, pet waste and other ecological harmful chemicals.

Policy 3.9 – The City will have spill response capability.

The City has access to spill clean-up kits in selected locations. The City will review its current program for spill response capability within one year of the date of adoption of this plan by the City Council, and if warranted, develop improvements in its spill response capability. Karst-sensitive areas as identified by the Minnesota Department of Health and the appropriate watershed management organization will have spill response plans.

Policy 3.10 – Carry out public education.

The City will actively implement an ongoing public education program. The program is directed primarily at City residents. Its objectives are to reduce phosphorus and sediment loadings to water bodies. The City Storm Water Information website, newsletter mailings and brochures are the primary vehicles for the program. The City also seeks out educational institutions within its community to implement programs and/or activities. The City is participating in the East Metro Water Resources Education Program to provide educational events and opportunities to the public regarding water quality and storm water pollution.

Goal 4: Classify and effectively manage water bodies in the community to achieve watershed management organization, state, and federal regulatory agency standards.

Policy 4.1 – The City adopts the classification and water quality protection standards for significant water bodies within the City of Cottage Grove as specified in the current watershed management plan.

For example, the classification and standards of the South Washington Watershed District Watershed Management Plan, adopted in October 2016 will be applied to Ravine Lake, O'Connors Creek and the Mississippi River.

Policy 4.2 – Develop guidelines for managing ponds with no developed public access.

The City will implement adequate maintenance for all ponds that are part of the City's stormwater management system to minimize as much as reasonably possible blockages of inlets

to- and outlets from- ponds, to maintain the original flood storage capacity, and to insure that each pond functions adequately as part of the City's flood management system.

Water quality or habitat improvement efforts for ponds without a developed public access must be balanced against overall public benefits. Property owners abutting a pond may desire that pond to provide or improve functions beyond what the City intends through this plan, such as improvement of aesthetics. In such cases, the City will work with affected residents in an advisory capacity to improve the pond environment. Where a city-wide benefit and city-wide knowledge can be gained, however, the City may elect to either assist with or implement itself, management measures on a specific pond.

Policy 4.3 – The City requires adequate pretreatment of stormwater runoff from development and redevelopment activities prior to discharge into all waterbodies.

Goal 5: Classify and manage wetlands in the community.

Policy 5.1 – The City will encourage the South Washington Watershed District in their efforts to update and complete the wetland inventory and management plan.

Approximately two-thirds of the wetlands within the City were assessed as part of an effort by the South Washington Watershed District in 1998. The inventory data associated with that assessment will be used by the City and Watershed District to guide management of those wetlands. The remaining wetland complexes in the City (approximately 40, located in the eastern third of the City) will be inventoried and assessed by the Watershed District as outlined in the 2016 Watershed Management Plan.

Policy 5.2 – The City will apply wetland buffer standards.

Wetland buffer zones are required on all public and private property which abuts a water body. The City will adopt the applicable wetland buffer standards of the South Washington Watershed District. The buffer standards will be applied to wetlands within parcels that are the subject of new development activity that must be approved by the City, or in accordance with the rules of the Watershed District.

Policy 5.3 – The City will encourage the South Washington Watershed District as Local Government Unit administering the overall wetland protection and preservation programs.

The South Washington Watershed District will continue to act as the Local Government Unit (LGU) for administration of the Wetland Conservation Act (WCA) of 1991 and all subsequent amendments in all portions of the City. This will include the application of officially adopted wetland protection standards promulgated through the WCA, and the SWWD as they relate to:

- Wetland impact sequencing
- Wetland replacement

The City supports the objective of no net loss in wetland functions and values within the City and will comply with the most current WCA regulations for mitigation requirements for any filling, draining, or excavation within a wetland.

Policy 5.4 – Where it is infeasible to meet watershed authority standards for wetland protection within the regional stormwater conveyance corridors identified on **Figure 9 in Appendix A** and also discussed in Section 4.3, the City will work with the SWWD to allow the corridor to serve a regional stormwater conveyance function.

The regional stormwater conveyance corridors identified on **Figure 9 in Appendix A** of this plan are essential components of the natural and man-made stormwater conveyance system that carries runoff from the communities of Lake Elmo, Woodbury, and Cottage Grove to the Mississippi River. In addition, these conveyance routes have been identified as regionally important

stormwater management features in past City and SWWD plans. The corridors are particularly important for conveyance of flood flows that could otherwise cause significant property damage. The City will work with the SWWD to manage wetland impacts and still allow use of the regional conveyance corridor. For example, SWWD Rule 3.2.2 states: "Wetlands which are clearly identified in historic local surface water management plans as integral to stormwater conveyance and management under full development may be granted a variance by the SWWD. However, all other applicable permits from other agencies still must be addressed."

Goal 6: Regulate new development and redevelopment activities.

Policy 6.1 – The City will comply with the SWWD rules and NPDES Construction Stormwater Permit standards for management of stormwater runoff for all development activity disturbing one acre or more of land, including projects less than one acre that are part of a larger common plan of development or sale, or according to the rules/regulations of the SWWD, whichever is more restrictive.

The City will comply with runoff volume reduction and stormwater treatment as presented in the SWWD Plan adopted October 2016, except that in place of the variable area-specific volume control requirements, the City shall apply a uniform volume control requirement equal to infiltrating 1" of runoff from new impervious areas of a development. For re-development projects, a net reduction from pre-project conditions (on an annual average basis) shall be obtained for the stormwater discharge volume and the stormwater discharges of total suspended solids (TSS) and total phosphorus (TP). The net reduction will apply to the impervious areas that are redeveloped. New impervious area of redevelopments, which is the difference between the total impervious area of the site before the re-development activity and total impervious area for the post-re-development condition, shall meet the full requirements of the volume control, TSS and TP rules.

At the discretion of the City Engineer, post-construction testing of infiltration/filtration rates within stormwater basins will be required, or post-construction records of water level measurements within stormwater basins will be required, to verify that design infiltration/filtration rates and drawdown periods will be met.

Where regional facilities are used to manage stormwater from development activity, the regional facilities will be constructed and operational prior to development.

Policy 6.2 – Where infiltration to fully meet the volume control measure is not desirable or is infeasible, an Alternative Sequencing procedure will be applied to achieve compliance.

The City prohibits all infiltration within the 10-year groundwater capture zone of the City wells. In addition, based on guidance from the SWWD, the MN Department of Health, and the MPCA Minnesota Stormwater Manual, the City will not allow infiltration practices as indicated in Table 3.2:

Table 3.2 - Summary of situations where infiltration of stormwater runoff is prohibited or not recommended.[4]			
Condition	**Prohibited**	**Not recommended**	**Not recommended unless conditions are met[1]**
Local rule or ordinance prohibits infiltration	X		
BMP is < 100 feet from drinking well in sensitive aquifer[3]	X		
BMP is < 50 feet from drinking well in a non-sensitive aquifer[3]	X		
BMP receives discharges from vehicle fueling and maintenance areas	X		
There is less than 3 of separation to bedrock or saturated soil	if CGP applies[2]	X	
BMP receives discharges from certain industrial facilities[4]	if CGP applies		
BMP is in areas where high levels of contaminants in soil or groundwater will be mobilized by the infiltrating stormwater	if CGP applies		X
BMP is located in D soils	if CGP applies		X
BMP is 1,000 feet up-gradient or 100 feet down-gradient of active karst	if CGP applies	X	
BMP is located within an Emergency Response Area in a DWSMA exhibiting high or very high vulnerability	if CGP applies	X	
BMP is located within an Emergency Response Area (ERA) in a DWSMA exhibiting moderate vulnerability, or outside an ERA in a DWSMA exhibiting high or very high vulnerability	if CGP applies, unless a higher engineering review indicates infiltration is acceptable	X	
BMP is located in soils with infiltration rate > 8.3 in/hr	if CGP applies		X
BMP is located within 1 year travel time of drinking supply well			X
BMP located within 10 feet of building or structure			X
BMP located within 35 feet of a septic system			X
BMP located less than 200 feet from toe of slope that exceeds 20%		X	
BMP receives discharges from a confirmed stormwater hotspot			X
A groundwater mound formed beneath the BMP during infiltration extends into the BMP		X	

[1]See discussion for conditions under which infiltration is acceptable.
[2]CGP = Construction Stormwater General Permit
[3]See Minnesota Rules Chapter 4725
[4]To determine if infiltration is allowed for a specific industrial sector or subsector, go to the list of sectors, select the sector of interest, and review section 8 for that sector (*Use of Infiltration Devices and/or Industrial Stormwater Ponds for Stormwater Treatment and Disposal*)

[4]https://stormwater.pca.state.mn.us/index.php?title=Situations_where_infiltration_is_prohibited_or_not_recommended accessed December 7, 2018

If infiltration is infeasible and alternate compliance sequencing is proposed, the applicant will provide documentation for why infiltration is not feasible or allowable, and the applicant will reduce impervious surface associated with the proposed action to the maximum extent practical.

The following Alternative Compliance Sequencing steps will be followed in the order shown:

1. The applicant will use alternative volume control practices, as described in the Minnesota Stormwater Manual, that are sized to meet the volume control requirement for the site.
2. The applicant will use to the maximum extent practical filtration and biofiltration practices, using an underdrain and an impermeable liner, that are sized to meet the volume control requirement for the site. The MN Stormwater Manual will be used as the definitive guide in designing and installing the filtration/biofiltration feature. If the applicant can show that the full volume of runoff for the appropriate volume control standard is filtered, the volume control requirement will be deemed to have been met. Other alternative BMPs will also be considered by the City if the applicant can demonstrate equivalency with the City's requirement.
3. For circumstances where the applicant cannot cost effectively meet the conditions for post-construction stormwater management for runoff volume and water quality in policy 6.1 on the site of the original activity, the City at its discretion shall identify, or may require the applicant to identify, off-site locations where mitigation projects can be completed. Mitigation project areas shall be selected in the following order of preference:
    - Locations that yield benefits to the same receiving water that receives runoff from the original construction activity
    - Locations within the same Department of Natural Resource (DNR) catchment area as the original construction activity
    - Locations in the next adjacent DNR catchment area upstream
    - Locations anywhere within the City

For applicants that use mitigation projects to meet the requirements in policy 6.1, all mitigation projects must involve the creation of new structural stormwater BMPs or the retrofit of existing structural stormwater BMPs, or the use of a properly designed regional structural stormwater BMP. Routine maintenance of structural stormwater BMPs already required by the City cannot be used to meet mitigation requirements. All mitigation projects the City approves shall be completed within an approved time frame after the start of the original construction activity and the City shall determine and document who the responsible party is for maintaining the BMP.

4. Use of wet sediment basins sized per the standard described within the MPCA General Construction Stormwater Permit.

If the applicant has followed the Alternative Sequencing procedure above and the full runoff volume control standard is still not met, the applicant will pay a cash dedication as a last resort. The procedure for calculating the appropriate cash dedication amount is presented in Section 5.4 of this Plan and the revenue from cash dedications will be ear-marked exclusively for water quality or runoff volume reduction improvements in the City.

For linear projects where the lack of right-of-way precludes the installation of volume control practices that meet the conditions for post-construction stormwater management in policy 6.1, the City will require a reasonable attempt be made to obtain right-of-way during the project planning process.

The City may allow for lesser volume control on the site of the original construction activity than the requirements in policy 6.1 only under the following circumstances:

- The owner and/or operator of a construction activity is precluded from infiltrating stormwater through a designed system due to any of the infiltration related limitations described above in this policy
- The owner and/or operator of the construction activity implements, to the maximum extent practicable, volume reduction techniques, other than infiltration, (e.g. soil decompaction, evapotranspiration, reuse/harvesting, conservation design, green roofs, etc.) on the site of the original construction activity that reduces stormwater discharge volume, but may not meet the conditions for post-construction stormwater management in policy 6.1

Policy 6.3 – Pursue infiltration of stormwater runoff as appropriate primarily for water quality protection, stream baseflow preservation, and channel protection.

Infiltration of stormwater should be applied as a technique to limit peak flows and runoff volumes for precipitation events greater than a 1-year event (2.45 inches of rainfall in 24 hours) only when reviewed and approved by the City Engineer. Even when approved, outlets/emergency overflows need to be provided for the infiltration areas to assure that freeboard requirements in Policy 2.2 are met for adjacent low structures.

Policy 6.4 – Soil decompaction.

The City encourages the practice of re-establishing the native infiltrative capacity of soils upon completion of mass grading activities. During the development review process, the City will recommend that soil decompaction, by means of deep ripping to a depth of at least 18 inches, be incorporated into site restoration activities. The volume control benefit provided by the deep ripping activity can be applied toward the City's volume control requirement, per the methodology outlined in the SWWD Standards Manual.

Policy 6.5 – Detention basin design standards.

When new ponds are constructed for stormwater management purposes, they will be constructed to meet the City's standards for detention basin design (see Section 6.1.4), as well as those of the Watershed District. The sizing of the pond can be adjusted to account for upstream runoff volume reduction features or other BMPs in the pond's watershed.

Policy 6.6 – Development pays for itself.

Storm drainage system financing shall be by trunk area assessments against benefiting properties and storm sewer facilities. All new developments shall be required to pay the prorated cost to dedicate land and construct a stormwater treatment facility meeting City requirements.

Policy 6.7 – Additional treatment can be required to protect downstream priority water bodies and/or meet jurisdictional WMO requirements.

The City may require, as a condition of approval to develop vacant land or redevelop existing sites, the construction by the developer of additional treatment features (to include ponds) or installation of appropriate best management practices over and above that required under Policy 6.1-6.2. This may be required even when existing improvements or ponds already are in place. The City can require these practices when it is necessary to protect the water quality of downstream priority water bodies. The City shall apply these requirements if necessary in order to meet the phosphorus load targets for Ravine Lake and the Mississippi River as outlined in the South Washington Watershed District Rules (2015).

Policy 6.8 – Control erosion at construction sites.

The City requires that applications for new or redevelopment activity include in their applications for City review, a SWPPP as required under the NPDES construction permit in effect at the time of review. Construction sites will be inspected to ensure compliance with the existing erosion and sediment control ordinance, Watershed District requirements, and with the construction site

permit under NPDES Phase II MS4 rules administered by the MPCA. The City completes quality assurance inspections on all NPDES permits in the City (where the City is not the owner) twice each month. For NPDES permits on City owned projects, inspections are conducted weekly and after each 0.5" rain event by either the City or Contractor. A plan review process and a financial security instrument are the primary instruments used to establish a basis for compliance.

Erosion and sediment control best management practices as outlined in the Minnesota Stormwater Manual will be required and must be shown on required submittals to the City for approval. Any street sweeping conducted by the City to remove erosional debris from streets will be charged to the owner of the property.

3.3 WATERSHED MANAGEMENT ORGANIZATION REQUIREMENTS

The City of Cottage Grove is within the jurisdiction of the South Washington Watershed District. The City of Cottage Grove is required to follow the Watershed District rules and requirements for surface water management.

A general overview of the SWWD is presented below, but readers are encouraged to contact the SWWD directly to obtain the most up-to-date information on their goals, policies, rules, and programs.

3.3.1 SOUTH WASHINGTON WATERSHED DISTRICT (SWWD)

The South Washington Watershed District covers an area of approximately 110 square miles in Washington County at the confluence of the Mississippi and St. Croix River. The District includes portions of the cities of Afton, Lake Elmo, Oakdale, St. Paul Park, Newport, Grey Cloud Island Township, Woodbury, Denmark Township, and Cottage Grove. The SWWD was formed in 1993 (it was called the Cottage Grove Ravine Watershed District until 1995, when it changed its name to the SWWD). The SWWD officially adopted the plan under which it is currently operating in October 2016. Primary City water resources identified in the SWWD's 2016 plan include Ravine Lake and the Mississippi River (Pool 2).

The 2016 Watershed Management Plan identifies seventeen broad goals for the SWWD. In large part, the issues that pertain to this SWMP relate to pressures related to land uses, development and urban growth. Changing land uses and increases in impervious surfaces have contributed to increased peak flows and runoff volumes in the SWWD, impacting lakes, wetlands, and flows in ravines.

The following Table 3.3.1 lists the goals of the SWWD plan and identifies how the City of Cottage Grove goals, policies and strategies in this plan address the goals and policies outlined in the South Washington Watershed District Watershed Management Plan.

Table 3.3.1 - Goals of the SWWD Plan

South Washington Watershed District Policy	Cottage Grove Comment or Proposed Action
Goal: Minimize existing and future potential damages to property, public safety, and water resources due to flood events (Including the Cottage Grove Central Draw, West Draw intercommunity flow limits, and Clear Channel Pond storage expansion).	Goal 2, Policy 2.1, 2.2, 2.3, 2.4, 2.5
Goal: Complete establishment of a controlled overflow from SWWD's Northern Watershed to the Mississippi River (Central Draw Storage Facility and Overflow project).	Goal 2, Policy 2.1, 2.2, 2.3, 2.4, 2.5
Goal: Protection and restoration of SWWD resources to meet local resource goals and State standards.	Goal 1, 3, 4, 6 Policy 1.1, 1.2, 3.1, 3.2, 3.3, 3.4, 3.6, 4.1, 5.2, 6.1
Goal: Prevent resource degradation of SWWD resources from bluff, streambank, shoreland, and construction site erosion.	Goal 1, 3, 6 Policy 3.2, 3.3, 5.2, 6.1, 6.3, 6.8

Table 3.3.1 - Goals of the SWWD Plan (continued)	
South Washington Watershed District Policy	**Cottage Grove Comment or Proposed Action**
Goal: Implement conservation efforts to ensure long-term viability of groundwater resources in South Washington County.	Goal 1 Policy 1.3, 2.4, 3.9, 6.1, 6.2, 6.3
Goal: Protect groundwater resources through pollution prevention and management of surface water groundwater interactions.	Goal 1 Policy 1.1, 1.3, 2.4, 3.8, 3.9, 3.10, 6.1, 6.2, 6.3, 6.8
Goal: Protect, restore, and reconstruct native terrestrial and aquatic habitat for the benefit of resource management.	Policy 5.2, 5.3,
Goal: Facilitate increased resilience of SWWD resources and public infrastructure through development of information and strategies and implementation of accepted climate adaptation practices.	Goal 1, 2 Policy 1.3, 2.1, 2.2, 2.3, 2.6, 3.1,
Goals: • In partnership with Local, State, and Regional partners, operate a monitoring program adequate to establish baseline water quality and quantity measures and identify long-term trends. • Operate a monitoring program adequate to detect changes in loading rates as a result of SWWD implementation actions.	Goal 1, 2 Policy 2.3, 6.7 The City is strongly supportive of the District's monitoring programs and appreciates the value of the monitoring data for calibration and verfiication of hydrology and hydraulic models.
Goal: Maintain updated, district-wide hydrological modeling to inform SWWD and municipal management of resources and infrastructure.	Goal 1, 2 Policy 2.1, 2.3,
Goal: Work with local and regional partners to advance knowledge of watershed management issues.	Goal 1, Policy 3.3, 3.10, 6.8
Goal: Heighten the awareness of key constituencies within the SWWD, sufficient to modify behavior to improve the recognition and implementation of SWWD policies, programs, and activities.	Goal 1, 3, 4 Policy 3.1, 3.3, 3.4, 3.5, 3.8, 3.10, 4.2 City's NPDES-MS4 permit.
Goal: Utilize a Results Based Accountability approach in evaluating and refining implementation strategies for achieving resource goals and to evaluate and improve program performance.	Noted: No proposed action
Goal: Establish and maintain controls necessary to achieve established SWWD resource goals, comply with mandated permits and programs, and maximize regulatory consistency with neighboring jurisdictions.	Goal 1, 2, 4, 6 Policy 1.1, 1.3, 2.4, 4.1, 5.2, 5.3, 6.1, 6.8
Goals: • Limit duplication of planning and implementation efforts by the SWWD and its state and local partners by improving collaboration and coordination of efforts. • Create efficiencies in implementation through partnerships.	Noted: No proposed action

3.4 STATE AND FEDERAL AGENCY REQUIREMENTS

This section of the SWMP presents a synopsis of the current agency requirements while acknowledging the existence of other requirements that may be applicable. Many of these agency requirements are focused on wetland resources. However, recent programs at the state level involve nonpoint source pollution control.

The City is committed to the preservation and enhancement of its wetlands and water resources through compliance with local, state, and federal wetland and nonpoint source pollution regulations.

3.4.1 MINNESOTA DEPARTMENT OF NATURAL RESOURCES (DNR)

The DNR has regulatory authority over the lakes, wetlands and watercourses in the Protected Waters Inventory (**Figure 9** in Appendix A). Public Waters are defined within Minnesota Statutes 103G.005 Subdivision 15. Wetlands in the public waters inventory are generally those Types 3, 4, and 5 wetlands in excess of 10 acres in rural areas or in excess of 2.5 acres in municipalities and incorporated areas. Watercourses in the inventory generally include natural streams and altered watercourses with total drainage areas exceeding two square miles and designated trout streams. Information on the location of state protected waters and water courses are shown on **Figure 9** in Appendix A.

Other powers and duties of the Minnesota DNR within the City include:

Floodplain Management

The Minnesota DNR offers assistance to local floodplain administrators. Communities use their floodplain ordinance in conjunction with FEMA-approved maps to guide land use decisions. The DNR assists local communities by providing general regulatory assistance.

Management of the Flood Hazard Mitigation program

The program's purpose is to provide technical and financial assistance to local governmental units for conducting flood damage reduction studies and for planning and implementing flood damage reduction measures. Eligible projects include: flood damage reduction studies for planning and implementing structural and non-structural measures including: acquisition of structures in the flood plain, relocations, flood-proofing, development of flood warning systems, public education, flood plain restorations, dams, dikes, levees, flood bypass channels, flood storage structures, water level control structures and other related activities.

Shoreland Management

Minnesota's Shoreland Management Program guides land development along Minnesota's lakes and rivers to protect their ecological, recreational, and economic values. The state shoreland rules (MR 6120.2500 - 6120.3900) establish minimum standards to protect habitat and water quality and preserve property values. These standards are implemented through local shoreland ordinances. Anyone who owns land along a lake or river should contact their city with questions about the standards and permit requirements that apply to their property. The DNR's role is to ensure that local shoreland ordinances comply with the state shoreland rules and to provide technical assistance and oversight to these local governments.

Mississippi River Corridor Critical Area

The Minnesota Department of Natural Resources (DNR) published rules for the Mississippi River Corridor Critical Area (MRCCA), an important milestone toward protecting the river's 72-mile stretch through the Twin Cities metropolitan area. The rules are the result of extensive collaboration with local governments, business and environmental groups, and property owners to hear concerns, gather ideas, and balance interests for rules that:

- Improve protections for water quality, habitat and scenic views;
- Protect existing development and allow redevelopment while protecting key resources; and
- Provide clear standards for landowners and simplify local government administration.

Six MRCCA districts are identified in Minnesota Rules, part 6106.0100:

- Rural and Open Space District (CA-ROS
- River Neighborhood District (CA-RN)

- River Towns and Crossings District (CA-RTC)
- Separated from River District (CA-SR)
- Urban Mixed District (CA-UM)
- Urban Core District (CA-UC)

3.4.2 U.S. ARMY CORPS OF ENGINEERS (USACE)

The Corps' regulatory program includes Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act. Under Section 10, a Corps permit is required to do any work in, over or under a 'Navigable Water of the U.S.' Waterbodies have been designated as 'Navigable Waters of the U.S.' based on their past, present or potential use for transportation for interstate commerce. Under Section 404, a Corps permit is required for the discharge of dredged or fill material into waters of the U.S. Many waterbodies and wetlands in the nation are waters of the U.S. and are subject to the Corps' Section 404 regulatory authority.

3.4.3 BOARD OF WATER AND SOIL RESOURCES (BWSR)

The local and regional wetland rules are governed by the Wetland Conservation Act (WCA). The WCA, passed in 1991, extends protection to all wetlands unless they fall under one of the exemptions of the WCA. The WCA follows a “no net loss” policy. The wetlands covered under the WCA must not be drained or filled, wholly or partially, unless replaced by restoring or creating wetland of at least equal public value under an approved replacement plan. Replacement ratio is typically 2:1 (2 acres created for every 1 acre filled) for wetland impacts.

A designated Local Government Unit (LGU) is responsible for making exemption and no-loss determinations and approving replacement plans. Currently, the South Washington Watershed District acts as the LGU for WCA within the City.

The powers and duties of this Minnesota state agency also include:

- Coordination of water and soil resources planning among counties, watersheds, and local units of government.
- Facilitation of communication among state agencies in cooperation with the Environmental Quality Board.
- Approval of watershed management plans.

3.4.4 MINNESOTA POLLUTION CONTROL AGENCY (MPCA)

The USACE implements provisions of Section 404 of the Clean Water Act with guidance from the EPA through a permitting process. The Section 404 permit also requires a Section 401 water quality certification before it is valid. The EPA has given Section 401 certification authority to the MPCA.

The powers and duties of this Minnesota state agency include:

- Fulfilling mandates from the EPA, particularly in regard to the Clean Water Act.
- Administration of Cottage Grove's NPDES MS4 permit.
- Administration of the NPDES construction stormwater permit program.
- Administration of the NPDES industrial site discharge permit program.
- Development of Total Maximum Daily Loads (TMDLs) for water bodies and watercourses in Minnesota (often in conjunction with other agencies or joint powers organizations such as watersheds).

The NPDES program and the TMDL program. regulate nonpoint source pollution. These two programs

affect stormwater management and address water quality impacts from watershed activities.

Generally, Phase II of the NPDES program regulates communities less than 100,000 people that are within "urbanized" areas. NPDES Phase II addresses three areas of stormwater management:

- Municipal Separate Storm Sewer Systems (MS4)
- Construction site activity
- Industrial site activity

The primary goal of the MS4 program is to restore the integrity of waters of the state through management and treatment of urban stormwater runoff. This program was implemented by the MPCA in 2003. Regulated communities are required to submit a permit to the MPCA every five years. As part of the permit, MS4 communities must develop a Storm Water Pollution Prevention Program that details the use of appropriate Best Management Practices. The TMDL program seeks to address waters (lakes, streams or rivers) that do not meet their designated use; these waters are considered impaired. Every two years the MPCA must publish a list of state-wide impaired waters.

Surface waters listed as impaired on the Proposed 2018 TMDL (303(d)) impaired waters list developed by MPCA listed in Section 5.5 of this report. Broadly, the TMDL process identifies the sources and relative load contributions of all inputs to a water body for a given pollutant. Through this process, pollutant reduction strategies can be developed to allow a water body to meet its designated use. Specifically, a TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet its designated use, and an allocation of that amount to the pollutant's sources. This calculation must also include a Margin Of Safety (MOS).

3.4.5 STATE AND FEDERAL JURISDICTIONAL BOUNDARIES FOR PUBLIC WETLANDS AND WATERS

Wetlands are delineated in accordance with the Federal guidelines. The USACE and the BWSR regulate wetlands as defined by a jurisdictional delineation. For wetlands that fall under the MnDNR jurisdiction, the Ordinary High Water Level (OHW) determines the boundary of MnDNR jurisdiction. The OHW is established by the MnDNR.

3.5 AGENCY STORMWATER PUBLICATIONS

Best Management Practices (BMPs) are techniques, methods, and measures that prevent or reduce water pollution from stormwater runoff. These practices may include regulations, structural features, and operation/maintenance procedures. The City of Cottage Grove will adopt the MPCA's Minnesota Storm Water Manual as the standard reference to storm water BMPs.

In addition, the South Washington Watershed District has developed a Standards Manual. This manual provides guidance on meeting the performance endpoints outlined in the District's 2016 plan for managing runoff and protecting water resources. Among other purposes, it is intended to provide guidance on the means and methods for achieving watershed standards by providing technical guidance on sizing and siting specific BMPs and quantifying the benefits of those BMPs in pollutant load and runoff volume reduction.

3.6 AGENCY CONTACTS

The primary contacts for local regulating agencies described above are presented below. These contacts are accurate as of December 2018.

South Washington Watershed District
2302 Tower Drive
Woodbury, MN 55125
Phone: (651) 714-3729
Fax: (651) 714-3721
Website: www.swwdmn.org

SECTION 4 - WETLAND PROTECTION AND MANAGEMENT

4.1 WATERSHED MANAGEMENT ORGANIZATIONS

The South Washington Watershed District has the regulatory authority within the City of Cottage Grove for wetland protection and management.

In the late 1990's, the South Washington Watershed District began the process of creating a Wetland Management Plan for the wetlands within the watershed. During the initial phases of that project, the wetlands within the SWWD, including 82 of the approximately 140 wetlands within the City of Cottage Grove, were evaluated for specific functions and values using a modified version of the Minnesota Routine Assessment Method (MnRAM) version 2.0. In 2003, the SWWD sent the draft Wetland Management Plan for review; this document establishes standards for wetland management including water quality, water quantity, and buffer widths. The wetland management standards in this 2003 draft Wetland Management Plan has since been incorporated into the SWWD approved Watershed Management Plan. As part of this SWMP, the city will adopt the standards of the SWWD for city wetlands.

4.2 WETLAND ASSESSMENT

Two factors determine a wetland's susceptibility to damage from stormwater input: community type and community quality (as measured by floral diversity). Some wetland community types, such as sedge meadows, are highly susceptible to damage and degradation if exposed to repeated and/or extreme fluctuation in water levels (bounce). Other community types, such as floodplain forests, contain species that are adapted to this type of "bounce" in water levels and can tolerate stormwater impacts with fewer negative effects on the vegetation.

Similarly, the overall quality of the community affects how susceptible an area is to stormwater impacts. Because a high-quality area is more diverse, it is likely to contain species that are somewhat conservative in habitat. These conservative species have a lower tolerance for disturbance and usually drop out of a community as disturbance pressures increase. Thus, stormwater impacts can reduce the diversity at a site and alter the condition of good quality areas. Since low quality areas, by definition, have reduced species diversity and tend to be dominated by disturbance-adapted species, stormwater impacts are unlikely to cause further degradation at the site.

In order to provide appropriate management standards for each wetland, it is therefore essential to understand the community type (for managing stormwater runoff quantity) and community quality (for managing stormwater runoff quality). This information can be gained through completing a functions and values assessment for each wetland for which management standards are needed.

4.3 WETLAND MANAGEMENT STANDARDS

All of the inventoried wetlands within the SWWD study area were classified for management based on wetland type and quality. For wetlands of moderate or low quality, other criteria such as floodplain management were also considered when determining the wetland management class.

An additional category, Wetlands within Critical Stormwater Conveyance Corridor, was added by the City of Cottage Grove. These wetlands lie within corridors in the Langdon, West Draw, and East Ravine Districts (as identified on **Figure 9** in Appendix A) that are critical as regional conveyance features for stormwater from portions of the cities of Cottage Grove, Lake Elmo, Oakdale, Afton, and Woodbury. For example, the conveyance corridor in the Langdon District is the ultimate conveyance route for over 7,800 acres (including 600 acres from the City of Woodbury) and the East Ravine District is the ultimate conveyance route for over 20,000 acres (including 14,500 acres from the Cities of Woodbury, Lake Elmo, Oakdale, and Afton). In addition, these corridors have been part of the regional stormwater conveyance strategy since Cottage Grove's first surface water management planning efforts. Finally, significant regional rate control will need to be accomplished in order to protect the integrity of steep ravines at the lower end of each corridor that carry the regional discharge to the Mississippi River.

There are no viable alternatives to these major regional conveyance routes.

Flexibility for using these wetlands for stormwater management is also critical for preservation of the ecological value in other priority natural areas, including corridors near the Grey Cloud Dunes, along the terraces adjacent to the Mississippi River, and in portions of the Cottage Grove East Ravine. Certain wetland management standards are adjusted for wetlands within a Critical Stormwater Conveyance Corridor to allow maximum flexibility in their management. The adjustment of these standards will be based on a mutual agreement between the City and SWWD. A summary of the management classes, and the number of wetlands in each class, is presented in Table 4.3.

Table 4.3 - Wetland Management Classification

Management Classification	Number of Wetlands
Stormwater Conveyance	10
Protect	23
Manage I	21
Manage II	15
Filled	9
No Access	1
Lake	3

The wetland management standard categories identified in Table 4.4 include:

- Water Quality Protection
- Water Quantity Protection
- Buffer Zones
- Wetland Mitigation

4.3.1 WATER QUALITY

Increased pollutant loads to wetlands, especially nutrients and sediments, are a significant contributing factor to the degradation of diverse wetland systems. Some provision for water quality treatment before stormwater discharges into wetlands must be addressed. Since phosphorus is an important nutrient and is related to the removal of other contaminants, stormwater pretreatment for phosphorus is required for different wetlands depending on what is necessary to preserve their functional values.

In order to preserve those systems that still possess higher functional values for wildlife habitat and floral diversity/integrity, a stricter standard based on phosphorus loads is required. As discussed for lakes, wetland can serve as nutrient sinks, thus loads become important rather than just concentrations. Increased nutrient loading can affect the plant community of a wetland and therefore a more restrictive total loading standard is needed for Protect and Manage 1 wetlands. This is important since the wetland's functional value is highly dependent on the plant community quality. Wet detention ponding along with other BMPs can be used to accomplish the pretreatment requirements of the standards given in Table 4.4.

4.3.2 WATER QUANTITY

The State of Minnesota Stormwater Advisory Group has prepared a technical paper, Storm-Water and Wetlands: Planning and Evaluation Guidelines for Addressing Potential Impacts of Urban Storm-Water and Snow-Melt Runoff on Wetlands, which divides wetland community types into the categories of highly susceptible, moderately susceptible, slightly susceptible, and least susceptible. This document was used as a guideline for developing protection standards for each wetland in the city, and for developing overall stormwater susceptibility ranking. A summary of different community types and their susceptibility to stormwater impacts is provided in Table 4.3.2.

Table 4.3.2 - Wetland Community Susceptibility to Stormwater Impacts*			
Highly Susceptible Wetland Types	**Moderately Susceptible Wetland Types**	**Slightly Susceptible Wetland Types**	**Least Susceptible Wetland Types**
Sedge Meadow	Shrub-carrs	Floodplain Forests	Gravel Pits
Open Bogs	Alder Thickets	Fresh (Wet) Meadows	Cultivated Hydric Soils
Coniferous Bogs	Fresh (Wet) Meadows	Shallow Marshes	Dredged Material/ Fill Material Disposal Sites
Fill Material Disposal Sites			
Calcareous Fens	Shallow Marshes	Deep Marshes	
Low Prairies	Deep Marshes		
Coniferous Swamps			
Lowland Hardwood Swamps			

*Guidance for Evaluating Urban Storm-Water and Snow-Melt Runoff Impacts on Wetlands (Minnesota Storm Water Advisory Group, 1997)

4.3.3 BUFFERS

The wetland standards in Table 4.4 call for the establishment of "buffer zones" around wetlands. For wetlands within the SWWD, the Wetland Management Classification provides buffer zone widths designed to preserve the functions and related values of each basin.

A buffer of undisturbed vegetation around a wetland can provide a variety of benefits. The buffer can consist of trees, shrubs, grasses, wildflowers, or a combination of plant forms. Buffers reduce the impacts of surrounding land uses on wetland functions by stabilizing soil to prevent erosion; filtering solids, nutrients, and other harmful substances; and moderating water level fluctuations during storms. Buffers also provide essential habitat for feeding, roosting, breeding and rearing of young birds and animals; and cover for safety, movement and thermal protection for many species of birds and animals. Buffers can reduce problems related to human activities by blocking noise and glare from lights and reducing disturbance. Even a 10-20 foot buffer (depending on the slope steepness) of tall vegetation can provide some water filtering benefits, but wider buffers will provide additional water quality and habitat benefits.

Buffers can be planned to tie important upland habitats to wetlands, or connect wetlands and other waters.

Since many animal species require both wetland and upland habitats as part of their life cycles, and also require opportunities to move to escape predators or find food and cover, buffers should be planned to maximize these connections. Buffers will be most effective if the landowners around a wetland make a continuous buffer and connect desirable wetland and upland habitats.

Cutting vegetation, dumping grass clippings or other debris, and trampling should be avoided in buffer areas. If a path is desired through the buffer, it should be mown only as wide as necessary for walking, and gently meandered so that it does not encourage erosion or carry sediments and nutrients from surrounding areas to the wetland.

4.3.4 WETLAND MITIGATION

Regardless of wetland classification, loss of wetland area (i.e. impacts) will be mitigated (i.e. replaced) on-site whenever practical. The project applicant is responsible for demonstrating that on-site mitigation is not technically feasible or sound by a sequencing analysis. Where on-site replacement is determined unsuitable, replacement of wetland impacts shall be located within the hydrologic subwatershed; if location within the subwatershed is not feasible, mitigation should occur within the watershed. Where on-site replacement is not appropriate or possible, wetland replacements will target areas which exhibit flood prone conditions. Credits will be allowed for mitigating wetland impacts.

Replacement of wetland impacts on projects by public road authorities are provided through the State wetland bank, or through a separate wetland bank managed by the Minnesota Department of Transportation Metro Division. Impacts to wildlife habitat are difficult to quantify, therefore, mitigation

of wildlife impacts will be accomplished through maintaining connectivity to surrounding habitat areas.

4.4 SUMMARY OF WETLAND MANAGEMENT STANDARDS

Table 4.4 summarizes the management standards that the City will adopt for each wetland management classification for wetlands within the SWWD.

Table 4.4 - Wetland Management Standards for Wetlands within SWWD

Criteria	Protect	Manage I	Manage 2	Within a Critical Stormwater Conveyance Corridor
Water Quality				
Phosphorus Inflow Load (average annual pounds)	Maintain predevelopment	60% post-development load reduction	60% post-development load reduction	Based on Management Classification
Water Quantity				
Storm bounce 10-year rainfall (4.2-inch)	Existing[1]	Existing plus 1.0 foot	No limit	To be determined[2]
Discharge rate (inflow) 2-year (2.8-inch) & 100-year (6.3-inch) rainfall	Existing[1]	Existing or less	Existing or less	To be determined[2]
Inundation period 1-year rainfall (2.4-inch)	Existing[1]	Existing plus 2 days	Existing plus 7 days	To be determined[2]
Inundation period 2-year rainfall (2.8-inch)	Existing[1]	Existing plus 14 days	Existing plus 14 days	To be determined[2]
Run-out control elevation (free flowing)	No change	0 to 1.0 feet above existing run out	0 to 4.0 feet above existing run out	Based on Management Classification
Run-out control elevation (landlocked)	Based on SWWD Floodplain Map	Based on SWWD Floodplain Map	Based on SWWD Floodplain Map	Based on Management Classification
Buffer Width				
Wetlands <1 acre	75 feet	50 feet	25 feet	Based on Management Classification
Wetlands >1 acre	100 feet	75 feet	50 feet	Based on Management Classification
Impact Mitigation				
Area replacement ratio	3:1	2:1	2:1	Based on Management Classification
Volume replacement ratio	2:1	2:1	2:1	Based on Management Classification

[1] "Existing" means the existing hydrologic conditions. If there have been significant changes in conditions, it means the conditions which established the current wetland.

[2] This standard will be determined at a later time based on a mutual agreement between the City and SWWD.

4.5 PROCEDURES FOR WETLANDS NOT INVENTORIED

Roughly two-thirds of the wetlands within the city were inventoried by the SWWD in 1998. The approximately 40 remaining, non-inventoried wetlands are primarily in the eastern third of the City (Sections 1, 12, 13, 23, 24, 25, 26, and 34-36). Additional non-inventoried wetlands can also be found in Sections 3, 5, 7, and 19. The SWWD will update the Wetland Management Plan as outlined in the 2016 Watershed Management Plan.

SECTION 5 - WATER QUALITY ASSESSMENT

5.1 BACKGROUND

Since the early 1990's, there has been a considerable increase in the number and rigor of rules and programs at the state and federal level pertaining to water quality protection of surface and groundwater resources. In addition, the South Washington Watershed District has also adopted increasingly stringent control measures to protect water quality. The SWWD have identified priority surface water resources within their jurisdiction that they believe merit specific levels of water quality protection. As part of their updated watershed plans, the SWWD adopted management standards for designated priority waters in Cottage Grove.

Approximately 20% of the City was developed prior to the onset of more stringent water quality regulations occurring in the early 1990's. These areas of the City, including portions of the Central, East, St. Paul Park, and Thompson Grove Districts, provide only minimal stormwater ponding facilities, with the focus of these facilities being primarily flood control, not water quality treatment. The City has developed a list of water quality related system improvements used to guide the City in retrofitting these older portions of the City. Further discussion about the water quality improvements list is covered in Section 5.3 of this chapter.

This chapter will identify the priority waters and management standards applying to those waters. This chapter will also present information on the state and federal programs which most directly affect how the City manages its water resources to protect water quality.

5.2 SYSTEM IMPROVEMENTS FOR WATER QUALITY

In 2000, a list of water quality-related system improvements was developed to guide City efforts in this area.

The projects listed as well as estimated costs to implement the projects are presented in Appendix G at the back of this report. Most of the improvements involve removal of accumulated sediment and expansion of pond wet volumes to enhance pollutant removal performance of the ponds. In some cases, berms within the ponding areas were proposed to improve stormwater circulation in the pond with the intent of enhancing performance. The water quality-related system improvement appendix is adopted by reference for this report but should be reviewed and re-evaluated in the context of new regulations, requirements, and priorities that have arisen since it was developed, including NPDES and TMDLs (covered later in this chapter).

5.3 WATER QUALITY CASH DEDICATION

Greater impervious coverage associated with new development or redevelopment activity places additional burdens on the storm drainage system by increasing the rate and volume of runoff. This in turn increases the amounts of pollutants exported from a development site. Existing or expanded storm drainage systems needed to serve the developed area provide an efficient means of delivering these higher pollutant loads to downstream receiving waters. Unless these pollutant loads are reduced, downstream receiving waters will be degraded over time as a result of development.

The City of Cottage Grove recognizes its responsibility to protect priority water resources from adverse impacts due to increases in land use intensity caused by development and redevelopment activities.

To minimize the impacts of development on Cottage Grove's priority water bodies, development and redevelopment activity shall be subject to water quality mitigation requirements as outlined in the policies under Goal #6 in Chapter 3. Where applicable mitigation requirements are determined infeasible to be fully met on-site, this plan also includes provisions for collecting water quality cash dedications under certain situations and dedication of the revenue from such collections to help finance system requirements related to stormwater quality and runoff volume control. The following is intended to better define under what conditions the City can collect a cash dedication and how it will be calculated:

1. To the maximum extent practical, the volume control and water quality standards presented in this plan should be fully met on-site. However, infiltration as a volume control measure may be undesirable or impossible because of site conditions as outlined in Policy 6.2, and/or water quality treatment to achieve full compliance with total phosphorus removal standards may be infeasible or impractical.
2. If the applicant claims that infiltration is not feasible or it is not allowable on-site, the applicant must provide supporting documentation and follow the Alternative Compliance Sequencing as outlined in Policy 6.2.
3. If the applicant has followed the Alternative Sequencing procedure and the full infiltration requirement applicable to the site is still not met, the applicant will pay a cash dedication as a last resort for mitigation.
4. The procedure for calculating the appropriate volume control cash dedication amount is as follows:
    - The volume of 1" of runoff from the total impervious coverage of the site will be calculated.
    - An average depth of temporary ponding of 2 feet will be used to convert the volume of infiltration required to an area required for the theoretical infiltration feature.
    - The City Council will adopt, and adjust periodically, a unit land area price for each type of land use and a unit infiltration feature construction price that will be applied to the area of the hypothetical infiltration feature necessary to accommodate the runoff volume. The sum of the two components will be the cash dedication for the project.
    - To the extent that a percentage of the infiltration volume can be met by the development, the infiltration cash dedication will be based on the shortfall on a pro-rata basis.
5. The procedure for calculating the water quality total phosphorus removal off-site mitigation cash dedication is as follows:
    - The TP load from an acre of impervious surfaces in the MIDS model is 1.837 lbs./acre/year.
    - In MIDS, an infiltration basin sized for 1 acre of impervious surface (1815 sq. ft., 2' depth, 1.6 in./hr.) achieves 1.762 lbs./year TP removal (96%).
    - The unit cost of TP removal ($/lbs./year) is computed based upon the sum of the 1815 sq. ft. basin construction cost plus the 1815 sq. ft. land cost divided by the 1.762 lbs./year of TP removal. Construction and land unit costs are listed below in subsection 7. Cash dedications will be based on the unit costs of TP removal multiplied by the desired TP removal lbs./year
6. For redevelopment projects, when the total impervious area on the site is increased by any amount, the cash dedication will be based on the total impervious coverage of the site after re-development. The purpose of this standard is to discourage net increases in impervious coverage for re-development.
7. For the year 2019, the recommended rates are as follows:
    - Construction/installation cost: $14.00/sq-ft
    - Cost per acre for calculated infiltration feature surface for specific land types:
        - Residential $150,000/ac.
        - Schools and Churches $267,900/ac.
        - Industrial $117,600/ac.
        - Commercial $357,200/ac.

8. The proceeds from the cash dedication will be ear-marked exclusively to finance water quality and runoff volume reduction improvements in the City.
9. Example volume control cash dedication amounts based on this procedure are as follows:
    - Five acre new low-density residential development (20% impervious) - $31,660
    - Five acre new commercial development (75% impervious) - $151,100
    - Five acre new commercial development (75% impervious), can infiltrate only 1/3" of runoff on the site instead of 1" of runoff - $100,733
    - Two acre commercial re-development project (impervious coverage increased from 75 percent to 80 percent) - $64,469
    - Two acre commercial re-development project, no impervious increase - $0
10. Example TP removal cash dedication amounts based on this procedure are as follows:
    - 1 lbs. TP removal from industrial development - $17,202
    - 1 lbs. TP removal from commercial development - $22,868
    - 5 lbs. TP removal from residential development - $89,840
11. The Alternative Sequencing Procedure and cash dedication will be in effect until such time as the SWWD develops and adopts a system with which the City must comply.

5.4 TOTAL MAXIMUM DAILY LOADS AND IMPAIRED WATERS

Several waters within the City as well as the Mississippi River adjacent to its southern border are listed on the state impaired waters list. Known as the 303(d) list from the applicable section of the federal Clean Water Act, these waters are ones that do not currently meet their designated use due to the impact of a particular pollutant or stressor. If monitoring and assessment indicate that a waterbody is impaired by one or more pollutants, it is placed on the list. At some point a strategy would be developed that would lead to attainment of the applicable water quality standard.

The process of developing this strategy is commonly known as the Total Maximum Daily Load (TMDL) process and involves the following phases:

- Assessment and listing
- TMDL study
- Implementation plan development and implementation
- Monitoring of the effectiveness of implementation efforts

Responsibility for implementing the requirements of the federal Clean Water Act falls to the U.S. Environmental Protection Agency. In Minnesota, the EPA delegates much of the program responsibility to the state Pollution Control Agency. Information on the MPCA program can be obtained at the following web address: https://www.pca.state.mn.us/water/total-maximum-daily-load-tmdl-projects The following is an excerpt from the MPCA website describing the program and its need:

The Clean Water Act requires states to publish, every two years, an updated list of streams and lakes that are not meeting their designated uses because of excess pollutants. The list, known as the 303(d) list is based on violations of water quality standards and is organized by river basin.

Beyond the federal requirements, there are many reasons for us to move forward with the development of TMDLs. Foremost is the need to clean up our rivers, streams and lakes to maximize their contributions to the state's economy and quality of life and to protect them as a resource for future generations.

For each pollutant that causes a water body to fail to meet state water quality standards, the federal Clean

Water Act requires the MPCA to conduct a TMDL study. A TMDL study identifies both point and nonpoint sources of each pollutant that fails to meet water quality standards. Water quality sampling and computer modeling determine how much each pollutant source must reduce its contribution to assure the water quality standard is met. Rivers and streams may have several TMDLs, each one determining the limit for a different pollutant.

Table 5.4 lists the 303(d) impaired waters within the City of Cottage Grove and **Figure 11** shows the location of these waters in the City.

Table 5.4 - 303(d) List of Impaired Waters within the City of Cottage Grove

Water Body	City Ponding Designation	Year First Listed	Assessment Unit ID #	Affected Use	Pollutant or Stressor	TMDL Complete
Unnamed Creek (East Ravine)	N/A	2002	07010206-517	Aquatic life	Fish Bioassessments	Yes
Ravine Park Lake	ER-P5.4	2006	82-0087-00	Aquatic recreation	Nutrient/Eutrophication Biological Indicators	Yes
Mississippi River (Upper St Anthony Falls to St Croix R)	N/A	1998	07010206-814	Aquatic consumption	Mercury in fish tissue[1] Mercury in water column Pcb in fish tissue Perfluorooctane sulfonate (pfos) in fish tissue Perfluorooctane sulfonate (pfos) in water column	Yes approved for Mercury
		2017	07010206-814	Aquatic life	Nutrients Total suspended solids	Yes approved for TSS
		2017	07010206-814	Aquatic recreation	Fecal coliform	No
Lake St. Croix	N/A	2008	82-0001	Aquatic recreation	Excessive Nutrients/Phosphorus	Yes

[1]A state-wide mercury TMDL study was approved in 2008

The absence of a waterbody from the 303(d) list does not necessarily mean the waterbody is meeting its designated uses. It may be that it has either not been sampled or there is not enough data to make an impairment determination. Additionally, where mercury is identified as a stressor, the TMDL approach will be regional in nature as mercury is most commonly an air-borne pollutant.

For impaired waters whose watersheds extend into adjacent communities, the City may request the appropriate jurisdictional WMO to take the lead (with the City participating as needed) or to co-facilitate the completion and implementation of the TMDL. For TMDLs that have regional implications and potentially major implications for Cottage Grove (e.g., any of the Mississippi River TMDLs), the City will cooperate with lead agencies. Part of this involvement will be aimed at assuring due acknowledgement and consideration is granted the City for its past efforts to control urban nonpoint source inputs to the impaired water.

Figure 12 shows potential hotspots and contaminant sources in "What's in my Neighborhood." The MPCA provides a wide variety of environmental information through the "What's in my Neighborhood"

website[5]: including potentially contaminated sites, restored sites, environmental permits and registrations. This information is provided to help citizens understand their communities and environment.

5.5 NPDES MS4 PERMIT PROGRAM

In 2003, the Minnesota Pollution Control Agency required the City to submit an NPDES Permit Application to minimize the discharge of stormwater runoff pollutants and authorize stormwater discharge from the City's Municipal Separate Storm Sewer System.

The MPCA also required the City to prepare and submit a Stormwater Pollution Prevention Program (SWPPP).

The SWPPP identifies a combination of stormwater Best Management Practices (BMPs), including education, maintenance, control techniques, system design and engineering methods, and such other practices, both existing and planned, determined appropriate to meet the NPDES Permit requirements.

The Cottage Grove SWPPP includes 37 BMPs in the following categories or Minimum Control Measures:

- Public Education and Outreach
- Public Participation and Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Runoff Control
- Post-Construction Runoff Control
- Pollution Prevention/Good Housekeeping

Each year of the 5-year permit cycle, the City must conduct an Annual Public Meeting and submit an Annual Report to the MPCA which summarizes:

- The status of compliance with Permit conditions;
- Assessment of the appropriateness of the BMPs;
- Progress towards achieving the measurable goals for each of the minimum control measures;
- Stormwater activities planned for the next reporting cycle;
- A change in any BMP or measurable goals for any of the minimum control measures; and
- A notice that the City is relying on another entity to satisfy some of the Permit obligations (if applicable).

The BMPs listed in the SWPPP are a legally enforceable part of the Permit. The City must complete the tasks and milestones to remain authorized to discharge stormwater into waters of the state.

5.6 RECOMMENDATIONS

Following are recommendations related to this chapter of the SWMP:

- Re-evaluate/update the list of water quality-related system improvements developed in 2000 and included in Appendix G in light of changes in regulatory emphasis and management priorities. Complete the re-evaluation/update within one year of date of adoption of this plan by the City Council.
- Adopt the water quality cash dedication calculation methodology outlined in this chapter, and periodically review, update as necessary, and adopt unit costs for land dedication, outlet

[5] https://www.pca.state.mn.us/data/whats-my-neighborhood accessed December 5, 2018

appurtenance, and excavation as a basis for calculating the total water quality cash dedication when it is applied.

- Cooperate with state and local entities as needed to develop and implement TMDLs for listed impaired waters within the City.

SECTION 6 - WATER QUANTITY ASSESSMENT

6.1 TECHNICAL BACKGROUND

Stormwater facilities are an essential part of the development of any municipality. As an area develops from rural uses to urban uses, culverts and drainage ways that were adequate for rural runoff can become overloaded and may cause flooding and property damage.

The primary functions of an urban stormwater system are to protect the quality of a community's water resources and to reduce economic loss and inconvenience due to the periodic flooding of streets, buildings and low-lying areas. The desirable economic endpoint is reached when the cost of environmental impacts and damage attributable to storm flooding plus the cost of surface water facilities reaches a minimum. Economy is not the only consideration, since well-designed surface water facilities also provide water quality benefits and improve aesthetics, wildlife habitat, and recreational opportunities.

If a planned program of storm water management is established and implemented in the early development stages of a drainage basin, the most economical stormwater system will be achieved. The substantial cost of duplication and waste arising from storm water management construction or reconstruction after an area is developed can also be avoided. Trunk storm sewers and ponding areas can then be incorporated into a developer's plan as required. **Map 1** at the end of this report identifies the City's existing trunk facilities, as well as proposed facilities to act as a guide as development occurs.

6.1.1 DESIGN STORM

Stormwater runoff is defined as that portion of precipitation which flows over the ground surface during, and for a short time after, a storm. The quantity of runoff is dependent on the following:

- Rainfall depth and intensity of the storm event
- Amount of antecedent rainfall
- Length of storm
- Type of surface upon which the rain falls (i.e. soils, land cover, impervious surfaces)
- Slope of the ground surface

The intensity of a storm is described by the amount of rainfall that occurs over a given time interval. Storms are typically characterized by their design frequency. A design frequency designates the probability a single storm of a specific magnitude is expected to recur. Thus, the degree of protection afforded by storm sewer facilities is determined by selecting a design frequency for analysis.

The following design frequencies are required by the Cottage Grove SWMP for sizing trunk facilities:

- 5-year Rational Method for storm sewer design
- NOAA Atlas 14 100-year, 7.4-inch 24-hour (MSE3 distribution) event for overland drainage and pond storage design

As development occurs in Cottage Grove, actual storm sewer design should be a 5-year minimum recurrence for lateral, or local, systems in residential and commercial areas. This implies that no street, parking lot, or backyard ponding would occur for the 5-year design event.

Trunk facilities should be analyzed and designed to accommodate the 100-year ponded discharges plus 5-year rational flows from areas that enter the trunk to be carried to the next storage area downstream.

The excess runoff caused by storms greater than the 5-year will be accommodated by transient street ponding and overland emergency overflow (EOF) routes. The City requires that these EOF routes be identified on the grading plan, in accordance with Policy 2.2. During the City development review process, the City will ensure that these EOF routes provide the necessary protection to proposed properties within the development and downstream properties.

In general, complete protection against large, infrequent storms with return intervals greater than 100 years is only justified for important flood control projects. For most developing areas like Cottage Grove, the cost of constructing a large capacity storm drainage system (for events greater than the 100-year) is much greater than the amount of property damage that would result from flooding caused by a larger than 100-year event occurring in a system designed for the 100-year event.

6.1.2 HYDROLOGIC DESIGN PARAMETERS

Table 6.1.2 provides Natural Resources Conservation Service (NRCS) Curve Number (CN) values and runoff coefficients used in the SWMP to quantify runoff from future land uses. As noted earlier, the predominant Hydrologic Soil Group (HSG) within the study area is HSG A to HSG B. The CN values in Table 6.1.2 reflect HSG B, with average soil moisture conditions (Antecedent Moisture Condition II).

Table 6.1.2 - Runoff coefficients and Curve Numbers for Future Land Use

Land Use Type	Runoff Coefficient C	CN Value
	5-Year	
Bluff/Ravine	0.14	55-58
Public/Open Space	0.17	61
Rural Residential	0.23	66
Low Density Residential	0.38	75
Medium Density Residential	0.59	85
High Density Residential	0.66	88
Commercial/Industrial	0.71	90
Ponds	1.0	100
Special	As required by the City Engineer	

For the areas within the City containing primarily HSG A soils, the CN values within Table 6.1 for certain land use types (Bluff/Ravine, Park/Open Space, Rural Residential and ROW) may be lowered to reflect soils with a higher infiltration rate. However, it is assumed that the pervious surfaces for more urban land use types (Urban Residential and Commercial/Industrial) containing primarily HSG A will actually generate runoff depths similar to that of HSG B soils, due to factors such as:

- Compaction of the soil surface layer during construction
- Placement of topsoil and sod to retain soil moisture and promote healthy turf establishment
- Efficiently graded lots, limiting the amount of runoff allowed to pool on the landscape and infiltrate.

The CN values presented in Table 6.1 should be adjusted for site specific conditions based on the site percent impervious surface, as necessary. Generally, these calculations should assume a CN value of 61 for site pervious areas. In addition, the SWWD watershed management plan requires a maximum pre-development non-urban land use value of 62 be used. Additional information regarding recommended hydrologic design parameters can be found in the SWWD Standards Manual.

In addition to identifying the land use type for a specified area, the determination of the amount of runoff generated from that area also requires the estimate of a time of concentration. The time of concentration is the time required for the runoff from a storm to become established and for the flow from the most remote point (in time, not distance) of the drainage area to reach the design point. The time of concentration will vary with the type of surface receiving rainfall and the slope of the surface. Generally, a time of concentration no less than 8 minutes should be used for the design of stormwater systems.

6.1.3 CONVEYANCE SYSTEM DESIGN PARAMETERS

The following standards apply to all new conveyance system designs:

- The capacity of a storm sewer is dependent on the pipe slope, pipe diameter, and roughness of the

inner surface of the pipe. Computations for storm sewer capacity have been based on Manning's equation. For the purposes of storm sewer design, a Manning's roughness coefficient (n) of 0.013 should be used for concrete storm sewer pipe and 0.024 for corrugated metal pipe. These roughness coefficients take into account typical losses due to bends and manholes in the system as well as the roughness of the inner pipe surface.

- Proper design of a storm sewer system requires that all sewer lines be provided with access through manholes for maintenance and repair operations. Generally, spacing of manholes should be no greater than 400 feet. Intervals on larger diameter lines can be increased when the pipes are sufficiently large for a person to physically enter the storm sewer pipe for maintenance operations. Regardless of sewer size, manholes should normally be provided at all junction points and at points of abrupt alignment or grade changes.
- The design of multiple low points on streets is desirable to reduce catch basin bypass and distribute street ponding. For safety reasons, the maximum depth should not exceed two feet at the deepest point, and the lowest exposed building elevation should be at least one foot above the elevation to which water rises before overflowing through adjacent overland routes.
- Generally, inlets should be placed and located to eliminate overland flow in excess of 400 feet on all streets or a combination of streets and swales. Additionally, inlets should be located such that 3 cubic feet per second (cfs) is the maximum flow at the inlet for the 5-year design storm.
- Effective energy dissipation devices or stilling basins to prevent stream bank or channel erosion at all stormwater outfalls should be provided. The following recommendations should be kept in mind when designing an outlet:
    - Inlet and outlet pipes of stormwater ponds shall be extended to the normal water level whenever possible.
    - Outfalls with velocities of less than 4 feet per second (fps) that project flows downstream into the channel in a direction 30 degrees or less from the normal channel axis generally do not require energy dissipaters or stilling basins, but do require riprap protection.
    - Outfalls with velocities between 4 and 6 fps should include a designed riprap energy dissipation outlet.
    - Where outlet velocities exceed 6 fps, the design should be based on the unique site conditions present. Submergence of the outlet or installation of a stilling basin approved by the City is required when excessive outlet velocities are experienced.
    - Riprap should be provided at all outlets to an adequate depth below the channel grade and to a height above the outfall or channel bottom. It should be placed over a suitably graded filter material and filter fabric to ensure that soil particles do not migrate through the riprap and reduce its stability. Riprap should be placed in accordance with the current city standard detail plates. Overland drainage routes where velocities exceed 4 fps should be reviewed and approved by the City.
- Whenever possible, a minimum slope of 2% should be maintained in unlined open channels and overland drainage routes. Side slopes should be a maximum of 4:1 (horizontal to vertical) with gentler slopes being desirable. Where space permits slopes should be cut back to match existing grade. In general, the flatter the channel side slopes and the more meandering the channel alignment, the more natural the channel will appear.
- Sanitary sewer manholes that could be subject to temporary inundation, due to their proximity to ponds, channels, or roadway low points, should be equipped with watertight castings. Precautions should be taken during construction to prevent the entrance of stormwater into the sanitary sewer. When access is required at all times, sanitary manholes located near ponding areas should be raised above the 100-year high water level. If access is not required, water tight castings should

be installed. Future storm drainage construction should include provisions for improving the water tightness of nearby sanitary sewer manholes. All newly constructed sanitary manholes in the vicinity of ponding areas and open channels described in this report should be waterproof.

6.1.4 PONDING DESIGN PARAMETERS

Stormwater ponding areas are and will continue to be an essential part of Cottage Grove's stormwater management system. The following standards apply to new detention basin design:

- Where feasible, new local and regional stormwater ponds will be designed "off-line" from the upstream watershed rather than "on-line". This is to prevent the flushing of water quality volume prior to treatment with treated water from the upstream watershed. The residence time of water within a water quality pond is important to achieve sedimentation and allow for biological uptake of nutrients between storm events.
- Permanent pool volume should be greater than or equal to the volume of runoff from a 2.5-inch rainstorm under full projected watershed development. This value has been derived from design criteria developed under National Urban Runoff Program (NURP), with a 25% increase in volume to allow for roughly 25 years of sediment accumulation. In the summer, this sizing rule provides a mean hydraulic residence time of about 15 days.
- To promote settling and provide space for sediment accumulation, the mean depth of the permanent pool (volume/surface area) should be greater than or equal to 4 feet. This constraint may be infeasible for small ponds (< approx. 2 acre-feet in volume), where mean depths of 3-4 feet may be used.
- For safety purposes and to provide suitable habitat for rooted aquatic plants, an aquatic bench at least 10 feet in width and with a slope not steeper than 10 feet horizontal to 1 foot vertical should extend into the pond from the shoreline at normal water level. Pond slopes below this bench to the bottom of the pond should be no steeper than 3 feet horizontal to 1 foot vertical.
- To provide stability, the side slopes should not be steeper than 4 feet horizontal to 1 foot vertical.
- A 10-foot maintenance bench at a 10:1 slope shall be placed beginning 1-foot above the pond's outlet elevation. This bench should be tied into an access path connecting to a street, parking lot, or other point of entry for maintenance vehicles.
- For ponds within developed areas, not accessible from a residential street, trail, or parking lot, a dedicated 20-foot wide outlot shall be provided to allow the City access to the pond.
- To prevent development of thermal stratification, loss of oxygen, and nutrient recycling from bottom sediments, the maximum depth of the permanent pool should be less than or equal to 10 feet.
- This SWMP establishes peak flow limits for future regional ponding basins (see Appendix D) with the intention of preserving the integrity of downstream conveyance routes and detention areas, and providing an efficient conveyance system.
- Water quality pond outlet structures should be designed to skim the surface flow up to the 5-year pond high water level. The design velocity of water flowing through the skimmer opening should be no greater than 1.5 fps for the 5-year, 24-hour storm event to prevent suction of bottom sediment or floating debris.
- The City encourages stormwater ponding basins to be designed to appear more natural by incorporating aesthetic features such as undulating pond sides, side slope variation, and planting native upland and wetland seed mixes.
- Stormwater ponding in karst-sensitive areas will require additional investigation to assure bedrock stability. Guidance from the watershed district will be used to determine karst-sensitive

areas. Watershed district technical guidance and rules as well as the Minnesota Stormwater Manual and guidance from the Minnesota Department of Health will be followed in determining the suitability of specific sites for stormwater ponding.

6.2 STORMWATER MODELING OVERVIEW

As mentioned above in Section 6.1.1, stormwater runoff is defined as the portion of precipitation which flows over the ground surface during, and for a short time after, a storm. The quantity of runoff is dependent on the following:

- Rainfall depth and intensity of the storm event
- Amount of antecedent rainfall
- Length of storm
- Type of surface upon which the rain falls (i.e. soils, land cover, impervious surfaces)
- Slope of the ground surface

As part of Cottage Grove's updated 2018 SWMP, three key components which largely dictate runoff volumes and rates were updated based on recent NRCS statistical analyses and city-wide maps. These components include rainfall depth, rainfall intensity, and land use type.

Based on the Atlas 14 precipitation study (NOAA, Atlas 14 2013), 100-year 24-hour design storms that once reflected 6" (U.S. Weather Bureau TP-40, 1961) and 6.3" (Huff & Angel, NOAA 1992) rainfall depths with a SCS Type-II distribution, will now reflect a 7.4-inch rainfall depth with a MSE 3 distribution which simulates a more intense rainfall during the design storm. The various models utilized to determine peak runoff rates and volumes for the 2018 SWMP have been updated to incorporate updated Atlas 14 depths with an MSE 3 distribution. This increase in rainfall depth and intensity will consequently increase runoff rates and volumes within the city's trunk sewer system. Appendix D provides a direct comparison between TP-40 and Atlas 14 storm events.

The study area was also modeled assuming 2040 land use conditions (see **Figure 5**). The runoff generated from the various land use types within the SWMP study area follows the rationale presented in the previous section. An analysis was completed to determine the overall sensitivity of each drainage district's composite curve number based on the proposed changes in land use. Table 6.2 provides a comparison for each district's composite curve number as a result of the adjustments in land use between the 2030 and 2040 future land use designations. As shown, the South and Southwest Districts experienced the most significant change in land use between the 2030 and 2040 change.

Table 6.2 - 2030 vs. 2040 Future Land Use Curve Number Comparison

Drainage District	2030 Comp. CN	2040 Comp. CN
Central Draw District	71	71
East Draw District	71	71
East Ravine District	73	73
Gable Lake District	65	66
Grey Cloud Island District	65	65
Langdon District	85	85
Lower St Croix District	60	60
Seeger Creek District	65	64
South District	73	81
Southwest District	72	74
St. Paul Park District	72	72
Thompson Grove District	79	79
West Draw District	73	73

The stormwater models associated with drainage districts impacted by the land use changes have been revised appropriately to reflect changes in curve numbers to provide the most accurate and up-to-date rates and volumes. This plan incorporates a combination of both HydroCAD and XP-SWMM modeling programs to analyze the City's trunk stormwater ponding system. **Figure 13** identifies the modeling program used to model each subwatershed.

As mentioned above, a portion of the regional ponding system presented in this SWMP uses the HydroCAD stormwater modeling program. HydroCAD stormwater runoff hydrographs are calculated based on NRCS TR-20 methodology (i.e. calculation of runoff using drainage area, curve number, and time of concentration). HydroCAD uses the runoff CN to estimate infiltration and other losses. Curve numbers used in HydroCAD modeling are presented in Table 6.1. Hydrograph routing through channels and detention basins is performed using the Simultaneous Routing method within HydroCAD.

The remainder of the regional ponding system presented in this SWMP uses the XP-SWMM stormwater modeling program. Two methods for calculating runoff hydrographs are used within the SWMP:

- The St. Paul Park and north portion of the Thompson-Grove Districts use the NRCS TR-20 methodology (i.e. calculation of runoff using drainage area, curve number, and time of concentration) to generate runoff.
- The East Ravine District north of TH 61, modeled initially as part of the June, 2005 Cottage Grove East Ravine Alternative Urban Areawide Review (AUAR), uses the Horton infiltration method for generating runoff. This method generates runoff from the input of drainage area, percent impervious area, watershed width and slope, and the Horton runoff parameters.
- It should be noted that the SWWD has completed modeling of other parts of the City as well, including the East Ravine, West Draw, and Central Draw. Ongoing coordination between the City and the SWWD will likely be needed to reconcile any significant discrepancies in input data, methods, assumptions and results during calibrations and review of the impacts of future projects.

6.3 SYSTEM ANALYSIS AND RECOMMENDATIONS

6.3.1 GENERAL

The system descriptions and recommendations provided in this section address stormwater issues on a regional scale, including regional stormwater ponding and conveyance. Descriptions of and recommendations for addressing local stormwater issues will not be included in the SWMP. Local stormwater issues are typically dealt with on an operation and maintenance level by City staff, or are addressed as specific elements in the design and construction of public improvement projects.

The City of Cottage Grove was divided into 13 major drainage districts, as shown on **Map 1**. The major drainage districts were designated as shown in Table 6.3.1.

Table 6.3.1 - Major Drainage Districts Abbreviations	
Major Drainage District	**Abbreviation**
Central	C
East Draw	ED
East Ravine	ER
Gables Lake	GL
Grey Cloud Island	GCI
Langdon	L
Lower St. Croix	LSC
St. Paul Park	SPP
Seeger Creek	SC
South	S
Southwest	SW
Thompson Grove	TG
West Draw	WD

Each major drainage district was subdivided into minor drainage districts. A few of the minor drainage districts are further subdivided into sub-districts. Each minor district is identified by the abbreviation of the major district in which it is located, followed by the letter A (for area) and the number of the minor drainage district. An additional number is added for sub-districts within a minor drainage district to differentiate it from the other sub-districts. The areas of all subdistricts are presented in **Appendix A** and their boundaries are shown on **Map 1**.

The City of Cottage Grove's trunk storm sewer system is presented on **Map 1** and **Figure 15** and the characteristics of the proposed trunk pipe design characteristics are summarized in **Appendix C** of the SWMP.

Ponding areas are identified in the same manner as the subdistricts, but rather than using the letter A (for area), ponds are designated with the letter P. Pond data, including tributary area, storage volume, normal and highwater levels, peak outflow rate, and pond area, are presented in **Appendix D**. The storage volume and outflow rate of a pond are attributes that are important to preserve in order to successfully maintain the integrity of the storm drainage system.

More restrictive Regional Rate Control criteria may be required in order to protect the integrity of downstream conveyance channels and regional ponds. For example, project applicants and developers may be required by the City to restrict site outflow rates to less than the per acre inflow or outflow rates listed in the Appendix D Pond Table.

The costs associated with the proposed trunk stormwater management system are summarized in **Appendix E** of the SWMP. Following are sections summarizing the important issues and findings for each district.

6.3.2 CENTRAL DISTRICT

The Central District is located in the north-central portion of Cottage Grove primarily north of 80th Street, encompassing approximately 1,115 acres. This district is fully developed consisting primarily of low density residential development with one small pocket of medium density located in the northwest corner of the district.

Eight existing regional stormwater ponds serve this district, ultimately discharging out of pond C-P8 located in Pine Tree Pond Park south of 80th Street. The regional ponding system within the Central District has operated according to design, with no known flooding being reported to the City.

6.3.3 EAST DRAW DISTRICT

The East Draw District incorporates approximately 1,075 acres of drainage area and is located between the Central and East Ravine Districts, as shown on **Map 1**. Currently fully developed, the East Draw

District encompasses the extents of current development in the northeastern portion of the City. Development within the East Draw District is primarily low density residential, with a few small pockets of medium density residential. Grey Cloud Elementary School, Cottage Grove Junior High School, and Kingston Park are all located in the north-central portion of the East Draw District.

Ten existing regional stormwater ponds serve this district, ultimately discharging out of pond ED-P10 located in Woodridge Park immediately north of 90th Street and east of Jamaica Avenue. Pond ED-P10 also receives the discharge from the Central District via pond C-P8. The stormwater system within the East Draw District utilizes constructed berms or roadway embankments within steep draws to provide regional ponding opportunities in a number of locations, including ED-P4, ED-P5, ED-P6, ED-P8, and ED-P9. The regional ponding system within the East Draw District has operated according to design, with no known flooding being reported to the City.

6.3.4 EAST RAVINE DISTRICT

The East Ravine District incorporates approximately 5,633 acres or roughly 25% of the City of Cottage Grove.

This district extends from the City's border with Woodbury to the Mississippi River. Much of the district north of TH 61 is undeveloped, including the Cottage Grove Ravine Regional Park and existing agricultural land uses. Small pockets of existing Low Density and Rural Residential development can be found around the perimeter of the district.

The majority of the district south of TH 61 is owned by 3M. The existing 3M Cottage Grove Center is located in the southern portion of the 3M property, with the remaining areas currently undeveloped. To provide Cottage Grove with a complete SWMP incorporating the entire City, a regional stormwater system has been identified within the 3M property, based on an assumed curve number of 85 for all future development on 3M property. Future discussions with representatives from 3M will be necessary to further analyze and refine the regional system on 3M property to more fully meet the needs of the City and 3M.

In addition to the direct drainage area from the City of Cottage Grove, approximately 14,500 acres from the City of Woodbury will ultimately be routed into the East Ravine District via the Bailey Lake lift station. Discharge from the Bailey Lake lift station is routed into two basins owned and maintained by the SWWD (identified by the SWWD as CD-P85 and CD-P86). Regional stormwater basin ER-P2 incorporates the southern portion of CD-P86. The ultimate discharge rate from the Bailey Lake lift station, as it is routed through CD-P85 into ER-P2 (CD-P86) is included in the regional stormwater design of the East Ravine. The SWWD is progressing with the construction of the Central Draw Storage Facility and Overflow which will provide an outlet for ER-P2 (CD-P86) with the capacity to handle a peak pump station discharge from Bailey Lake of 150 cfs. This outlet is being financed by the SWWD. Rate and volume restrictions apply to development sites located within the East Ravine district that will drain into the Central Draw Storage Facility (including ER-A1 and ER-A2). Agreements between the City and the South Washington Watershed District include rate and volume restrictions for areas draining to the Central Draw Storage Facility. These restrictions on future development call for a total outflow volume of 0.3 acre-feet per acre over 24 hours and a peak flow rate not to exceed 1.3 cfs/acre. The regional stormwater system for this district builds off of the stormwater ponding layout proposed in the AUAR for the East Ravine. The AUAR document identifies an entire stormwater system of interconnected basins and natural drainage-ways designed to promote infiltration and protect downstream key water resources. From the design proposed in the AUAR, a number of key ponding basins within the AUAR study area have been incorporated into the regional stormwater system for the East Ravine District.

As development occurs within the East Ravine District, the regional stormwater system identified in this SWMP should be implemented. Specific regional stormwater management items are included below:

- Lake Robert (Shepard's Woods Pond) ER-P1 is located in the north-central portion of the City,

within the East Ravine District. The drainage area to this pond is approximately 560 acres including a portion of the City of Woodbury. Lake Robert (Shepard's Woods Pond) has no natural outlet near the elevation of the Ordinary High Water level (OHW 921.53 NAVD88), but has maintained a fairly constant water level over the years by a combination of evaporation and infiltration. The City is planning to install a 36-inch diameter RCP outlet with invert elevation of 920.0 feet (NAVD88) in order to convey the runoff expected from a 7.4 inch 100-year Atlas 14 rainstorm and maintain water levels within an acceptable range. DNR and Watershed District permits will be required to install the outlet pipe.

- Pond ER-P3 is an existing land locked basin. A gravity piped emergency outlet for this basin is identified in this SWMP. The preliminary plan is for this outlet to discharge into the SWWD CDSF 72" diameter pipe outlet, which is aligned to pass through basin ER-P3. It is recommended that this emergency outlet pipe be constructed concurrently with the SWWD CDSF 72" diameter pipe outlet.
- Pond ER-P4 is an existing land locked basin, maintaining a water surface elevation roughly 40 feet below the overland overflow for this basin by the combination of evaporation and infiltration. This SWMP proposes a 4.7 cfs lift station with a 2100 foot length of forcemain to provide an emergency outlet for pond ER- P4 to East Ravine downstream. The lift station is sized to provide capacity to pump the runoff from a 100-year 24-hour rainstorm over a 16 day period (similar to the Bailey Lake design drawdown). Until gradually rising water levels in this basin begin to threaten adjacent structures or roadways, the proposed lift station may be unnecessary. The City currently monitors the water surface elevation of this basin periodically to determine whether the water levels are rising.
- Pond ER-P11 is a proposed regional pond located in the East Ravine District south of Highway 61 and just east of the Langdon District pond L-P3. The 2008 SWMP envisioned this pond to treat a drainage area of 52 acres and discharge through a 3600 foot length of outlet pipe into the East Ravine. The City is studying the feasibility of routing this drainage area into the adjacent L-P3. Preliminary studies indicate that directing some or all of this subwatershed into L-P3 may be feasible if L-P3 storage can be expanded by approximately 28 acre-feet. Future realignment of County Road 19 to transition into 100th Street South may also provide an opportunity to shorten the outlet distance from subwatershed ER-11 to L-P3.

6.3.5 GABLES LAKE DISTRICT

The Gables Lake District is located in the northeast corner of the City and is approximately 1,470 acres in size, with over 50% of this total area draining from the City of Woodbury. Much of this district is undeveloped, with the majority of the land use within the district either agricultural or ravine/bluff areas surrounding Gables Lake (basin GL-P1). Future development of this district within Cottage Grove will include a mix of low density and rural residential land uses, along with the eastern portion of the district identified as agricultural on the 2040 land use map.

Gables Lake is an existing land-locked basin, with the lowest existing overland overflow approximately 50 feet above the assumed water surface elevation of 852.0. The lake appears to maintain a fairly constant water level by the combination of evaporation and infiltration.

This SWMP proposes a 10 cfs lift station outlet with a 3500 foot length of forcemain to ultimately manage water levels within Gables Lake. The lift station is sized to provide capacity to pump the runoff from a 100-year 24-hour rainstorm over a 16 day period (similar to the Bailey Lake design drawdown). The preliminary plan for the outlet includes preparing operating plans and agreements to allow discharging the forcemain south into the SWWD 72" diameter CDSF outlet pipe or alternately first into regional basin ER-P3 then into the SWWD 72" diameter CDSF outlet pipe. Steep slopes (<18%) surround Gables Lake, making development below the 900 contour elevation unlikely. For this reason, a future lift station outlet may not be necessary to protect adjacent structures, but may be desired to maintain the existing physical characteristics of Gables Lake. It is recommended that the City monitor the

water surface elevation of Gables Lake to determine if and when water level management and a lift station are necessary.

6.3.6 GREY CLOUD ISLAND DISTRICT

The Grey Cloud Island District is located in the southwest corner of the City and is approximately 1,271 acres in size, with all but about 90 acres of this area located within the City of Cottage Grove. The current land uses on the island are primarily extractive (mining of the available aggregate resources), industrial/utility and undeveloped, but also includes some existing rural residential properties around the perimeter of the island. The City identifies Grey Cloud Island as rural residential and transition planning area on the 2040 land use map. The County and Met Council show the island as a regional park. The City will continue to work with the County and Met Council on future zoning so that future development proceeds in a way that also preserves the natural resources of Grey Cloud Island.

No regional stormwater improvements have been identified in the Grey Cloud Island District at this time. Future studies will identify whether regional stormwater facilities will be necessary in the Grey Cloud Island District.

6.3.7 LANGDON DISTRICT

The Langdon District is approximately 1,267 acres in size with the portion of the district north of TH 61 fully developed and the portion of the district south of TH 61 partially developed industrial areas with significant areas still largely undeveloped. The district receives runoff from the Thompson Grove, Central, and East Draw Districts, and outlets through a stream channel (DNR Protected Waters) to the Mississippi River.

The majority of the undeveloped area within the district is owned by 3M, with only a small portion of this area currently developed as part of the 3M Cottage Grove Center. To provide Cottage Grove with a complete SWMP incorporating the entire City, a regional stormwater system has been identified within the 3M property, based on an assumed curve number of 85 for all future development on 3M property. Future discussions with representatives from 3M will be necessary to further analyze and refine the regional system on 3M property to more fully meet the needs of the City and 3M.

As development has continued in the Langdon District north of TH 61, a number of on-site private stormwater ponds have been constructed. The primary function of these ponds is to provide water quality treatment for the properties they serve. These on-site ponds provide some rate control, but are not considered part of the regional stormwater system because they are privately owned and maintained.

Development of the regional stormwater system within the Langdon District should continue as recommended in this SWMP, unless otherwise revised based on cooperation between the City of Cottage Grove and 3M. Specific regional stormwater design recommendations are included below:

- A large portion of the development north of TH 61 within the Langdon District is routed to pond L-P3 via an existing 84” pipe, with the majority of this area lacking stormwater quality treatment. The 84” pipe discharges directly into the existing MnDNR protected wetland. The SWMP recommends that additional flood storage and water quality volume be provided within L-P3
- The drainage area to L-P3 is 7,508 acres. The SWMP design of L-P3 is based on correspondence between 3M and the City establishing a peak 100-year discharge rate of 370 cfs from pond L-P3, while maintaining a 100-year HWL of roughly 770 (based on modeling of a 6-inch 24-hour 100-year design storm). Based on the revised preliminary analysis completed as part of this SWMP, pond L-P3 can only meet these established criteria by providing additional flood storage and modifying the existing 6’x12’ box culvert outlet. The proposed storage volume of pond L-P3 is 390 acre-feet. Only 50% of this volume is currently in place, so expanding the pond storage will need to involve significant excavation or the raising the flood pool with an impoundment. Both the excavation and the impoundment option will likely be challenging due to shallow bedrock and environmental concerns relating to the existing wetlands and stream. The City will perform

additional studies and will open discussions with 3M, the South Washington Watershed District and others to explore options for improving the stormwater storage, flood conveyance and water quality treatment while protecting the natural resources of the wetland and stream corridor.

- So as to not significantly impact the existing ravine downstream of L-P3 with the increase in runoff volume due to providing an outlet for TG-P19 (particularly for the small frequent storm events), additional rate control within ponds L-P3 and L-P4 for the 2-year storm event is recommended. Additional efforts to stabilize and protect the existing drainage-way are also recommended. Costs associated with improvements to the existing drainage way are included in **Appendix E** of the SWMP.

6.3.8 LOWER ST. CROIX DISTRICT

The Lower St. Croix District is approximately 1,350 acres in size and is located in the northeast corner of the City of Cottage Grove. This district is presently used primarily for agricultural purposes and also includes some low density residential areas. The City's 2040 land use plan identifies this district maintained as primarily agricultural and rural residential land uses along the western border of the district. The City will be developing a master plan for this district in advance of opening the area for development.

Drainage within the district generally proceeds from the southern and northern portions of the district to subwatershed LSC-A3, the upstream contributing basin of O'Connors Creek. O'Connors Creek drains easterly to the land-locked O'Connors Lake. This district is the only subwatershed within the City to not drain south to the Mississippi River.

No regional stormwater improvements have been identified in the this subwatershed. A more detailed study to identify whether regional stormwater facilities will be necessary will be completed with a future master plan.

6.3.9 ST. PAUL PARK DISTRICT

The St. Paul Park District is located along the west side of Cottage Grove. This district is approximately 640 acres in size and straddles TH 61, as the highway enters Cottage Grove. The topography within the district varies from moderately steep to fairly steep slopes, with ground elevations ranging from 1,000 feet in the north to 780 in the south. The St. Paul Park district is approximately 60% developed. The portion of the district north of TH 61 consists mainly of low density and rural residential development, with a small pocket of commercial property within SPP-A7. The portion of the district south of TH 61 is fully developed, including primarily low density residential development and a small strip of commercial development along Hadley Avenue.

In addition to Cottage Grove drainage, this district also incorporates approximately 180 acres of primarily low density residential drainage area from the northeast corner of St. Paul Park. Runoff from within this district is directed to an existing wetland area (basin SPP-P9) bordered to the north and south by TH 61 and Canadian Pacific (CP) Railroad. Currently, the existing wetland area (DNR Protected Water #82-75W) drains to the northwest, within a CP Railroad ditch.

Pond characteristics based on a preliminary design of the Gateway pond (SPP-P9) are presented in Appendix D. These improvements focus mainly on the maximization of flood storage in this area and the installation of a lift station outlet. This design also assumes that the 100-year discharge rate from pond SPP-P9 is a combination of the 10 cfs lift station to TG-P4 and overflow to the northwest. The ultimate design of pond SPP-P9 will include input from a number of different parties, including:

- City of Cottage Grove
- City of St. Paul Park
- CP Rail
- Minnesota DNR

- MNDOT

Specific regional stormwater design recommendations are included below:

- Existing ravine erosion issues are present downstream of ponds SPP-P1 and SPP-P2. These ponds reduce peak rates to the ravine. In addition, restoration of the ravine channel is also recommended. The City will work with SWWD on a future ravine channel project. Additional costs for channel restoration are included in the SWMP.
- Further discussions regarding the ultimate design of SPP-P9 with the parties listed above is recommended. The ultimate design of pond SPP-P9 requires that additional ponding be provided adjacent to the existing wetland. The ultimate design must take into account the constraints within which the ponding needs to be provided, namely:
    - The additional excavated flood storage required must be provided outside the existing wetland.
    - Additional flood storage cannot be provided more than roughly 1 foot below the MNDNR established Ordinary High Water Level (OHW) for this existing wetland of 777.06'.
    - The future SPP-P9 100-year HWL must provide adequate freeboard to the CP Railway track elevation of roughly 780.4.
    - The existing ponding system includes approximately 180 acres of drainage area from the City of St. Paul Park.
    - Discharge no more than 10 cfs to pond TG-P4 via a future lift station.
    - Reduce the existing 100-year peak discharge to the northwest within St. Paul Park.

It should be noted that the SWWD has listed high water and inter-community flow issues for this area (Clear Channel/TH61 Pond) in their 2016 WMP and has expressed an interest in participating in the implementation of improvements to resolve the flooding problems.

6.3.10 SEEGER CREEK DISTRICT

The Seeger Creek District encompasses the 3,830 acre drainage area for Seeger Creek, located in the far southeastern corner of the City of Cottage Grove. Seeger Creek is identified as a DNR protected water and a direct tributary to the Mississippi River. Of the 3,830 acre drainage area to Seeger Creek, approximately 1,580 acres are located outside of the City of Cottage Grove, in the adjacent Denmark Township to the east.

For the portion of the Seeger Creek District within the City of Cottage Grove, the current land use plan identifies the northern portion of this district as agricultural, with the remainder of the district identified as rural residential and a small pocket of commercial land use adjacent to TH 61. Existing development within the district is primarily within subwatershed SC-A9, including rural residential and commercial development along TH 61.

Four future regional ponding locations have been identified within the district. The primary means of stormwater conveyance will be existing drainageways with stormwater rate control being provided where feasible, such as at road crossings. A more detailed study to identify whether the proposed regional stormwater facilities will be adequate to support the type of development identified in a future master plan for this area will be necessary.

Specific regional stormwater design recommendations are included below:

- Geologic investigation will be necessary prior to the siting of the regional ponding facilities in the District, due to the presence of potential karst features.
- SC-P8 is located at the top of a steep ravine slope discharging to the Mississippi River. The pond is designed to provide stormwater treatment to all of the future rural residential area within the

district south of TH 61. By providing rate control for subwatershed SC-A8 and piping the flows down the steep slope to the base of the ravine, the pond is designed to minimize potential erosion within this ravine due to development. Further analysis to determine the condition of the existing ravine is recommended to determine where the outlet for SC-P8 should discharge.

The proposed regional ponds will meet applicable watershed authority rules and regulations.

6.3.11 SOUTH DISTRICT

The South District is located along the southern border of Cottage Grove and includes approximately 1,625 acres. The South District includes primarily agricultural land uses and low density and rural residential development exists in the south-central portion of the district. The topography within the district varies from fairly flat areas in the northern portions of the district to steep slopes and ravines adjacent to the Mississippi River.

The general drainage pattern within the South District is from West to East and then South to the Mississippi River. This drainage pattern is consistent with the proposed trunk stormwater system for this district eventually draining to an existing ravine that drains under the railroad tracks to the Mississippi River. One 24-inch pipe under the tracks is currently operating and as the area upstream develops, a second 24- inch will need to be provided for sufficient capacity. Pond S-P2 is an existing low area adjacent to the railroad embankment overflowing out an existing 10'x 7' box culvert.

The far eastern portion of the South District is owned by 3M. To provide Cottage Grove with a complete SWMP incorporating the entire City, a regional stormwater system has been identified within the 3M property, based on an assumed curve number of 85 for all future development on 3M property. Future discussions with representatives from 3M will be necessary to further analyze and refine the regional system on 3M property to more fully meet the needs of the City and 3M.

Subwatershed S-A2 and the western portion of S-A11 are owned by the DNR and are being preserved as the Grey Cloud Dunes Scientific and Natural Area. This SWMP assumes that the portions of the South District within this Scientific and Natural Area will not be developed. No regional stormwater improvements are recommended within the Scientific and Natural Areas.

6.3.12 SOUTHWEST DISTRICT

The Southwest District is located in the southwest corner of the City of Cottage Grove and is roughly 1,110 acres in size. This district includes agricultural land uses as well as industrial and low density residential developments (particularly along the Mississippi River). Future land uses are identified as a mix between low density residential, medium density residential, industrial and transitional areas.

Important land use features within the district include the Bailey's Nursery site, located north of 103rd Street (subwatersheds SW-A12, A13, A14) and the former Mississippi Dunes golf course, located south of 103rd Street (subwatersheds SW-A17, A18, A19). The natural drainage pattern within the Southwest District flows from north to south, but there is minimal runoff from the undeveloped areas because of many land-locked depressions and sandy soils. Bailey's Nursery has constructed three stormwater ponds (SW-P12, P13, P14) that discharge out a 12" pipe to an existing depression adjacent to 103rd Street (pond SW-P16). A piped outlet for the existing depression was provided as part of the 103rd Street Improvements project, alleviating existing drainage issues at this depression area.

To meet the City's flood protection and planning goals, Bailey's Nursery needs to provide additional rate control and flood storage volume on their property. It is recommended that the Bailey's Nursery ponding system be improved to meet City rate control standards, such that the 100-year discharge rate from SW-P14 does not exceed the rate specified for this basin in Appendix D. Additional rate control can be provided by a combination of outlet modifications to better utilize available flood storage and additional flood storage within existing ponds.

6.3.13 THOMPSON GROVE DISTRICT

The Thompson Grove District is approximately 2,380 acres in size and is located in the west-central portion of Cottage Grove. This district also receives drainage from both the West Draw and St. Paul Park Districts. Land use within the Thompson Grove District varies from existing commercial and residential development in the north to both existing and future industrial development in the south within the Cottage Grove Industrial Park. Hamlet Park is located in the center of this district.

Proceeding south from the West Draw District, the terrain within the Thompson Grove District is considerably more flat and broad. As runoff drains through the district from the Hamlet Park ponding system (TG-P4) about 2.5 miles to the southeast, the grade only drops about 15 feet or an average slope of 0.11%. The lack of grade across the Thompson Grove District coupled with the significant flow rates to be conveyed required the construction of a riprap flume to provide stormwater conveyance. Currently, this flume extends from the Hamlet Park Pond system, through the industrial park, ending at Jamaica Avenue. The City will monitor conditions and will install a box culvert under Jamaica Avenue to convey runoff to the L-P3 pond when needed.

The commercial and residential areas in the northern portions of the district were nearly fully constructed by the early 1960's. At that time, the Cottage Grove stormwater management philosophy was to collect and route stormwater to the Mississippi River in the most efficient manner possible. This management philosophy is evident in the design of those portions of the Thompson Grove District that developed first, namely subwatersheds TG-A1 to TG-A4. These subwatersheds show very few ponding areas, but rather rely on large diameter storm sewer pipe to convey stormwater to Hamlet Park pond. From Hamlet Park pond a high capacity concrete flume was proposed to extend from Hamlet Park pond to the far southeast corner of the district, ultimately routing a 100-year peak flow of 1,200 cfs to the downstream Langdon District.

The City has since changed their stormwater management philosophy within the Thompson Grove District due to both the cost and regulatory implications of the previous design. As a part of this change, the City agreed to limit the discharge rate from the Thompson Grove District at Jamaica Avenue to the 3M property (L-P3) to roughly 300 cfs. As a result, revisions to the stormwater system within the Thompson Grove District were first proposed back in the year 2000. These year 2000 revisions were primarily associated with the then partially developed Cottage Grove Industrial Park area. Although the concept of a drainage flume from the existing Hamlet Park pond remained, numerous regional ponding locations were identified within the industrial park to reduce peak discharge rates to the flume, thus reducing the required capacity of the flume and ultimately meeting the maximum discharge rate to the 3M property.

The Hamlet Park Pond Improvements project included removing conveyance restrictions within the existing Hamlet Park Pond to reduce high water levels per MNDOT's directive and providing additional flood storage downstream in the expansion pond. The Hamlet Park Pond Improvements project provides a significant flood control and aesthetic benefit to the City. The planned work remaining involves installing the proposed box culvert under Jamaica avenue to connect the flume from Hamlet Park Pond to L-P3.

6.3.14 WEST DRAW DISTRICT

The West Draw District is located in the northwest corner of Cottage Grove, consisting of approximately 1,470 acres within Cottage Grove. The land use within the district reflects predominantly low density residential development, with smaller pockets of mixed medium and high density residential development in the southern portion of the district. The stormwater infrastructure within the West Draw has proceeded according to the City's 1984 SWMP and subsequent drainage studies. The 1984 SWMP set forth a framework for utilizing the topography within the West Draw District to provide regional ponding locations to both protect existing natural conveyance features within the district and reduce discharge rates to deal with existing downstream pipe capacity issues at TH 61.

Topography within the district ranges from rolling to fairly steep slopes. Land surface elevations range from about 1,000 feet in the northern portion of the district to about 750 feet in the southern portion. The West Draw stormwater system utilizes the existing terrain to provide both opportunities for stormwater ponding within existing depression areas, as well as providing stormwater conveyance via existing ravines. Runoff from the majority of the district is ultimately routed to the three Hidden Valley ponds (WD-P15 5, 6 and 7), located on either side of 70th Street. These large ponds act as one pond discharging to the Hardwood Avenue storm sewer system draining to Hamlet Park Pond south of Trunk Highway 61. Runoff from Hamlet Park Pond continues through the Thompson Grove and Langdon Districts to the Mississippi River.

The West Draw extends from the northwest corner of Cottage Grove to TH 61 and the Hamlet Park area, incorporating approximately 1,450 acres of drainage area within the City. An additional 620 acres of drainage area from the City of Woodbury drains overland through the West Draw into Cottage Grove.

In addition to the overland drainage area, the 1979 Woodbury Stormwater Plan proposed that 850 acres draining to a land locked basin just north of the Cottage Grove/Woodbury border be pumped into Cottage Grove via a lift station. Currently, flows are pumped to an existing land-locked basin on the border of Woodbury and Cottage Grove, but are pumped no further.

The XP-SWMM model of the 620 acres draining overland from Woodbury into the City, includes a proposed future discharge rate of 25 cfs from Woodbury to Cottage Grove. This model includes future features to provide additional flood storage and rate control within Woodbury to restrict the discharge rate into Cottage Grove from approximately 200 cfs to 25 cfs (per 10/22/2014 letter from Houston Engineering to the SWWD). As the City of Woodbury develops an ultimate conditions model for the 620 acres draining overland to Cottage Grove (with a maximum 100-year discharge of 25 cfs), the impact of the additional runoff volume (above the volume associated with the 25 cfs) must be identified so as to not negatively impact the existing Cottage Grove trunk system.

The hydrograph associated with the 25 cfs discharge rate from the XPSWMM model is incorporated into the City's ultimate development SWMP HydroCAD model of the West Draw. The 2008 SWMP identified concerns that 2 feet of freeboard to adjacent low openings was not maintained within the Hidden Valley Ponds WD-P15 5, 6 and 7—even with the restriction to 25 cfs from Woodbury, consequently additional runoff expected due to the higher design rainfall amounts of Atlas 14 will further reduce freeboard and continues to be an important issue. The cost for oversizing the storage ponds on the Cottage Grove trunk system to further reduce the flows from Woodbury and maintain the necessary freeboard within ponds WD-P15 5, 6 and 7 should be borne by the City of Woodbury.

Subwatershed WD-A7 receives an existing conditions 100-year peak runoff rate of approximately 200 cfs from the 620 acres of drainage area from Woodbury. Conveyance within the existing West Draw stormwater system to handle this existing peak rate is being provided via the existing stream channel (MNDNR protected waters) including a road crossing under 65th Street. The stream channel outlets into the Hidden Valley ponds (WD-P15 5, 6 and 7).

The South Washington Watershed Management plan lists the 25 cfs inter-community flow limit from Woodbury to Cottage Grove in the West Draw as a flood issue that needs to be resolved. The City of Cottage Grove will work with Woodbury and the SWWD address this issue and look for solutions.

6.4 HIGH PRIORITY STORMWATER QUANTITY RECOMMENDATIONS

Following are the highest priority recommendations related to this chapter of the SWMP:

- City will work with 3M, SWWD and others to design and install the needed storage, outlet structure and stream channel conveyance for L-P3 while protecting adjacent properties and the natural resources of the stream and wetland.
- City will work with Woodbury and SWWD to resolve the inter-community flow limit issue in the West Draw.

- The City will work with all parties involved including the City of St. Paul Park, MNDOT, DNR, SWWD, and Canadian Pacific Railroad to determine an acceptable design and identify and pursue a joint funding strategy for the Gateway Pond (SPP-P9) improvements that reflects the proportionate contribution to the problem among the parties.
- The City will construct the box culvert under Jamaica Avenue and the conveyance route to basin L-P3.

SECTION 7 - IMPLEMENTATION

7.1 GENERAL

This SWMP provides a plan for expanding and managing the City's surface water system, and protecting key water resources in the City. The real measure of success of the SWMP will be in its implementation. Implementation of the SWMP covers a number of aspects, including:

- Administering regulations and programs
- Managing surface water as redevelopment and new development occur
- Implementing a public education program regarding stormwater management
- Operating and maintaining the surface water system
- Constructing prioritized capital improvements
- Financing projects and programs
- System improvement projects and activities
- Providing a process for future amendments to the SWMP

7.2 REGULATORY ADMINISTRATIVE RESPSONSIBILITIES

The South Washington Watershed District has made an effort to encourage cities within the watershed district to adopt local SWMPs and assume the regulatory responsibility for stormwater management and other related issues. The City assumes that with the adoption of this SWMP, the primary regulatory responsibility for applying and enforcing the watershed district rules and standards will rest with the City, with the exception of the Wetland Conservation Act (the South Washington Watershed District is the LGU). The City expects that close coordination between the watershed district will continue as development proceeds in Cottage Grove.

7.2.1 EROSION AND SEDIMENT CONTROL

Since 2006, the City has been required to submit an NPDES MS4 Permit to the MPCA to authorize discharge from the city's storm sewer system. As part of the permit requirements, the City is responsible to:

- Develop an ordinance or other regulatory mechanism to require erosion and sediment controls, as well as sanctions to ensure compliance, to the extent allowable under law.
- Develop and implement requirements for construction site operators to control waste, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality.
- Develop requirements for construction site operators to implement appropriate erosion and sediment control best management practices.
- Establish procedures for site plan review which incorporate consideration of potential water quality impacts.
- Establish procedures for receipt and consideration of reports of noncompliance or other information on construction related issues submitted by the public.
- Establish procedures for site inspection and enforcement of control measures.

Currently, the City is taking a proactive approach to erosion and sediment control inspection and enforcement. The City's program reflects the additional minimum best management practices as outlined in the NPDES permit. The City completes quality assurance inspections on all NPDES permits in the City (where the City is not the owner) twice each month. For NPDES permits on City owned projects,

inspections are conducted weekly and after each 0.5" rain event by either the City or Contractor.

7.2.2 PRELIMINARY AND FINAL PLATTING PROCESS

The City has established and fully implemented both a preliminary and final platting process. The preliminary platting process is outlined as follows:

1. Filing and Review of Application
2. Submission of Application to Planning Commission
3. Report of Planning Commission
4. Council Action, Approval or Denial

The final platting process is outlined as follows:

1. Filing of Application
2. Review of Application
3. Standard Form and Content Review
4. Certification and Financial Guarantee for Improvement Completion
5. Council Action, Approval or Denial
6. Recording (if approved)
7. Plat print to City Clerk/Treasurer
8. Record Plans

7.2.3 FLOODPLAIN ORDINANCE

The City has a current Floodplain Management Ordinance. This ordinance states that the City is fully responsible for floodplain regulation within the City. **Figure 14** shows the FEMA mapped floodplains within Cottage Grove.

7.3 EDUCATION

7.3.1 GENERAL

Education plays an important role in any effort to implement a stormwater management program like the one outlined in this SWMP. The objectives of an education effort vary, depending on the target audience. In general, the target audience for this education program is City staff, City residents, and the development community. The following sections describe why education of each of these groups is important and presents educational methods for each that the City is using.

7.3.2 CITY STAFF

City staff have a wide range of responsibilities for implementing this plan. These include:

- Implementing street sweeping and spill containment cleanup programs.
- Maintaining stormwater pond performance and system operability.
- Planning for and management of projects to achieve specified levels of pollutant removal performance, wetland protection, etc.
- Carrying out grounds maintenance of City-owned lands/facilities in a way that sets a good example for residents.
- Utilizing BMPs in application of ice control material.
- Application of Best Management Practice policies and regulations to new and redevelopment

projects.

- Develop an effective administration of an erosion and sediment control program.
- Planning and delivering education programs.
- Working out cooperative arrangements with regulatory and non-regulatory organizations to achieve SWMP objectives.
- Assisting the City Council in the application of the SWMP policies.

Because these responsibilities involve many different levels of City staff, City staff members are trained to have a basic understanding of the SWMP, including:

- A description of the major stormwater management issues (including known stormwater management problem areas, stormwater management expectations for new and redevelopment projects, incorporation of stormwater mitigation into capital improvement projects, and regulatory jurisdictions).
- The objectives of the SWMP and the general approach outlined in the SWMP for resolution of these issues.
- The responsibilities of the different work units in implementing the SWMP.
- The information the SWMP provides.

This information is disseminated in presentations at staff meetings and covered in internal newsletters and memos.

7.3.3 CITY RESIDENTS

In order to obtain the necessary political and economic support for successful SWMP implementation, it is vital to inform City residents about basic stormwater management and water quality concepts, policies and recommendations in the SWMP, and the progress of stormwater management efforts.

This information is presented to the public through the City website, newsletters, press releases to local papers, and at public meetings as appropriate. Periodic updates on the progress of SWMP implementation and information on specific improvement projects is also provided to the public. Again, the City website, newsletters and press releases to local papers are good methods by which this information is disseminated.

Education projects focused on stormwater quality have received increasing attention and interest from the public over the last decade. Specific education projects that have been used successfully in Cottage Grove, or are being considered by the City include the following:

Catch basin stenciling/door hanger distribution

The objective of this activity is to provide recognition of the direct connection between the City storm drainage system and many of the community's creeks and wetlands. The door hangers further explain this connection and why it is important to keep vegetative material, fertilizer, pet litter, and chemicals off hard surfaces and out of the storm drainage system. Scout troops often participate in catch basin stenciling.

Web Site

The existing City web site currently includes many volunteer opportunities related to minimizing the effects of stormwater runoff and also raises awareness of the individual practices which can be taken to help minimize runoff contamination and nutrient loading.

Metro-area phosphorus fertilizer ban

Effective January 1, 2004, Minnesota state law banned application of fertilizer containing phosphate to lawns with some exceptions, such as, where a recent soil test has shown the lawn soil is deficient in

phosphorus. State law also requires clean-up of any fertilizer spread or spilled on paved surfaces. The City will promote awareness of this law in public education efforts.

Brochures

There are numerous excellent brochures available that could easily be customized for the City. Distribution could be accomplished through direct mailings, as a fold-in to the City newsletter, a door-to-door distribution by volunteers, etc.

Annual Stormwater Public Meeting

Each year, the City conducts an annual stormwater public meeting as required by the NPDES Phase II MS4 Permit. For each meeting, City staff provides residents with a brief description of the stormwater impacts of municipal runoff and identify the actions taken by the City. Time is available during the meeting to allow residents the opportunity to comment on the adequacy of the City's stormwater program and provide any helpful comments for future management.

The City will join efforts with the watershed district to develop and execute educational activities in order to increase the cost-efficiency of the program, avoid duplication of effort, and ensure delivery of consistent messages across the City. The City is a member of the Washington County Conservation District East Metro Water Resource Education Program (EMWREP). This partnership of 24 local units of government, educates residents, businesses, staff and decision-makers about issues affecting local lakes, rivers, streams, wetlands and groundwater resources.

7.3.4 DEVELOPMENT COMMUNITY

The SWMP is designed to provide the official policy direction that City staff and the City Council desire to guide stormwater mitigation for new and redevelopment projects. The information about mitigation requirements will be disseminated to developers and their consulting engineers as early as possible in the development review process.

In this way, developers will know what is expected of them and can consider the requirements in their initial assessments of the site as well as incorporate the necessary BMPs in any subsequent designs.

Much of the necessary information will be disseminated to the developers in an information packet in the development submittal information they receive from the City. The information packet will contain:

- Information on the regulatory administrative responsibilities for developments within the major watersheds covering the City.
- Information regarding stormwater mitigation requirements.
- Any information on areas of the City where special regulations may apply because of the existence of overlay districts.

While dissemination of the information above through an information packet is valuable, there is no substitute for a meeting between key City staff and the developer as early as possible in the review process. This helps define expectations for submittals, clarify regulatory compliance issues, and provide additional detailed guidance. Developers are encouraged to do this as soon as possible after they have reviewed the written information cited above and thought about how it applies to their site.

7.4 OPERATION AND MAINTENANCE

7.4.1 STORMWATER BASINS

Stormwater basins represent a sizable investment in the City's drainage system. General maintenance of these facilities helps ensure proper performance and reduces the need for major repairs. Periodic inspections are performed to identify possible problems in and around the basin. Inspection and maintenance cover the following:

- Basin outlets

- Basin inlets
- Side slopes
- Illicit dumping and discharges
- Sediment buildup

Basin Outlets

A key issue with stormwater basins is ensuring that the outlets perform at design capacity. Inspection (minimum 20% of outlets per year) and maintenance of basin outlets address the following:

- The area around outlets is kept free and clear of debris, litter, and heavy vegetation.
- Trash guards are installed and maintained over all outlets to prevent clogging of the downstream storm sewer.
- Trash guards are inspected at least once a year, typically in the spring, to remove debris that may clog the outlet. Problem areas are addressed more frequently, as required.
- Emergency overflow outlets are provided for all ponds when possible. These are kept clear of debris, equipment, and other materials and properly protected against erosion.

Basin Inlets

Inspection and maintenance of basin inlets address the following:

- Inlets are inspected for erosion.
- Where erosion occurs near an inlet, energy dissipaters or riprap are installed.
- Inlets are inspected for sediment deposits, which can form at the inlets due to poor erosion practices upstream.
- Where sediment deposits occur, these are removed to ensure design capacities of storm sewers entering the basin are maintained.

Side Slopes

Inspection and maintenance of basin side slopes address the following:

- Side slopes are kept well-vegetated to prevent erosion and sediment deposition into the basin. Severe erosion alongside slopes can reduce the quality of water discharging from the basin and require dredging of sediments from the basin.
- Noxious weeds are periodically removed from around basins.
- Some basins in highly developed areas require mowing. If mowing is performed, a buffer strip of 20 feet or more adjacent to the normal water level is typically maintained. This provides filtration of runoff and protects wildlife habitat.

Illicit Dumping and Discharges

Inspection and maintenance of illicit dumping and discharges into basins address the following:

- Basins are periodically inspected for evidence of illicit dumping or discharges.
- The most common of these is dumping of yard waste into the basin.
- Where found, illicit material is removed, and signs are posted as needed prohibiting the dumping of yard waste.
- Water surfaces are inspected for oil sheens. These can be present where waste motor oil is dumped into upstream storm sewers.

- Skimmer structures are installed as needed at outlet structures to prevent oil spills and other floatable material from being carried downstream.
- Skimmer structures are periodically inspected for damage, particularly from freeze-thaw cycles.

As part of the NPDES Phase II Stormwater Pollution Prevention Program, the City is implementing a local spill containment cleanup plan. Additional information regarding the City's spill containment plan can be found in the SWPPP.

Sediment Buildup

Inspection and maintenance of sediment buildup in basins address the following:

- Basins are inspected to determine if sediment buildup is causing significant loss of storage capacity from design levels. Excessive sediment buildup significantly reduces the stormwater treatment efficiency of water quality ponds.
- Sediment removal is performed where excessive sediment buildup has occurred.
- As a general guideline, ponds require dredging every 15 to 20 years.

7.4.2 SUMP MANHOLES AND SUMP CATCH BASINS

Sump manholes and sump catch basins are included in storm sewer systems to collect sediments before they are transported to downstream waterbodies. These structures keep sediments from degrading downstream waterbodies. Once sediments are transported to a lake or pond, they become much more expensive to remove.

Sediments originate primarily from road sanding operations, although construction activity and erosion can also contribute. Since these structures are designed to collect these sediments, they are routinely cleaned to provide capacity for future sedimentation. Suction vacuum equipment is typically used.

7.4.3 STORM SEWER INLET STRUCTURES

To fully utilize storm sewer capacity, inlet structures are kept operational in order to get runoff into the system. All efforts are made to keep catch basins and inlet flared ends free of debris and sediments so as not to restrict inflow and cause flood damage. Leaf and lawn litter are the most frequent cause of inlet obstructions. On a routine basis, City staff visually inspects inlet structures to ensure they are operational.

7.4.4 PIPING SYSTEM

The storm sewer system constitutes a multimillion-dollar investment for the City. **Figure 15** shows the existing storm drains in Cottage Grove. The City performs a comprehensive maintenance program to maximize the life of the facilities and optimize capital expenditures. The following periodic inspection and maintenance procedures are followed:

- Catch basin and manhole castings are inspected and are cleaned and replaced as necessary.
- Catch basin and manhole rings are inspected and are replaced and/or regrouted as necessary.
- Catch basin and manhole structures are inspected and are repaired or replaced as needed.
    - Pipe inverts, benches, steps (verifying integrity for safety), and walls are checked.
    - Cracked, deteriorated, and spalled areas are grouted, patched, or replaced.
- Storm sewer piping is inspected either manually or by video to assess pipe condition. Items looked for include root damage, deteriorated joints, leaky joints, excessive spalling, and sediment buildup. The piping system is programmed for cleaning, repair, or replacement as needed to ensure the integrity of the system.

7.4.5 OPEN CHANNELS

Overland flow routes constitute an important part of the surface water system. 17 stormwater ponds were recently identified as having 100-year highwater levels increasing by 2 feet or more as a result of the Atlas 14 7.4 inch 24-hour rainfall depth and distribution (**Figure 16**). These 17 ponds will be analyzed further regarding highwater levels and outflows through the pipe spillways and emergency overflows. Stormwater ponding and conveyance features including emergency overflow spillways and open channel conveyance routes provide a measure of resilience to the effects of climate change since small increases in depth provide large increases in capacity.

Open channels are typically vegetated and occasionally lined with more substantial materials. The lined channels typically require little or no maintenance. Vegetated channels are periodically inspected and maintained, as high flows can create erosion within the channel. Eroded channels can contribute to water quality problems in downstream waterbodies as the soil is continually swept away. If not maintained, the erosion of open channels would accelerate, and the repair would become increasingly more costly.

7.4.6 DE-ICING PRACTICES

Minnesota receives approximately 54 inches of snow during a typical year. This requires a large amount of de-icing chemicals (primarily salt) to be applied to roads and sidewalks each winter. Estimates indicate that 80 percent of the environmental damage caused from de-icing chemicals is a result of inadequate storage of the material (MPCA 1989). Improper storage as well as overuse of salt increases the risk of high chloride concentrations in runoff and groundwater. High chloride concentrations can be toxic to fish, wildlife, and vegetation. The following procedures are used for storing de-icing chemicals in the City:

- Stockpiles of de-icing materials are covered by a permanent structure and placed on impervious surfaces.
- Road de-icing stockpiles are not located near municipal well areas or in other sensitive groundwater areas.
- Runoff from stockpiles is not allowed to flow directly into streams or wetlands where environmental damage can occur.

7.4.7 STREET SWEEPING

Street sweeping is an integral part of the City's effective surface water management system. It greatly reduces the volume of sediments that must be cleaned out of sump structures and downstream waterbodies. The City has a "street sweeping policy" that includes two sweeping operations in a year. Spring sweeping begins in either late March or early April after the risk of later snowfall has passed. Fall sweeping commences in mid-August and is typically completed by Labor Day weekend. Stormwater quality areas are swept on a priority basis throughout the year.

7.4.8 LITTER CONTROL

Through City programs such as adopt-a-street and adopt-a-park, the City provides opportunities for volunteers to beautify the City's public resources. Participants are asked to coordinate a spring and fall clean up effort to ensure that City resources are visually attractive to its users throughout the year.

7.4.9 VOLUME CONTROL BMPS

The City will follow the guidance provided in the Minnesota Stormwater Manual regarding the operation and maintenance considerations for volume control BMPs owned and maintained by the City. The City also requires a detailed operation and maintenance plan for privately owned volume control BMPs be provided.

7.4.10 STRUCTURAL STORMWATER BMPS

For all structural stormwater BMPs that are not owned and operated by the City, a documented agreement

between the owner and the City shall be drafted. The agreement shall include conditions that:

- Allow the City to conduct inspections of the BMP(s), perform necessary maintenance, and assess costs for the BMP(s) when the City determines the owner/or operator of the BMP(s) has not conducted maintenance.
- Preserve the City's right to ensure maintenance responsibility when ownership and/or operator responsibilities are legally transferred to another party.
- Protect/preserve BMP(s) and site features that are implemented to comply with policy 6.1 of Section 3 – Goals and Policies of this Surface Water Management Plan. If site configurations or the BMP(s) change, causing decreased BMP effectiveness, new or improved structural stormwater BMPs must be implemented to ensure the conditions for post-construction stormwater management in policy 6.1 continue to be met.

7.5 TRUNK SURFACE WATER SYSTEM COSTS

The proposed surface water system in the City is presented in **Map 1**. Surface water facilities will be constructed in conjunction with new development, redevelopment and street construction. One of the basic objectives of this report was to determine the cost of completing the City of Cottage Grove's surface water system and at the same time determine trunk area costs that will ensure availability of sufficient funds for the required construction.

The cost estimates presented in this report are based on 2008 construction costs estimated in the 2008 SWMP, but have been updated to 2019 costs using the RSMeans construction cost indexes. A detailed breakdown of the trunk surface water system cost estimates is presented in **Appendix E**. The cost estimates are for construction, legal, engineering, and administrative costs.

For this SWMP, the estimated cost to complete the remaining proposed stormwater system cost is $41,401,300. This estimated cost includes the cost of the proposed conveyance system (including costs for stream and ravine restoration projects), regional pond construction costs, and some land acquisition costs. This total system cost will be factored into the City's annual area charge rate update.

7.6 FINANCING

Several methods of financing the proposed projects and programs in this SWMP are available. Some of these are as follows:

- Area charges: These are fees charged to urban developments on an area (cost per acre) basis. The area charges for the land use types more dense than single family residential are higher because these land uses have a higher percentage of impervious surface and thus generate more runoff. The City currently collects area charges from new development. The City will also collect area charges from redevelopment when there is a land use change or if area charges haven't been collected in the past. The existing area charge rates were developed by a previous study and have been updated by the City on a regular basis.
- Special assessments: Assessments against benefiting or responsible properties can be used to finance surface water improvements.
- Stormwater utility: This is a fee charged to existing properties based on an estimate of runoff generated and discharged to the City's system. The City has established a stormwater utility to generate revenue to fund the operation and maintenance of the City's trunk stormwater system. Currently, the City charges approximately $15 per quarter per household, with denser non-residential land uses paying a higher rate. The stormwater utility rate is based on a review and inspection of the City's existing trunk system, with updates to the rates occurring on a regular basis. The annual stormwater utility fees generate $830,000.
- Grants: Though subject to budgetary constraints, many local, state, federal and other grant

programs are available for surface water and stormwater management.

7.7 AMENDMENT PROCEDURES

The SWMP is intended to extend through the year 2028. For the plan to remain dynamic, an avenue must be available to implement new information, ideas, methods, standards, management practices and any other changes that may affect the intent and/or results of the SWMP. The amendment procedure for the SWMP is presented below:

Request for Amendment

Written request for plan amendment is submitted to City staff. The request shall outline the need for the amendment as well as additional materials that the City will need to consider before making its decision.

Staff Review of Amendment

A decision is made as to the validity of the request. Three options exist: 1) reject the amendment, 2) accept the amendment as a minor issue, with minor issues collectively added to the plan at a later date, or 3) accept the amendment as a major issue, with major issues requiring an immediate amendment. In acting on an amendment request, City staff shall recommend to City Council whether or not a public hearing is warranted.

Council Consideration

The amendment and the need for a public hearing shall be considered at a regular or special Council meeting. Staff recommendations should be considered before decisions on appropriate action(s) are made.

Public Hearing and Council

This step allows for public input based on public interest. Council shall determine when the public hearing should occur in the process. Based on the public hearing, the City Council could approve the amendment.

Watershed Management Organization Approval

All proposed amendments must be reviewed by the watershed management organizations prior to final adoption of the amendments.

Council Adoption

Final action on an amendment, following approval by the watershed management organizations, is City Council adoption. However, prior to the adoption, an additional public hearing could be held to review the plan changes and notify the appropriate stakeholders.

7.8 ANNUAL REPORT TO COUNCIL

A brief annual report will be made by City staff summarizing development changes, capital improvements, and other water management- related issues that have occurred over the past year. The review will also include an update on available funding sources for water resource issues. Grant programs are especially important to review since they may change annually. These changes do not necessarily require individual amendments. The report can, however, be considered when the plan is brought up to date. The annual report should be completed by July 1st to allow implementation items to be considered in the normal budget process.

The City's SWMP will remain in effect through 2028. The City will then review the SWMP for consistency with current water resource management methods. At that time, all annual reports and past amendments will be added to the document. Depending on the significance of changes, a new printing of the SWMP may be appropriate.

7.9 SYSTEM IMPROVEMENT PROJECTS AND ACTIVITIES

Based on the assessment of the City's current stormwater management program, a prioritized list of

system improvement projects and activities has been identified. The system improvements identified range from those being driven by regulatory requirements, to others driven more by the functionality of the City's regional stormwater management system. **Table 7.9** presents a summary of recommended high and medium priority stormwater and water resource management projects and activities. The budget amounts included in this table should be considered planning-level cost estimates, with more specific cost estimates to be determined as the project or activity approaches.

For capital improvement projects, the City will continue to rely on its very detailed 5-year capital improvement planning process to schedule and plan for funding these projects. This planning process is updated annually by City staff and reviewed and approved annually by the City Council. The items listed in **Table 7.9** will be used as a reference for projects and activities specific to stormwater and water resources management to be included in the capital improvement planning process.

Table 7.9 - High and Moderate Priority System Improvement Projects and Activities

Project	Description	Estimated Cost	Priority	Comments
Apply and Enforce Watershed District Rules and Standards	Review development and redevelopment projects for compliance with this Plan and the Rules & Standards of the Watershed District	Costs for development reviews is borne by the applicant. Costs for administration and coordination with watershed is $10,000 to $20,000 per year.	High	On-going
Evaluate Watershed District standards, rules, and guidance documents	Review and comment on new Watershed District standards, rules, and guidance documents as necessary to address concerns regarding City compliance	$10,000 - $20,000 for City staff and City Attorney/Consulting Assistance	High	Periodic. Evaluate as SWWD standards manual and rules are updated and enacted
Operation and Maintenance of the Stormwater System	The City's stormwater system is a Multi-Million Dollar infrastructure constructed to collect, convey, store and treat runoff from the City	$100,000 in annual inspections, operation, maintenance, repairs and replacements which includes 110 miles of storm drain pipes, over 100 stormwater ponds and associated items	High	On-going
Street Sweeping	Street Sweeping of 167 miles of City Streets once per year	$35,000 per year	High	On-going
MS4 and SWPPP Implementation	The City of Cottage Grove is an NPDES MS4 community. The NPDES MS4 permit and SWPPP require the BMP activities listed below:			
	Maintain Storm Sewer Base Map and GIS System	$5,000 to $10,000 per year	Moderate	On-going
	Public Education and Outreach: Continue to work with the Watershed and the East Metro Water Resources Education Program	$5,000 per year	Moderate	On-going
	Public Participation	$2,000 per year	Moderate	

Table 7.9 - High and Moderate Priority System Improvement Projects and Activities (continued)				
Project	**Description**	**Estimated Cost**	**Priority**	**Comments**
	Illicit Discharge Detection and Elimination	$3,000 per year	Moderate	On-going
	Construction Site Stormwater Runoff Control	Coordinate with SWWD on inspections. Project costs	Moderate	On-going
	Post Construction Stormwater Management	Development or project costs	Moderate	On-going
	Pollution Prevention Good Housekeeping for Municipal Operations	$5,000 per year	Moderate	On-going
Hydrogeologic Assessments of Infiltration in DWSMA	Complete site or regional hydrogeologic assessments of stormwater infiltration	$1,500 for specific sites, $5,000 for regional assessments	High	Complete within 2 years of adoption of SWMP by City Council
Central Draw Storage Facility Regional Outlet	Coordinate with the SWWD in the design and installation of the SWWD outlet for pond ER-P2 (CD-P86)	Financed by the SWWD	High	
Regional Stormwater Models	Maintain and improve the City's Regional Stormwater Models	Project funding primarily borne by permit applicants and development projects	Moderate	Ongoing
Lake Robert (Shepard's Woods Pond) Outlet	Complete permitting and construct outlet	$5,000 to $10,000 for permitting, Outlet pipe costs to be determined	Moderate	Complete in conjunction with adjacent development
ER-P3 and ER-P4 Outlets	Coordinate with the SWWD in the design and installation of the SWWD outlet for pond ER-P3. Complete design, permitting and construct outlet for ER-P4	ER-P3 outlet to utilize CDSF outlet pipe designed and financed by SWWD. ER-P4 outlet to be determined	Moderate	ER-P3 outlet dependent on SWWD CDSF timeline
ER-P11	Complete design, permitting and construct outlet to L-P3	$400,000	Moderate	Development driven timeline
L-P3 Storage, Outlet and Conveyance	Include 3M, SWWD and others to explore options for storage, conveyance, water quality and natural resource protection. Design and construct solutions	$3,000,000	Moderate	Complete with future County roadway project

Table 7.9 - High and Moderate Priority System Improvement Projects and Activities (continued)				
Project	**Description**	**Estimated Cost**	**Priority**	**Comments**
West Draw Inter-Community Flow Limit	The City will work with Woodbury and SWWD to address existing 200 cfs flow and 25 cfs limit	Necessary storage ponds will be completed along with development projects	High	Ongoing with development
Gateway Pond (SPP-P9) Improvements	Implement the necessary improvements to the Gateway Pond	$1,890,000	Moderate	Work with MnDOT, MnDNR, City of St. Paul Park, SWWD, and Canadian Pacific Railroad to develop a joint funding strategy
Thompson Grove water quality pond	Construct a quality treatment pond adjacent to the Hamlet Park Pond system to provide treatment for some of the tributary residential area	$1,640,000	Moderate	Other water quality BMPs should also be investigated
Jamaica Avenue box culvert	Install 6'x6' box culvert under Jamaica Ave and provide stabilized conveyance to L-P3	$250,000	Moderate	Cost estimate includes box culvert and channel stabilization to L-P3
Update long-term system improvements for water quality	Update the water quality system improvements costs CIP from 2000 to reflect new priorities in the City's plan, such as volume control	$6,000 - $12,000 for City staff time and consulting time	High	Complete within two years of adoption of this SWMP by City Council

SECTION 8 - SUMMARY AND RECOMMENDATIONS

8.1 SUMMARY

The Cottage Grove Surface Water Management Plan addresses the current needs of the City regarding stormwater management. It will serve as a guide to managing the surface water system and protecting key water resources within the City. The surface water system is shown on **Map 1**. The following issues have been incorporated into this SWMP:

- Description of the physical environment and context for surface water management in Cottage Grove
- Up-to-date goals and policies of the City as well as agency requirements affecting surface water management
- General layout and a description of the system
- Regulatory responsibilities
- Guidelines for surface water management as redevelopment occurs
- Public education
- Operation and maintenance of the surface water system
- Implementation items

8.2 RECOMMENDATIONS

The following actions are recommended to implement this SWMP:

- Proceed with implementation items
- Continue operating and maintaining the City's surface water system in accordance with this SWMP
- Continue a public education program to inform citizens about water resource management and protection
- Continue with established standard review procedures to ensure that all new development/redevelopment is in compliance with the City's goals and policies as well as Watershed District and agency rules and requirements
- Continue cooperating with the South Washington Watershed District to regulate, manage, and protect water resources
- Adopt and implement amendments to the SWMP as warranted by future standards or regulations

SECTION 9 - REFERENCES

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SECTION 10 - GLOSSARY OF TECHNICAL TERMS

Acre-Foot: Volume of water that would cover an acre of land to a depth of one foot (43,560 cubic feet).

Bedrock: Any solid rock exposed at the earth's surface or covered by unconsolidated material such as till, gravel, or sand.

Best Management Practices (BMPs): Activities or structural improvements that help reduce the quantity and improve the quality of stormwater runoff. BMPs include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Bluegreen algae: A type of algae whose population often increases dramatically at high nutrient concentrations in lakes. They can form objectionable surface scums, cause taste and odor problems, and secrete toxins poisonous to warm-blooded animals.

Bounce: The difference in elevation between the normal water elevation and the peak water elevation of a pond for a given size runoff event.

Buffer strip: A band of un-maintained, preferably native, vegetation left along the edge of a stream, lake or wetland to filter runoff and/or stabilize the shoreline.

Clean Water Act (Water Quality Act): (formerly the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972). Public law 92-500; 33 U.S.C. 1251 et seq.; legislation which provides statutory authority for the NPDES program. Also know as the Federal Water Pollution Control Act.

Conveyance: The process of water moving from one place to another. Cubic feet per second (cfs): A unit of flow rate.

Degradation: A decrease in quality.

Detention Pond: A pond designed to catch and temporarily store runoff before discharging the water downstream. The volume of the pool of standing water in the pond is important in determining how effective the pond will be in treating the incoming stormwater.

Discharge: The volume of water (and suspended sediment if surface water) that passes a given location within a given period of time.

Discretionary MS4: A small MS4 who is required to comply with the NPDES Phase II permit due to the permitting agency (MPCA) designated criteria.

Dissolved Oxygen (D.O.): Oxygen that is dissolved in water. Fish and other water organisms need oxygen for respiration to survive. Depletion of oxygen from water can occur as a result of chemical and biological processes, including decomposition of organic matter.

Ecosystem: A community represented by interaction among animals, plants, and microorganisms, and the physical, biological and chemical environment in which they live.

Empirical: Based on experiment and observation; used to describe water quality models which are developed from measured data.

Erosion: When land is diminished or worn away due to wind, water, or glacial ice. Often the eroded debris (silt or sediment) becomes a pollutant via stormwater runoff. Erosion occurs naturally but can be intensified by land clearing activities such as farming, development, road building, and timber harvesting.

Eutrophication: A natural process caused by the gradual accumulation of nutrients and consequent increased biological production, and resulting in the slow filling in of a basin with accumulated sediments, silt, and organic matter. Man's activities can increase the rate at which eutrophication occurs.

Feet per second (fps): A unit of flow velocity.

Flood Storage Volume: The volume of water that can be stored between a pond's normal water level and its high water level. The size of the flood storage volume strongly influences the performance of the pond for floodwater management and rate control.

Excavation: The process of removing earth, stone, or other materials from land.

General Permit: A permit issued under the NPDES program to cover a certain class or category of stormwater discharges whose operations, emissions, discharges, or facilities are the same or substantially similar. These permits reduce the administrative burden of permitting stormwater discharges.

Grading: The cutting and/or filling of the land surface to a desired slope or elevation.

High Water Level (HWL): The peak water surface elevation in a ponding area as a result of a specific runoff event. Once the peak is reached, the pond water elevation eventually returns to its normal (standing) water level.

Hydrology: The science and study of water in nature, including its circulation, distribution, and its interaction with the environment. Impervious Surface: A surface that is impermeable to the downward seepage of water; e.g., pavement and roof tops.

Karst-sensitive area: Areas consisting of less than 50 feet of soil cover to fractured bedrock, and the first bedrock encountered is either unconsolidated St. Peter Sandstone or the soluble Prairie du Chein group.

Loading: The amount of a pollutant or other substance delivered to a lake, usually expressed as a weight per unit time (i.e. pounds per year). The loading of a given constituent to a receiving water is a function of the volume of incoming water and the concentration of the constituent in the incoming water.

Model: A mathematical representation of an event or process.

Mitigation: Actions taken to reduce an impact. Water quality mitigation measures can be non-structural (such as street sweeping, regulation of fertilizer use, and creation/protection of natural buffers to filter runoff) or structural (such as installation of detention basins). Properly designed detention basins are among the most effective and reliable measures for mitigating the water quality impacts of urban developments.

Municipal Separate Storm Sewer System (MS4): A publicly-owned conveyance or system of conveyances that discharges to waters of the U.S. or waters of the State, and is designed or used for collecting or conveying stormwater, is not a combined sewer, and is not part of a Publicly-Owned Treatment Works (POTW).

NPDES (National Pollutant Discharge Elimination System): The name of the surface water quality program authorized by Congress as part of the 1987 Clean Water Act. This is EPA's program to control the discharge of pollutants to waters of the United States (see 40 CFR 122.2). In Minnesota, the MPCA is the permitting authority and also controls the discharge of pollutants to the waters of the State.

Normal Water Level (NWL): The elevation of the surface of the standing water pool within a pond or wetland. Generally, the NWL is the elevation of the bottom of the primary outlet pipe or overland flow channel.

Non-Point Source Pollution: Refers to pollution other than that caused by discharge of pollutants through a pipe from a closed system to a receiving water. Pollution caused by runoff from farm fields or paved streets are examples of this non-point pollution.

NURP: Acronym for Nationwide Urban Runoff Program, an EPA program aimed at characterizing the composition of stormwater runoff and its impacts upon receiving waters as well as assessing Best Management Practices.

Nutrient Trap: A type of pond or wetland that is effective at removing nutrients from water.

Parts per billion (ppb): A unit of concentration, sometimes expressed as micrograms per liter (ug/l).

Parts per million (ppm): A unit of concentration, sometimes expressed as milligrams per liter (mg/l).

pH: A measure of the acidic or basic nature of the water; it is defined as the logarithm of the reciprocal of the hydrogen-ion concentration in moles/liter.

Phosphorus: A nutrient essential to plant growth. Phosphorus is the nutrient most commonly limiting plant growth in lakes.

Rate Control: A term that refers to controlling the rate at which water is discharged from a watershed. Rate control is often accomplished by creating ponds-either by excavation or berming- to temporarily store runoff, then discharging the stored water at a slower rate to downstream areas. Further reductions in the rate at which water is released from a pond can be accomplished by reducing the size of the outlet, such as through installation of a wall in the outlet structure with a hole (orifice) through it.

Residence Time: The amount of time it takes for water flowing into a lake to equal the lake volume. The shorter the residence time, the more incoming water the lake is receiving relative to its volume.

Stormwater Pollution Prevention Program (SWPPP): A program to describe a process whereby an MS4 thoroughly evaluates potential pollutant sources and selects and implements appropriate measures designed to prevent or control the discharge of pollutants in stormwater runoff.

Suspended Solids: Particulate material which floats in or is carried along in water (e.g., algae, soil particles).

Total Maximum Daily Load (TMDL): The maximum amount of pollutants which can be released into a water body without adversely affecting the water quality.

Total Phosphorus: A measure of all of the different forms of phosphorus in water. Includes phosphorus dissolved in the water, suspended or incorporated in algae or other organisms.

Watershed: The area of land draining into a specific body of water.

Wetland: Habitats where the soil is saturated or covered with water for part of the year.

Wet Volume: The volume of water in a ponding area that lies between the bottom of the ponding area and the normal (standing) water level. The size of the wet volume strongly influences the water quality treatment performance of the ponding area.

Appendix A: Figures

2018 Surface Water Management Plan

Cottage Grove, MN

Regional Location Map

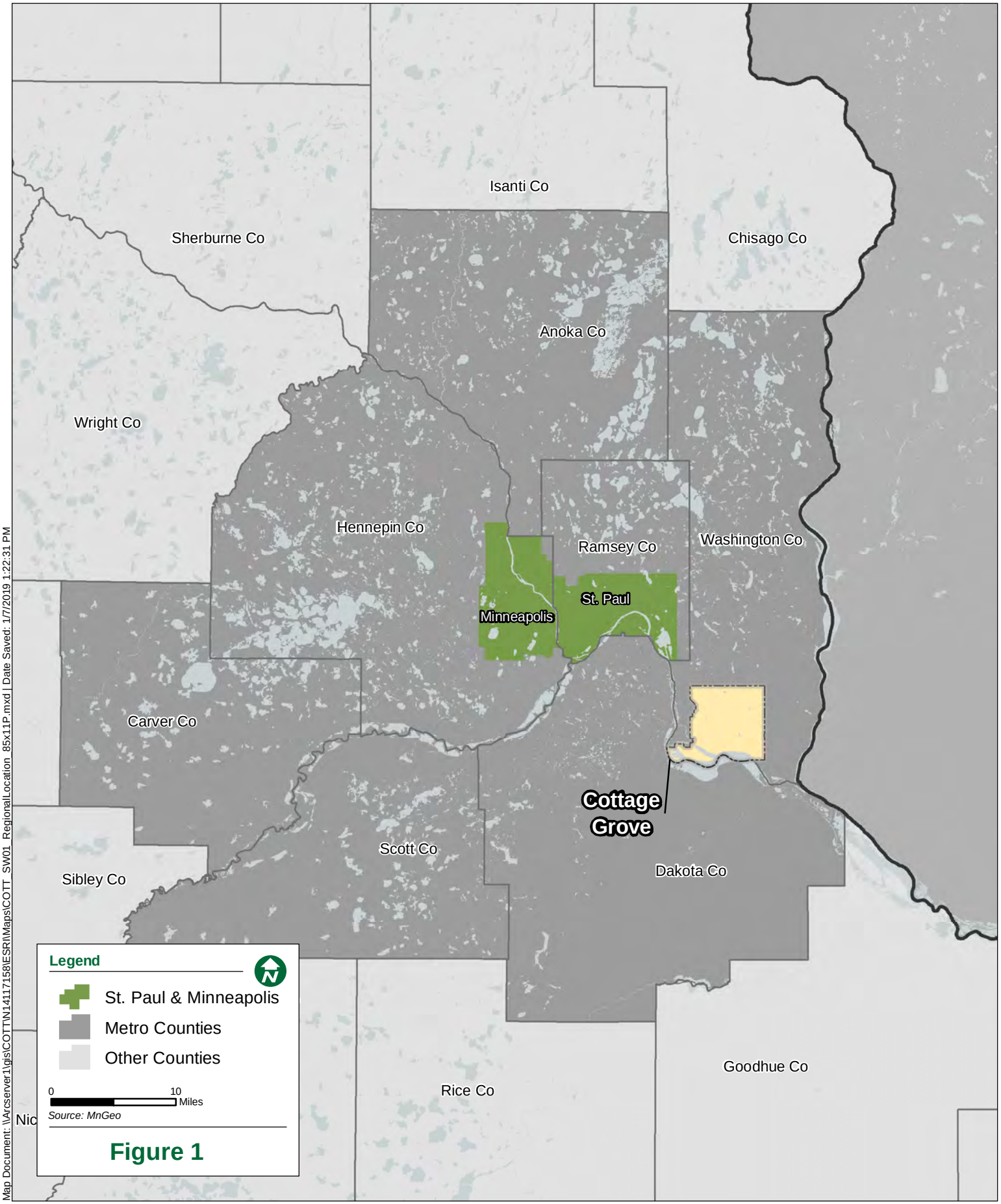


Figure 1

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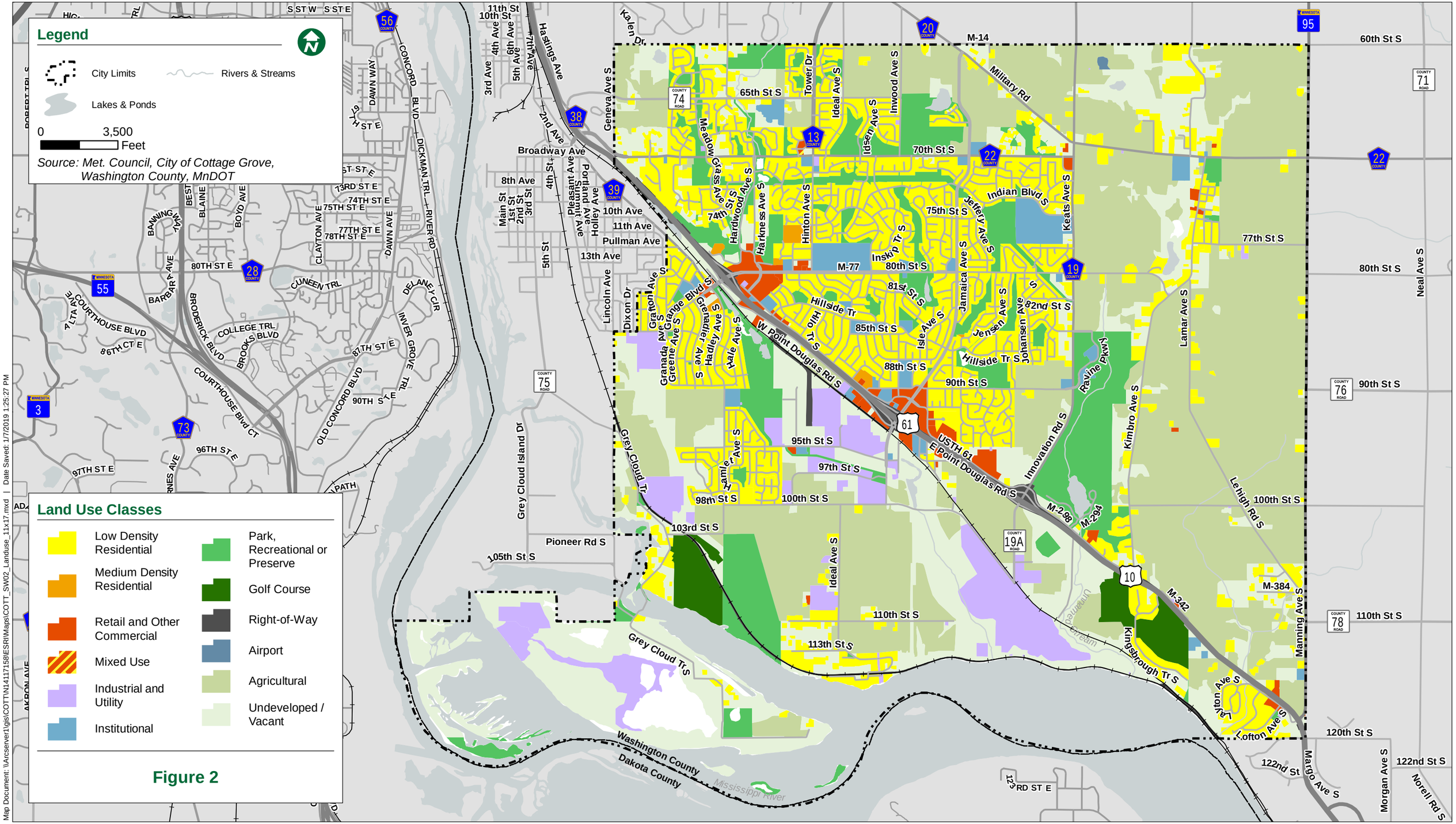
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Where Pride and Prosperity Meet

2018 Surface Water Management Plan

Cottage Grove, MN

Existing Land Use

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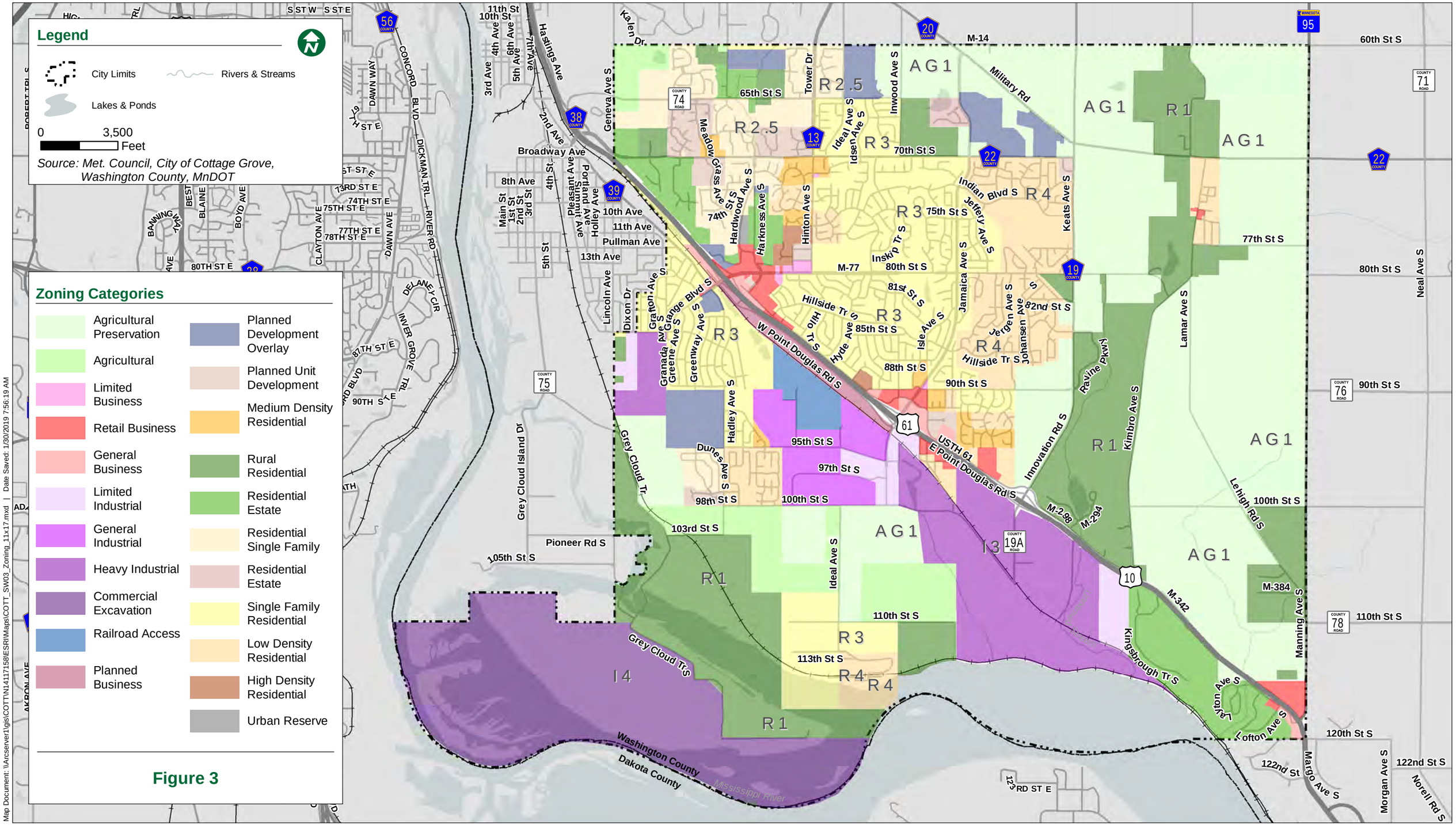
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Cottage Grove, MN

Zoning

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Cottage Grove, MN

Minnesota Land Cover Classification

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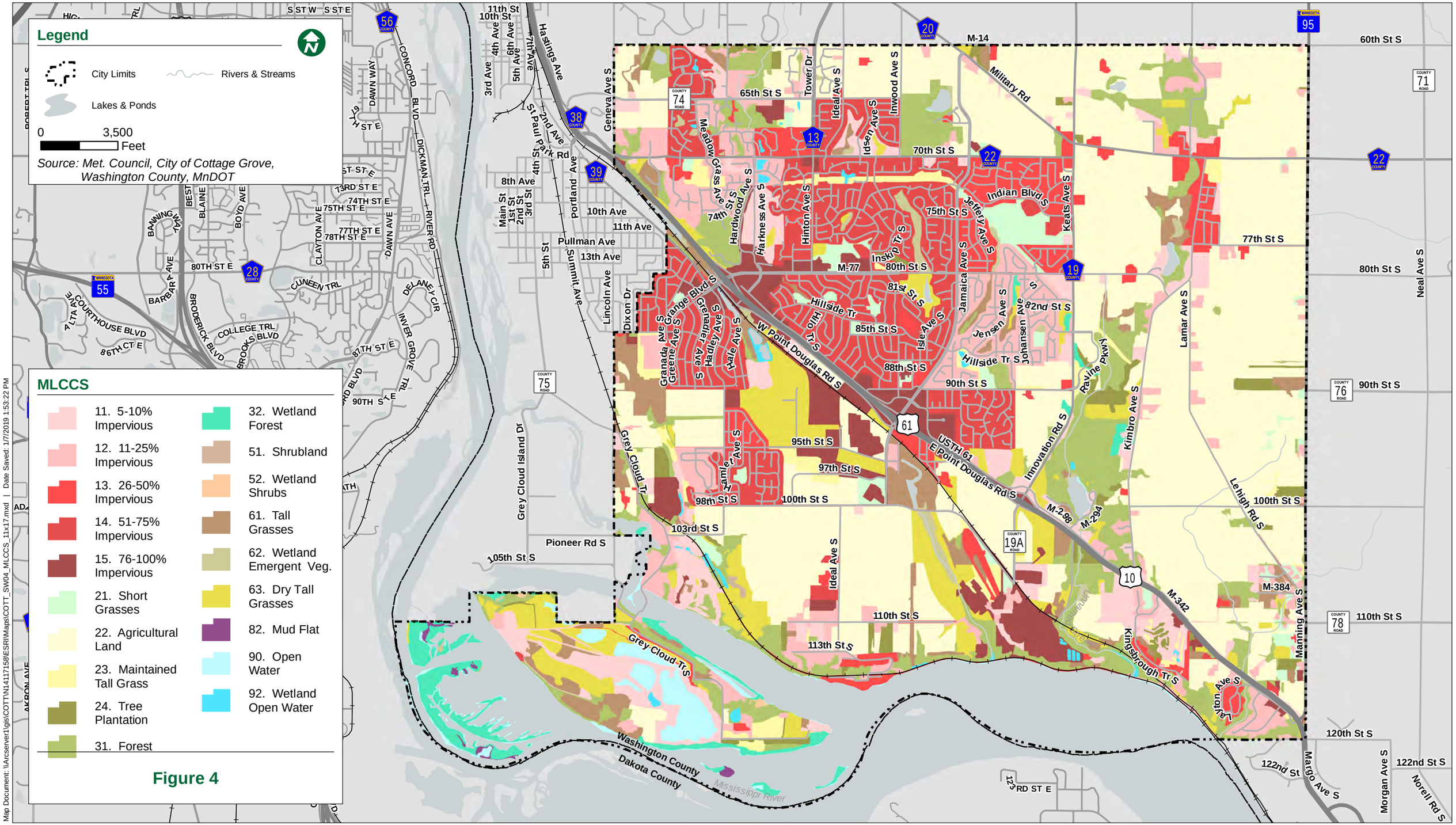


Figure 4

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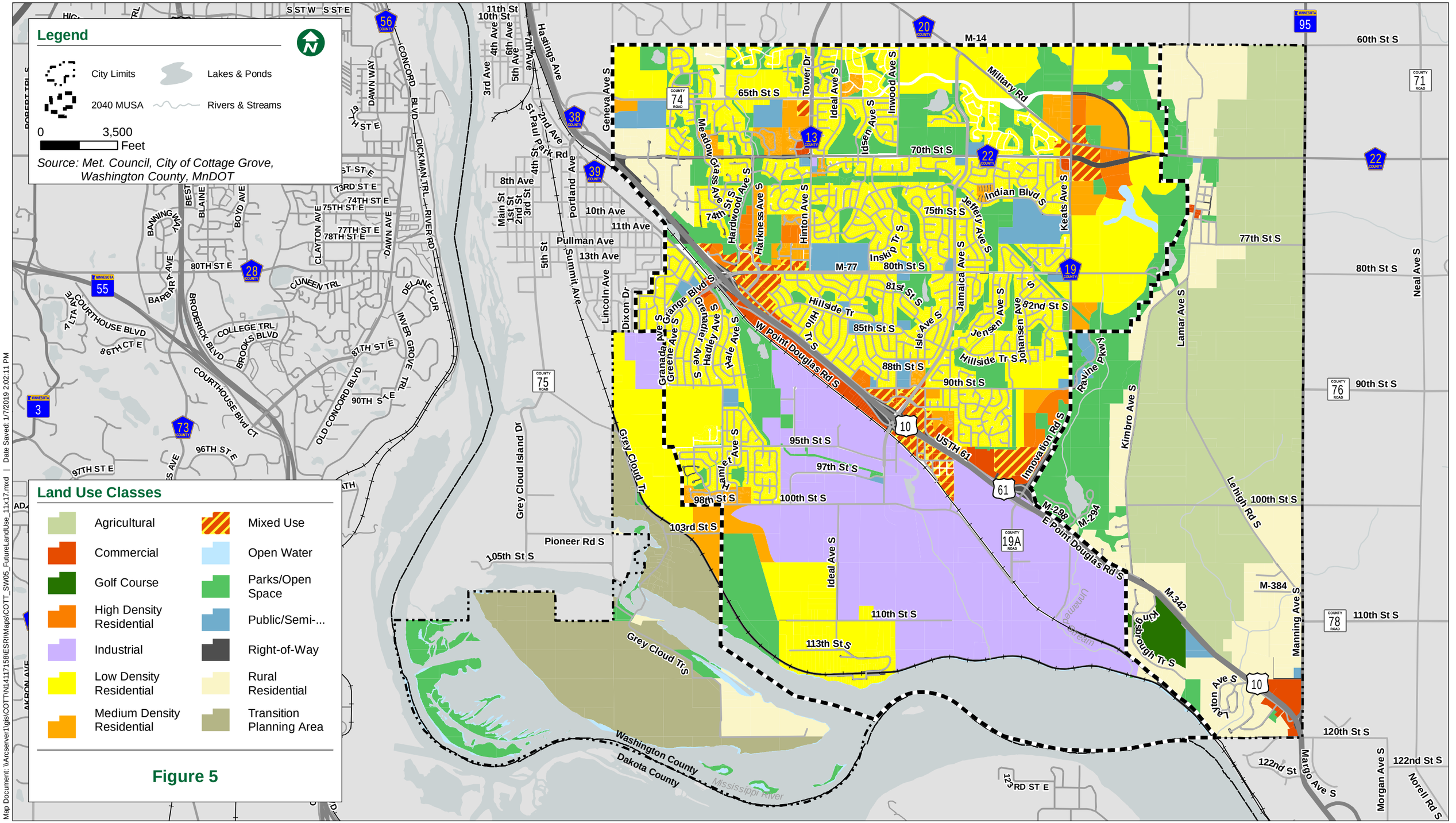
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Cottage Grove, MN

2040 Future Land Use

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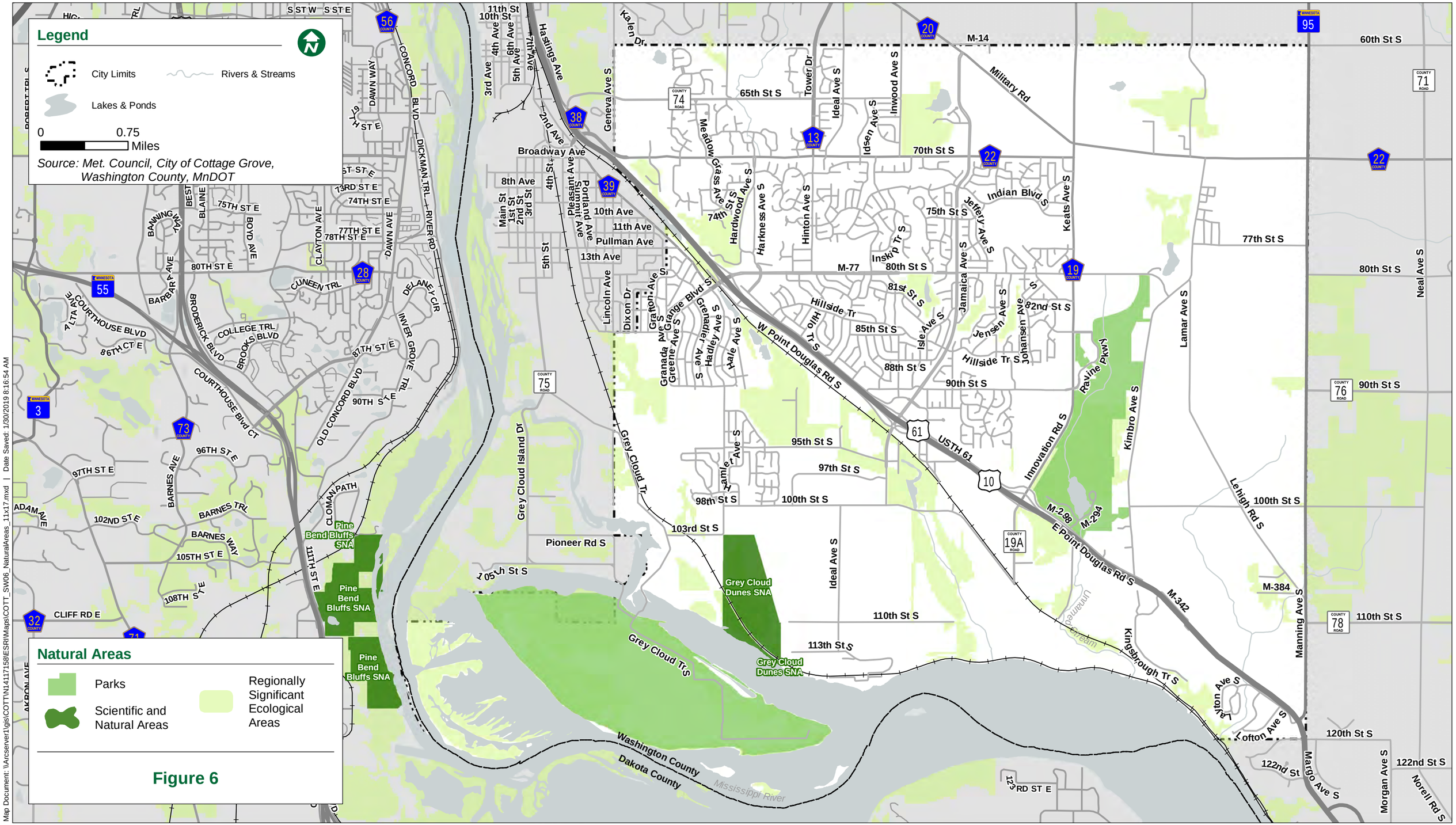
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2018 Surface Water Management Plan

Cottage Grove, MN

Natural Areas

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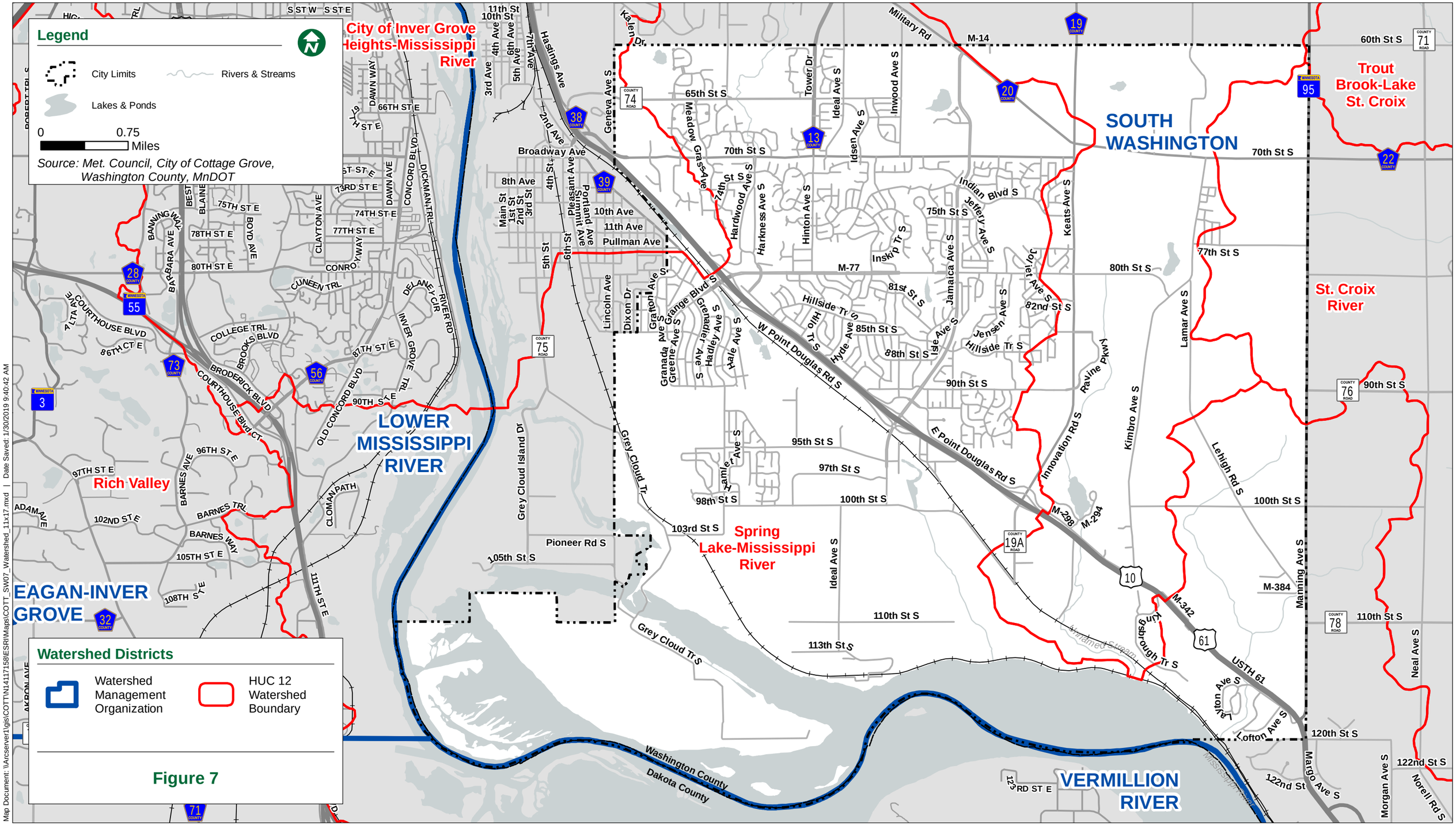
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2018 Surface Water Management Plan

Cottage Grove, MN

Watershed Districts

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Cottage Grove
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2018 Surface Water Management Plan

Cottage Grove, MN

Soil Series

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Legend

City Limits
2040 MUSA
Lakes & Ponds
Rivers & Streams

0 0.75 Miles

Source: Met. Council, City of Cottage Grove, Washington County, MnDOT

Soils By Area

- Sparta (8)
- Antigo (49B)
- Antigo (49)
- Sparta (8B)
- Ostrander
- Zimmerman
- Waukegan
- Other
- Water

Figure 8a

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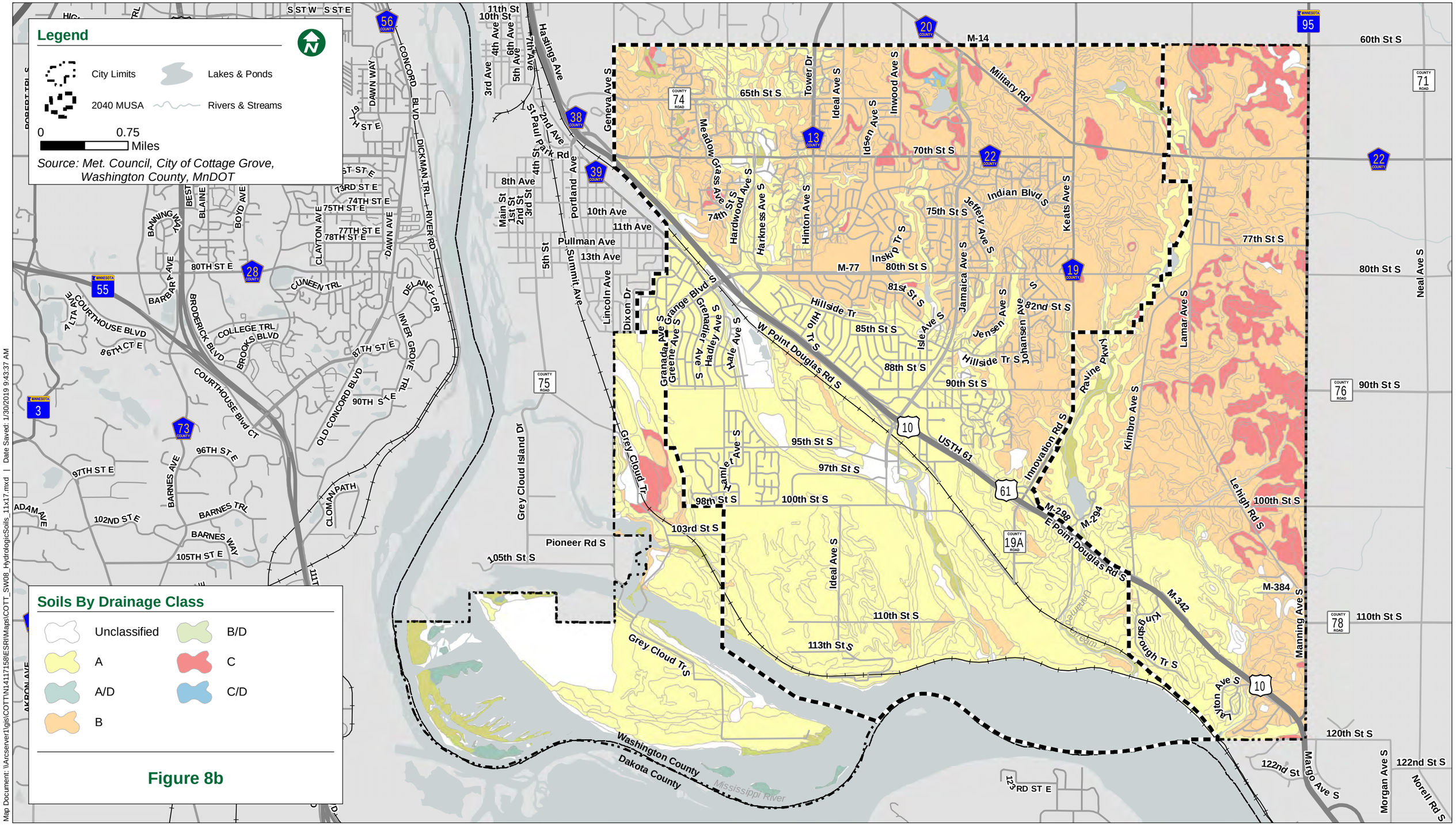
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2018 Surface Water Management Plan

Cottage Grove, MN

Hydrologic Soil Groups

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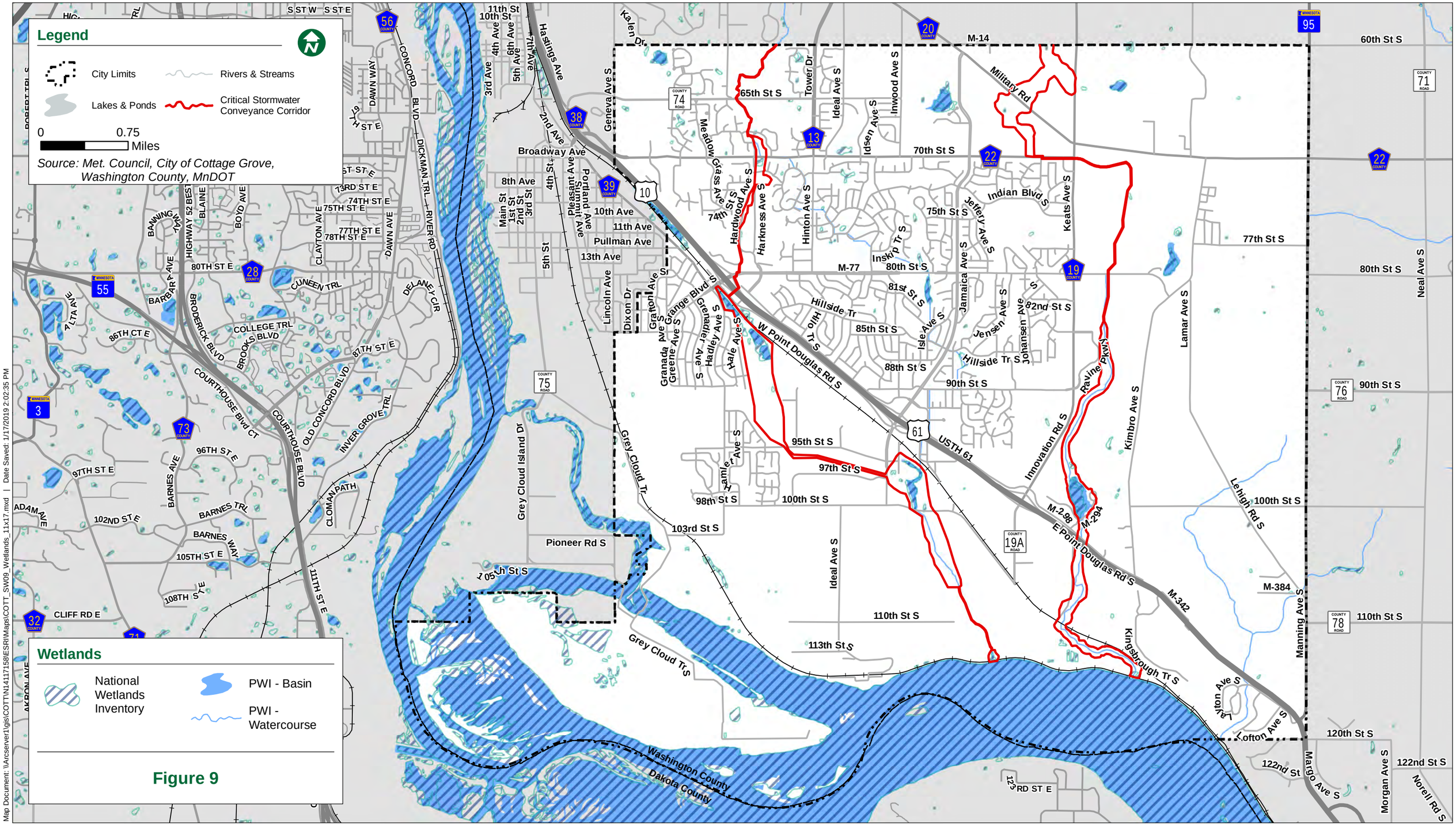
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Where Pride and Prosperity Meet

2018 Surface Water Management Plan

Cottage Grove, MN

National Wetlands Inventory & DNR Public Waters

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2018 Surface Water Management Plan

Cottage Grove, MN

Drinking Water Supply Management Areas

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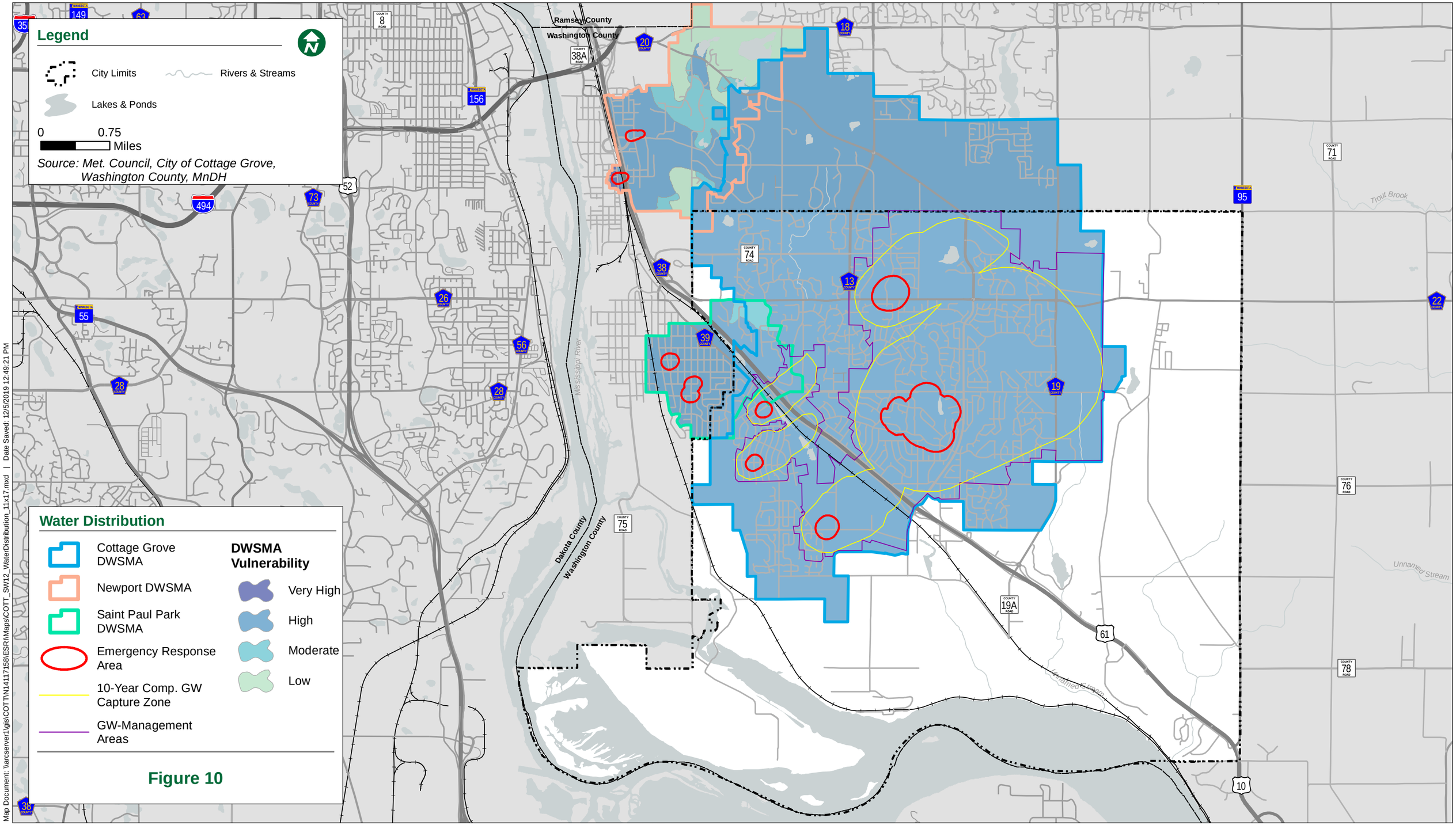


Figure 10

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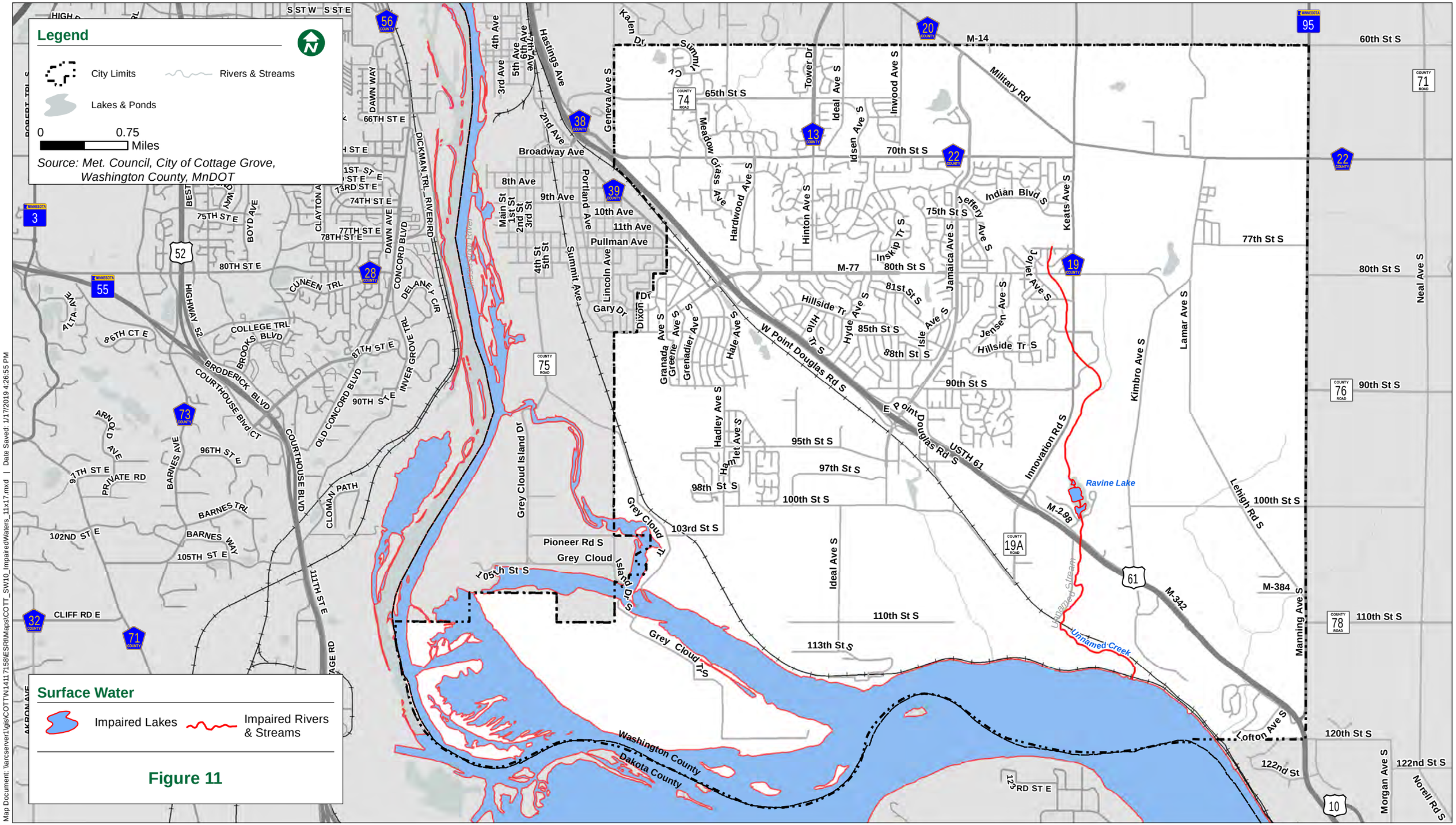
Cottage Grove
Where Pride and Prosperity Meet

2018 Surface Water Management Plan

Cottage Grove, MN

Impaired Waters

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Legend

City Limits
Rivers & Streams
Lakes & Ponds

0 0.75 Miles

Source: Met. Council, City of Cottage Grove, Washington County, MnDOT

WIMN Sites

- Aboveground Tanks
- Air Quality
- Brownfields
- CERCLIS Site
- Construction Stormwater
- Feedlots
- Hazardous Waste
- Industrial Stormwater
- Integrated Remediation
- Multiple Activities
- Petroleum Remediation, Leak Site
- SSTS, Licensed Organization
- Site Assessment
- Solid Waste, Permit by Rule
- Underground Tanks
- Wastewater
- Wastewater, Industrial

Figure 12

Map Document: \\arcserver1\gis\COTTN\14117158\ESRIMaps\COTT_SW11_WIMN_11x17.mxd | Date Saved: 1/17/2019 4:39:51 PM

Cottage Grove
Where Pride and Prosperity Meet

2018 Surface Water Management Plan

Cottage Grove, MN

Hydrologic and Hydraulic Modeling Map

BOLTON & MENK
Real People. Real Solutions.

Legend

City Limits
Rivers & Streams
Lakes & Ponds
General Drainage Direction

0 3,500 Feet

Source: Met. Council, City of Cottage Grove, Washington County, MnDOT

Sub-Watershed Key

1.) Upper Portion of West Draw District
2.) Saint Paul Park District
3.) Lower Portion of West Draw District and Upper Portion of Thompson Grove District
4.) Lower Portion of Thompson Grove District
5.) Central District, East Draw, and Northern Portion of Langdon District
6.) Lower Portion of Langdon District (3M Property)
7.) Upper Portion of East Ravine District and Gables Lake District
8.) Lower St. Croix District, Seeger Creek District, and Lower Portion of East Ravine District
9.) Southwest District
10.) South District
11.) Grey Cloud Island District

Model Areas

HydroCAD - Existing
HydroCAD - Future
XPSWMM - Existing
XPWMM - Future

Figure 13

Mississippi River
Unnamed Stream
U.S. Lock & Dam #2 Pool Lake
Washington County
Dakota County

Map Document: H:\COTTN\14117158\GIS\Maps\COTT_SW16_ModelingMap_11x17.mxd | Date Saved: 1/17/2019 3:56:34 PM

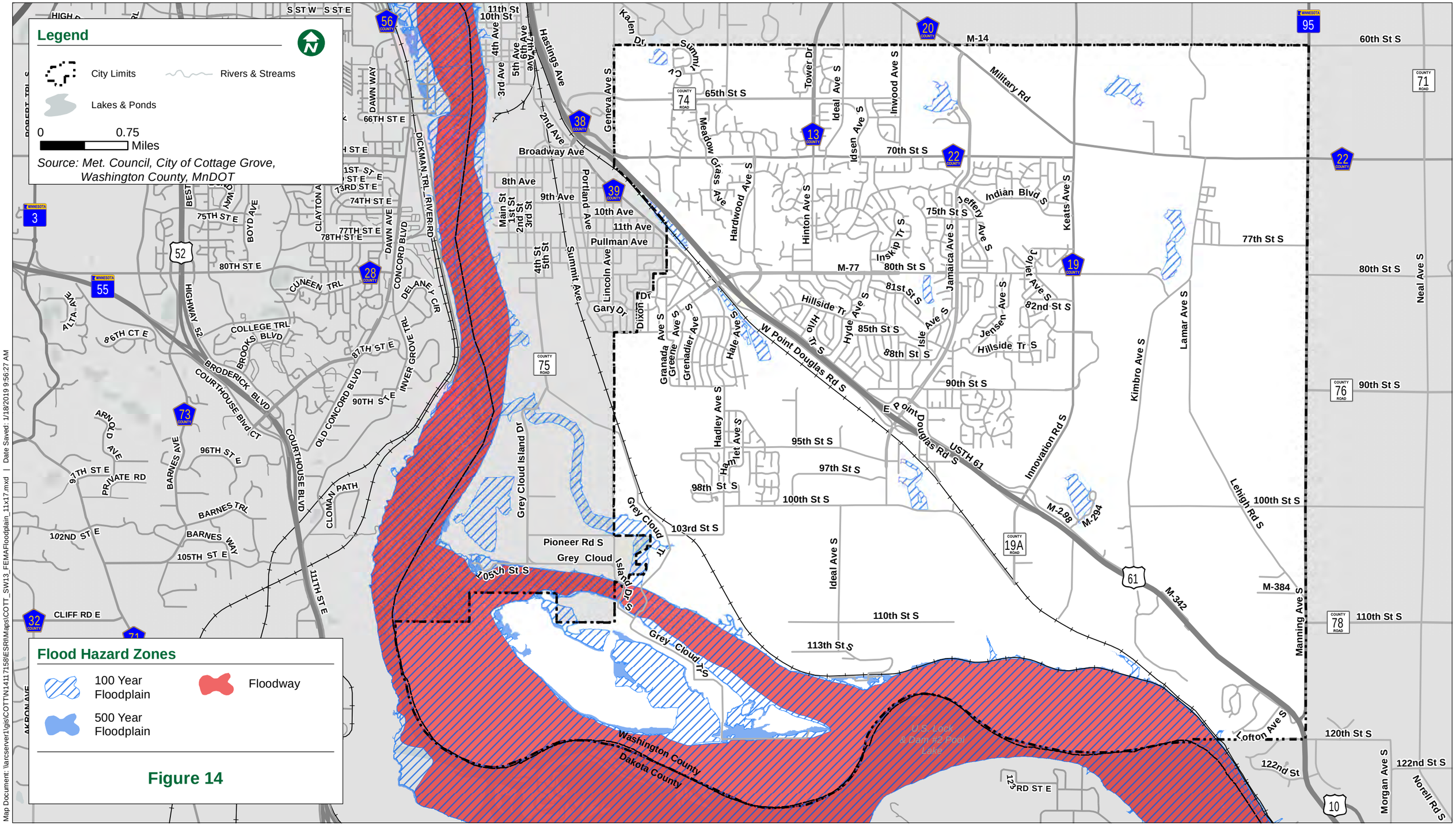
Cottage Grove
Where Pride and Prosperity Meet

2018 Surface Water Management Plan

Cottage Grove, MN

FEMA Floodplain

BOLTON & MENK
Real People. Real Solutions.



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Cottage Grove
Where Pride and Prosperity Meet

2018 Surface Water Management Plan

Cottage Grove, MN

Existing Storm Sewer System

BOLTON & MENK
Real People. Real Solutions.

Legend

City Limits

Rivers & Streams

Lakes & Ponds

0 0.75 Miles

Source: Met. Council, City of Cottage Grove, Washington County, MnDOT

Storm Sewer System

Storm Sewer System

Figure 15

Map Document: \\arcserver1\gis\COTTN\14117158\ESRIMaps\COTT_SW14_ExistingStorm_11x17.mxd | Date Saved: 1/18/2019 10:03:48 AM

Pond Location Map Legend

- City Limits
- Rivers and Streams
- Existing Storm Sewer
- High Water Level Increases < 2.0'
- HWL Increased 2.0' - 2.5'
- HWL Increased 2.5' - 3.0'
- HWL Increased 3.0' - 3.5'
- HWL Increased 3.5' - 4.0'
- HWL Increased > 4'

Figure 16

0 0.75 Miles

Source: Met. Council, City of Cottage Grove, Washington County, MnDOT

WD-P4.2
SPP-P5
WD-P18.3
ED-P4.2
ER-P5.3
ED-P8
ED-P9.1
TG-P5.1
SW-P19
S-P10
ER-P7
ER-P16
ER-P19
ER-P23
U.S. Lock & Dam #2 Pool Lake
Washington County

Map Document: H:\COTTN\1411715\8\GIS\Maps\COTT_SW19_CriticalBasinLocationMap.mxd | Date Saved: 8/19/2019 6:49:28 AM

Regional Surface Water Drainage Legend

- County Boundary
- Parcel
- Natural Conveyance Routes
- General Drainage Direction
- Regional Conveyance Routes
- Existing Storm Sewer
- Preliminary Pipe Alignment
- Proposed Basin Locations
- Proposed Lift Station
- Proposed Force Main

Drainage District Areas

- Central Draw District
- East Draw District
- East Ravine District
- Gables Lake District
- Grey Cloud District
- Langdon District
- Lower St. Croix District
- Seeger Creek District
- South District
- Southwest District
- St. Paul Park District
- Thompson Grove District
- West Draw District

Existing Storm Water Management Features

- PWI Waterway
- Constructed Basin - Dry
- Constructed Basin - Wet
- Constructed Channel
- Constructed Infiltration Feature
- Constructed Treatment Structure
- Constructed Wetland
- Natural Depression
- Underground Stormwater Storage

Map 1

0 0.5 1 Miles

Source: Met. Council, City of Cottage Grove, Washington County, MnDOT

Ramsey County
Washington County
Carver Lake
La Lake
Washington County
Dakota County
Washington County
Dakota County
U.S. Lock & Dam #2 Pool Lake

Map Document: H:\COTTN\141715R\GIS\Maps\COTT_SW17_RegionalStorm_11x17_FINAL.mxd Date Saved: 12/9/2019 5:31:13 PM

Appendix B: Drainage Areas

Appendix B - Drainage Areas

Central District

Area Designation	Area (acres)
C-A1	238
C-A2	71
C-A3	42
C-A4	112
C-A5	44
C-A6	230
C-A7	315
C-A8	62
Total Area	1114

East Draw District

Area Designation	Area (acres)
ED-A1	39
ED-A2.1	119
ED-A2.2	41
ED-A3.1	11
ED-A3.2	56
ED-A4.1	80
ED-A4.2	46
ED-A5	155
ED-A6	105
ED-A7	78
ED-A8	121
ED-A9.1	19
ED-A9.2	12
ED-A9.3	3
ED-A9.4	4
ED-A10	185
Total Area	1074

Gables Lake District

Area Designation	Area (acres)
GL-A1	1469
Total Area	1469

East Ravine District

Area Designation	Area (acres)
ER-A1	526
ER-A2	596
ER-A3	606
ER-A4	475
ER-A5.1	17
ER-A5.2	9
ER-A5.3	13
ER-A5.4	1784
ER-A6	17
ER-A7	304
ER-A8	135
ER-A9	85
ER-A10	16
ER-A11	52
ER-A12	217
ER-A13	48
ER-A14	111
ER-A15.1	24
ER-A15.2	49
ER-A16	67
ER-A17	64
ER-A18	36
ER-A19	70
ER-A20	59
ER-A21.1	20
ER-A21.2	50
ER-A22	27
ER-A23	8
ER-A24	77
ER-A25	14
ER-A26	5
ER-A27	4
ER-A28	13
ER-A29	21
ER-A30	13
Total Area	5633

Appendix B - Drainage Areas

Grey Cloud Island District

Area Designation	Area (acres)
GCI-A1	1271
Total Area	1271

Langdon District

Area Designation	Area (acres)
L-A1	37
L-A2	138
L-A3	597
L-A4	289
L-A5	206
Total Area	1267

Lower Saint Croix District

Area Designation	Area (acres)
LSC-A1	527
LSC-A2	344
LSC-A3	252
LSC-A4	225
Total Area	1347

South District

Area Designation	Area (acres)
S-A1	42
S-A2	209
S-A3	193
S-A4	140
S-A5	259
S-A6	278
S-A7.1	35
S-A7.2	70
S-A7.3	22
S-A8	8
S-A9	87
S-A10	202
S-A11	80
Total Area	1624

St. Paul Park District

Area Designation	Area (acres)
SPP-A1.1	22
SPP-A2	34
SPP-A3	41
SPP-A4.1	16
SPP-A4.2	8
SPP-A5	74
SPP-A6	51
SPP-A7	46
SPP-A8	172
SPP-A9.1	59
SPP-A9.2	54
SPP-A10	16
Total Area	593

Southwest District

Area Designation	Area (acres)
SW-A1	76
SW-A2	92
SW-A3	36
SW-A4	95
SW-A5	75
SW-A6	41
SW-A7	45
SW-A8	64
SW-A9	33
SW-A10	26
SW-A11	106
SW-A12	39
SW-A13	11
SW-A14	48
SW-A15	35
SW-A16	23
SW-A17	53
SW-A18	16
SW-A19	11
SW-A20	184
Total Area	1108

Appendix B - Drainage Areas

Seeger Creek District

Area Designation	Area (acres)
SC-A1	687
SC-A2	538
SC-A3	1294
SC-A4	174
SC-A5	83
SC-A6	31
SC-A7	566
SC-A8	162
SC-A9	293
Total Area	3828

Thompson Grove District

Area Designation	Area (acres)
TG-A1.1	25
TG-A1.2	22
TG-A1.3	2
TG-A1.4	25
TG-A2	43
TG-A3	77
TG-A4	1450
TG-A5.1	98
TG-A5.2	29
TG-A6	118
TG-A7	19
TG-A8	22
TG-A9	22
TG-A10	18
TG-A11	10
TG-A12	131
TG-A13.1	4
TG-A13.2	5
TG-A13.3	5
TG-A14	144
TG-A15	6
TG-A16	16
TG-A17	41
TG-A18	8
TG-A19	17
TG-A20	23
Total Area	2381

West Draw District

Area Designation	Area (acres)
WD-A1	19
WD-A2	62
WD-A3	72
WD-A4.1	28
WD-A4.2	28
WD-A4.3	25
WD-A4.4	9
WD-A4.5	2
WD-A4.6	11
WD-A4.7	35
WD-A5	18
WD-A6	28
WD-A7	67
WD-A8	32
WD-A9.1	20
WD-A9.2	13
WD-A9.3	12
WD-A9.4	3
WD-A9.5	32
WD-A10.1	25
WD-A10.2	23
WD-A10.3	14
WD-A10.4	100
WD-A11.1	8
WD-A11.2	3
WD-A11.3	21
WD-A12	48
WD-A13.1	14
WD-A13.2	10
WD-A13.3	7
WD-A13.4	16
WD-A13.5	7
WD-A13.6	38
WD-A13.7	5
WD-A14.1	43
WD-A14.2	3
WD-A15.1	23
WD-A15.2	16
WD-A15.3	12
WD-A15.4	14
WD-A15.5	149
WD-A15.6	74
WD-A15.7	74
WD-A16	44
WD-A17	49
WD-A18.1	26
WD-A18.2	4
WD-A18.3	12
WD-A19.1	24
WD-A19.2	11
WD-A19.3	37
Total Area	1467

Appendix C: Proposed Trunk Storm Sewer Data

Appendix C - Proposed Trunk Storm Sewer Data				
From	To	Ponded Design Flow (cfs)	Conveyance Pipe Size (in.)	Conveyance Length (ft.)
East Ravine District				
ER-P1	ER-P2	53.0	36	1241
ER-P4.1	ER-P5	4.7	12" FM	2100
ER-P8	ER-P19	750.0	10'X6' Box	100
ER-P10	ER-P12	2.0	12	150
ER-P11	ER-P12	7.0	18	3640
ER-P12	ER-P14	42.5	27	150
ER-P13	ER-P14	3.8	12	950
ER-P15.1	ER-P15.2.4	2.2	12	300
ER-P15.2.4	ER-P19	64.0	30	110
ER-P17	ER-P18	15.1	21	740
ER-P18	ER-P19	16.7	18	750
ER-P19	ER-P24	808.5	2-66	125
ER-P21.1	ER-P21.2	6.1	12	310
Gables Lake District				
GL-P1	ER-P4	10.0	15" FM	3500
Langdon District				
L-P4	L-N5.1	392.2	10'x5' Box	100
St. Paul Park District				
SPP-P9.2	TG-P4	10.0	24" FM	3000
Seeger Creek District				
SC-P1.3	SC-N2.1	147.4	2-36	60
SC-P2	SC-N7.1	242.1	4'x6' Box	60
SC-P8.2	SC-N9.1	141.6	18	575
South District				
S-P3	S-P4	17.2	27	1910
S-P4	S-P5	36.8	36	2510
S-P5	S-P7.3	64.0	36	2980
S-P6	S-P7.3	31.9	24	110
S-P7.1	S-P7.3	5.2	12	180
S-P7.2	S-P7.3	8.6	12	330
S-P7.3	River	100.6	2-24	150
S-P9	S-P10	8.6	15	250
Southwest District				
SW-P1	SW-P2	7.0	12	660
SW-P2	SW-P3	14.5	21	690
SW-P3	SW-P6	21.7	24	370
SW-P6	SW-P8	52.4	36	2610
SW-P7	SW-P8	3.6	12	1300
SW-P8	SW-P9	64.8	36	580
SW-P9	SW-N10.1	60.3	36	1620
SW-P10	SW-N10.1	3.1	8	160
SW-N10.1	River	63.4	36	950
SW-P14	SW-N16.1	4.5	12	120
SW-P15	SW-N16.1	1.7	15	1130
Thompson Grove District				
TG-P1.1	TG-P1.3	6.2	18	510
TG-P19	TG-P20	363.4	6'x6' Box	140
TG-P20	L-P3	363.7	8'x5' Box	90
West Draw District				
WD-P1	WD-P2	1.2	12	380
WD-P2	WD-P3	1.3	12	880
WD-P5	WD-P6	1.0	12	365
WD-P7	WD-P8	21.9	18	950

Appendix D: Pond Data

Appendix D - Pond Data

Pond ID	Existing (E); Proposed (P)	Tributary Area			Direct 100-year Peak Inflow	NWL	100-year Storm Event				Pond Area		Outlet Size	Comments
		Direct	Upstream	Total			HWL	Storage Volume	Peak Pipe Outflow	Peak Total Outflow	At NWL	At 100yr HWL		
		(acres)	(acres)	(acres)	(cfs)	(feet)	(feet)	(ac-ft)	(cfs)	(cfs)	(acres)	(acres)		
Central District														
C-P1.1-2	E	24	0	24	178	972.5	975.2	3.5	25.8	25.8	0.6	1.6	21"	Calarosa Development ; South Basins north of CH 74
C-P1	E	214	24	238	525	901.4	909.7	68.4	6.4	6.4	3.4	11.5	12"	Highlands 2nd Pond
C-P2	E	71	238	309	240	892.1	897.3	18.8	11.5	11.5	2.7	4.7	15"	
C-P3	E	42	0	42	141	876.7	883.2	9.9	7.5	7.5	0.0	2.9	12"	LSWMP Pond
C-P4	E	112	351	463	294	870.6	877.3	21.7	51.3	51.3	1.0	5.2	42"	Basin split in two by 77th st.
C-P5	E	44	0	44	148	904.6	909.8	6.5	32.5	32.5	0.5	1.8	30"	
C-P6.1	E	31	0	31	72	926.2	934.5	6.9	4.3	4.3	0.3	1.0	12"	
C-P6.2	E	166	31	197	227	886.0	891.7	7.1	228.9	228.9	0.6	1.2	36" AND 18' WIDE EOF	
C-P6.3	E	33	241	274	131	876.0	891.7	35.1	120.8	120.8	0.0	4.6	48" OVERFLOW STRUCTURE WITH 18" OUTLET. 140' WIDE EOF	Two-celled basin combined as one
C-P7	E	315	741	1056	497	856.7	873.7	109.5	105.5	105.5	1.4	15.1	12" LOW FLOW INTO 48" OVERFLOW STRUCTURE. 54" OUTLET	12" Pipe for small storm rate control.
C-P7.3	E	4	0	4	32	895.0	897.8	1.4	5.8	5.8	0.2	0.4	6" LOW FLOW WITH 12" OUTLET. 10' WIDE EOF	Fire Station wet basin
C-P8	E	62	1056	1117	175	847.7	856.8	70.3	92.5	92.5	5.3	9.9	18" AND 200' WIDE EOF	Discrepency in NWL based on updated pond countour data based on Jan. 2012 update. 26.3 cfs out of 18"; 66.2 cfs out of EOF
East Draw District														
ED-P1	E	39	0	39	70	900.0	905.7	7.7	3.7	3.7	0.3	1.5	12" AND 172' WIDE EOF	
ED-P2.1	E	119	39	159	630	892.1	904.6	29.3	25.7	116.3	1.2	4.9	24" AND 100' WIDE EOF	Pond on North side of Indian Blvd. 25.7 cfs out of primary; 136.6 cfs out of EOF
ED-P2.2	E	41	159	200	146	889.7	904.6	10.2	23.4	23.4	0.0	2.1	24"	Pond on South side of Indian Blvd.
ED-P3.1	E	11	0	11	77	920.0	924.1	3.0	7.2	7.2	0.5	0.9	12"	Almar Village Pond
ED-P3.2	E	56	11	67	203	890.4	900.9	18.6	5.2	5.2	0.2	3.4	15"	
ED-P4.1	E	80	0	80	153	896.1	901.8	10.6	36.3	36.3	0.4	4.5	60"X60" GRATE WITH 24" OUTLET	
ED-P4.2	E	46	147	193	162	882.2	891.8	6.4	82.8	82.8	0.4	1.2	24" AND 36" HIGH FLOW OUTLET	Prestige Estates Pond - Pond also overflows under 80th St. to ED-P8 via 36" pipe
ED-P5.1	E	82	0	82	305	880.0	886.7	10.8	39.5	110.6	0.4	2.3	48" OVERFLOW WITH 24" OUTLET AND 20' WIDE EOF	Two celled basin. Wet Basin discharging into Filtration Basin. 39.5 cfs out of primary; 71.06 cfs out of EOF
ED-5.2	E	69	282	351	158	874.0	884.7	37.8	33.2	33.2	0.2	7.2	48" OVERFLOW WITH 18" OUTLET AND 100' WIDE EOF	ED-P5 upstream of new berm
ED-5.3	E	4	544	548	16	872.0	879.1	1.6	38.8	53.4	0.0	0.5	27" OUTLET AND 12'x12' BOX CULVERT EOF	Overflow into box culvert is 878.5. 2008 SWMP indicated to maintain > 2 feet of freeboard to this overflow point. 38.77 cfs out of primary; 14.60 cfs overtops into box culvert
ED-P6	E	105	548	653	292	828.2	837.4	58.8	39.3	39.3	3.1	6.7	24"	
ED-P7	E	78	0	78	238	895.0	901.5	16.6	4.5	11.0	2.0	3.0	8" LOW FLOW ORIFICE BELOW 5.5' WIDE WEIR, 30" OUTLET	Pine Meadows Pond. 4.49 cfs out of 8"; 6.48 cfs overtops 5.5' weir
ED-P8	E	121	78	199	154	864.3	878.5	28.5	8.2	76.9	0.2	5.7	12" WITH 70' LONG EOF	8.2 cfs out of primary; 68.7 cfs out of EOF
ED-P9.1	E	19	199	218	68	852.1	865.2	3.9	52.5	52.5	0.0	1.3	24"	
ED-P9.2	E	12	218	230	44	839.4	848.2		51.9	59.3	0.0	0.4	27" WITH 40' WIDE EOF	Sandy Hills 1st Pond. 51.9 cfs out of primary; 7.43 cfs out of EOF
ED-P9.3	E	3	230	233	4	833.5	842.4	1.9	32.3	70.8	0.1	0.5	21" WITH 60' WIDE EOF	Sandy Hills 2nd Pond. 32.3 cfs out of primary; 38.5 cfs out of EOF
ED-P9.4	E	4	233	238	6	825.4	841.0	8.8	25.9	51.1	0.0	1.5	18" WITH 10' AND 200' WIDE EOF	Sandy Hills 3rd Pond. 25.9 cfs out of primary; 25.2 cfs out of EOF
ED-P10	E	185	2008	2193	466	798.0	807.2	49.7	111.9	146.6	4.0	7.2	54" WITH 10' WIDE EOF	111.9 cfs out of primary; 34.7 cfs out of EOF
East Ravine District														
ER-P1	E	81	445	526	233	920.0	922.6	40.0	53.0	53.0	12.2	18.3	36"	Lake Robert (Shepards Woods Pond). Change in total drainage area due to Calarosa Development redirecting site discharge to West Draw and Central Drainage Districts
ER-P1.2	E	20	9	29	94	916.0	929.4	7.3	6.7	6.7	0.1	1.5	15"	Michaels Point water quality basin
ER-P1.3	E	9	0	9	60	919.0	932.5	2.6	5.6	5.6	0.0	0.8	15"	Michaels Point water quality basin
ER-P1.4	E	57	21	77	222	968.0	932.5	21.3	43.5	43.5	2.3	4.6	30"	Calarosa Phase II Basin
ER-P2.1	E	314	14901	15216	492	901.0	905.0	216.6	149.1	149.1	50.0	62.5	40' WIDE TRAP CHANNEL	Upstream-most cell of SWWD Basin CD-P86. 14,500 acres from Bailey Lake in Woodbury added here. XPSWMM Model HWL: 904.8. 1.3 cfs/acre unit outflow per
ER-P2.2	E	83	15367	15450	209	895.0	902.0	129.7	137.0	137.0	11.0	23.0	1 - 10'x14' BOX CULVERTS	Part of SWWD Basin CD-P86; XPSWMM Model HWL: 901.2
ER-P2.3	E	30	16052	16082	165	893.0	902.0	35.8	151.5	151.5	1.5	10.8	2 - 4'x6' BOX CULVERTS	Part of SWWD Basin CD-P86; XPSWMM Model HWL: 901.2
ER-P2.4	E	25	16226	16251	142	889.0	902.0	91.5	144.6	144.6	0.2	12.1	72"	Downstream-most cell of SWWD Basin CD-P86. District to provide 72" outlet. XPSWMM Model HWL: 901.0
ER-P3	P	263	17874	18137	879	895.0	903.6	103.3	52.4	52.4	0.1	16.1	18"	Inlet/outlet configuration revised to reflect SWWD Central Draw planset. Removed 12" outlet to ER-P4 and added proposed 72" pipe running under basin. Plan sheet indicates permanent pool 7.6' higher than 2008 SWMP. Gables Lake liftstation rerouted to discharge into ER-P3
ER-P4	E	398	77	475	1268	844.0	848.9	149.6	4.7	4.7	24.8	36.0	4.7 cfs LS	4.7 cfs lift station for this pond
ER-P4.1	P	25	0	25	72	864.0	864.2	1.3	45.3	45.3	0.6	0.6	6' WIDE EOF	
ER-P5.1	E	17	0	17	82	911.6	916.8	3.4	3.5	3.5	0.3	1.0	12"	Pine Forest 4th Pond
ER-P5.2	E	9	17	26	56	911.6	916.8	6.3	4.2	4.2	0.7	1.5	15"	Pine Forest 5th Pond
ER-P5.3	E	13	26	39	50	909.8	917.3	3.0	6.3	6.3	0.2	0.7	12"	Pine Forest 5th Pond
ER-P5.4.1	E	26	39	66	154	869.0	870.0	0.9	105.1	105.1	0.4	1.0	5' WIDE TRAP CHANNEL	
ER-P5.4.6	E	23	0	23	86	776.0	785.6	0.9	15.2	15.2	0.9	1.0	NATURAL CHANNEL	
ER-P5.4	E	127	20268	20396	578	770.5	777.1	196.5	126.2	761.4	25.6	33.2	6'X8' BOX CULVERT AND 60' WIDE EOF	Cottage Grove Ravine Park Lake. 126.2 cfs out of 18"; 635.2 cfs out of EOF
ER-P6	P	17	0	17	156	804.0	809.8	3.7	20.7	20.7	0.1	1.4	24"	Existing outlet pipe under TH 61
ER-P7	E	35	20664	20700	161	765.3	777.8	35.5	757.6	757.6	0.0	7.0	6X6 BOX CULVERT	Existing outlet pipe under TH 61
ER-P8	P	135	20700	20835	328	754.0	764.1	71.5	743.3	743.3	4.3	11.0	3' AND 15' WIDE COMPLEX WEIR. 120"x 72" BOX CULVERT OUTLET	Modeled basin storage volume assumes that additional flood storage can be excavated within the drainageway to reduce discharge rates. Additional small storm rate control should be provided to protect stream. Assumed that a new roadway would be significantly elevated to provide bounce.
ER-P9	P	86	0	86	109	845.0	855.3	37.4	4.5	4.5	2.4	4.5	12" OUTLET	
ER-P9.1	E	12	0	12	63	813.6	821.4	3.0	6.9	6.9	0.2	0.6	18" OUTLET AND 10' WIDE EOF	Walmart Supercenter - North infiltration basin
ER-P9.2	E	14	12	26		811.0	818.4	8.5	3.0	3.0	0.7	1.6	SKIMMER WITH 18" OUTLET	Walmart Supercenter - South wet basin
ER-P9.3	E	34	26	60	33	810.5	818.2	1.5	13.9	13.9	0.1	0.4	6" LOW FLOW INTO 48" OVERFLOW STRUCTURE. 21" OUTLET	Part of East Point Douglas Project. Outlet to ER-P9.2
ER-P9.4	E	19	0	19	33	832.0	833.8	1.7	13.9	13.9	0.1	0.4	15"	Part of East Point Douglas Project. West roundabout filtration basin
ER-P10	P	16	0	16	117	814.0	817.6	6.3	1.7	1.7	1.2	1.9	6" LOW FLOW WITH 12" OUTLET	
ER-P11	P	52	0	52	304	808.0	813.7	21.3	7.0	7.0	2.4	4.4	18"	
ER-P12	P	209	87	296	788	794.0	798.7	79.2	36.2	36.2	12.4	17.6	27"	
ER-P13	P	48	0	48	235	800.0	804.7	19.1	3.6	3.6	2.8	4.5	12"	
ER-P14	P	111	344	455	547	788.0	793.4	48.4	48.2	48.2	6.6	9.6	12" LOW FLOW BELOW 5' LONG WEIR TO 30". 48" OUTLET	

Appendix D - Pond Data

Pond ID	Existing (E); Proposed (P)	Tributary Area			Direct 100-year Peak Inflow	NWL	100-year Storm Event				Pond Area		Outlet Size	Comments
		Direct	Upstream	Total			HWL	Storage Volume	Peak Pipe Outflow	Peak Total Outflow	At NWL	At 100yr HWL		
		(acres)	(acres)	(acres)	(cfs)	(feet)	(feet)	(ac-ft)	(cfs)	(cfs)	(acres)	(acres)		
ER-P15.1	P	24	0	24	147	765.0	769.5	9.5	2.0	2.0	1.4	2.4	6" LOW FLOW. 12" OUTLET	
ER-P15.2.1	E	17	0	17	101	783.3	789.2	0.4	88.3	88.3	0.0	0.2	36"	Existing 3M basin.
ER-P15.2.4	E	32	495	527	47	752.5	761.1	2.5	64.1	117.6	0.0	0.6	30" AND 40' WIDE EOF	Existing 3M basin. 64.1 cfs out of primary; 53.3 cfs out of EOF
ER-P16	E	66	0	66	209	870.0	881.0	12.8	12.3	12.3	0.0	2.8	12" LOW FLOW. 24" OUTLET	Existing 24" RCP crossing under TH 61.
ER-P17	E	63	66	130	256	794.0	807.2	21.1	15.1	15.1	0.5	5.9	15" LOW FLOW WITH 21" OUTLET. 20' WIDE EOF	15.1 cfs out of primary; 0.0 cfs out of EOF
ER-P18	E	36	130	166	222	783.0	787.6	22.4	16.7	16.7	0.0	5.4	8" LOW FLOW INTO 48" OVERFLOW STRUCTURE. 18" OUTLET. 50' WIDE EOF	
ER-P19	E	70	21528	21598	284	738.5	753.3	25.5	794.1	794.1	0.0	5.5	2- 66"	
ER-P20.3	E	56	1	57	323	776.0	783.4	15.5	50.9	180.3	1.1	2.0	33" AND 20' WIDE EOF	Existing 3M ponds/low areas. 50.9 cfs out of primary; 124.9 cfs out of EOF
ER-P20.4	E	0	64	64	0	775.4	783.3	1.1	71.0	71.0	0.0	0.3	18' LONG OVERFLOW STRUCTURE WITH 30" OUTLET	Existing 3M ponds/low areas.
ER-P20.5	E	0	64	64	0	-	-	-	121.9	121.9	-	-	36"	Structure to combine all ER-P20 basins
ER-P21.1	P	20	0	20	68	800.0	802.0	3.2	4.6	4.6	0.9	1.7	12"	
ER-P21.2	E	50	20	70	135	719.0	723.7	0.1	139.0	139.0	0.0	0.1	60"	Existing pipe under RR tracks
ER-P22	E	27	0	27	66	755.0	759.2	0.1	37.7	65.9	0.0	0.1	30" AND 5' WIDE EOF	Existing pipe under RR tracks. 37.71cfs out of primary; 28.21cfs out of EOF
ER-P23	E	8	27	35	26	748.0	753.9	0.2	44.8	44.8	0.0	0.1	30"	Existing pipe under RR tracks.
ER-P24.1	E	4	0	4	25	788.4	790.7	0.1	6.6	25.0	0.0	0.1	18" AND 80' WIDE EOF	Existing pipe under RR tracks. 6.6 cfs out of primary; 18.3 cfs out of EOF
ER-P24.2	E	73	21828	22723	128	686.0	700.1	79.3	670.8	827.6	1.5	8.1	84"x72" BOX CULVERT AND 20' WIDE EOF	Existing box culvert under RR tracks. 670.79 cfs out of primary; 156.76 cfs out of EOF
ER-P25	E	14	0	14	31	688.0	691.1	1.2	13.0	13.0	0.2	0.6	18"	Existing pipe under RR tracks
ER-P26	E	5	0	5	15	694.0	696.2	0.2	9.8	9.8	0.0	0.2	18" AND 20' WIDE EOF	Existing pipe under RR tracks. 9.8 cfs out of primary; 0.0 cfs out of EOF
ER-P27	E	4	0	4	16	690.0	692.0	0.0	15.6	15.6	0.0	0.0	18" AND 36" OUTLETS	Existing pipe under RR tracks
ER-P28.1	E	3	0	3	30	781.0	782.4	0.7	2.5	2.5	0.0	1.3	12"	Existing 3M basin above bluff
ER-P28.2	E	2	0	2	19	777.5	781.6	0.6	3.9	3.9	0.1	0.2	2-12"	Existing 3M basin above bluff
ER-P28.3	E	8	6	13	22	687.0	689.1	0.1	26.6	26.6	0.0	0.1	60"	Existing 3M basin against RR tracks
ER-P29.1	E	13	0	13	100	776.4	783.0	0.3	28.3	34.2	0.2	0.8	WEIR WALL WITH 30" OUTLET. 10' WIDE EOF	Existing 3M basin above bluff. 28.3 cfs out of primary; 5.9 cfs out of EOF
ER-P29.2	E	8	13	21	41	691.0	696.2	0.9	31.1	48.1	0.0	0.5	24" AND 60' WIDE EOF	Existing 3M basin against RR tracks. 31.1 cfs out of primary; 17.0 cfs out of EOF
ER-P30	E	13	0	13	79	687.5	693.0	1.4	31.9	31.9	0.1	0.5	24"	Existing pipe under RR tracks
Gables Lake District														
GL-P1.1	E	42	50	93	148	882.0	890.7	13.2	7.8	7.8	0.9	1.9	12"	West of Gables Lake
GL-P1.2	E	133	913	1046	706	900.0	901.9	60.1	352.6	352.6	29.1	33.3	NATURAL CHANNEL	North of Gables Lake
GL-P1	E	141	1139	1280	154	852.0	873.1	317.1	10.0	10.0	4.9	26.4	10cfs LS	Gables Lake. 10 cfs lift station outlet. Outlet discharge location moved from ER-P4.1 to ER-P3
Langdon District														
L-P1	E	37	0	37	153	811.6	818.2	6.6	20.6	20.6	0.0	2.0	24"	
L-P2	E	138	37	175	506	801.1	810.2	31.1	41.5	41.5	0.1	6.6	42" AND 30"	42" outlet discharges to 30" pipe. LP2 represents two basins (LP-2.1 and LP-2.2)
L-P3	P	519	7554	8073	1524	760.6	772.0	466.3	424.4	424.4	0.5	54.5	67.2"x72" LOW FLOW BELOW 15' LONG WIER, 144"x72" BOX CULVERT OUTLET	2008 SWMP - Additional storage incorporated into L-P3 in order to meet agreed upon HWL and rate of 770.0 and 370 cfs, respectively. It may not be feasible to provide all of this flood storage in the location of L-P3, a more detailed analysis will be necessary to make this determination.
L-P3.1	E	28	0	28	88	800.0	807.3	3.2	19.5	19.5	0.0	1.5	21" INTO A 42"	Small depression east of the Menards Pond
L-P3.3	E	16	0	16	120	798.0	805.7	6.4	2.6	2.6	0.5	1.1	6" LOW FLOW WITH 15" OUTLET	Menards Pond
L-P3.4	E	25	0	25	155	799.0	805.7	14.7	4.9	4.9	1.0	1.7	8" LOW FLOW BELOW 5' LONG WEIR, 12" OUTLET	Pine Grove Basin. West of Menards
L-P3.6	E	4	0	4	30	805.0	807.4	1.2	8.9	18.1	0.2	0.3	5" LOW FLOW BELOW 5' LONG WEIR WITHIN 60" OVERFLOW STRUCTURE. 15" OUTLET. 10' WIDE EOF	Pointe West Business Park Pond. 8.9 cfs out of primary; 9.2 cfs out of EOF
L-P3.7	E	5	0	5	34	802.9	806.9	1.7	7.1	7.1	0.2	0.3	6" LOW FLOW AND 12" OUTLET. 100' WIDE EOF	Acorn Mini Storage Pond
L-P4	P	289	7554	7842	1424	757.0	764.9	206.4	409.0	409.0	3.6	59.9	3' AND 20' LONG MULTI-STAGE WEIR WITH 120"x60" BOX CULVERT OUTLET	Based on 2008 SWMP - Existing roadway embankment will need to be raised significatnly (roughly 10') to provide flood storage.
L-P5	E	146	7902	8048	635	686.2	694.9	17.0	509.3	509.3	0.5	3.4	96"x96" BOX CULVERT	Existing Box culvert under RR tracks.
St. Paul Park District														
SPP-P1.1	E	19	3	22	121	939.5	944.7	6.3	3.6	3.6	0.9	1.6	12" AND 10' WIDE EOF	Constucted as part of New Oltman Middle School project. West wet basin; 3.2 acres upstream accounts for High Pointe Development Area
SPP-P2	E	31	3	34	210	933.5	939.7	12.6	3.8	3.8	1.4	2.5	12" AND 10' WIDE EOF	Constucted as part of New Oltman Middle School project. East wet basin; 3.2 acres upstream accounts for High Pointe Development Area
SPP-P3	E	41	56	98	107	834.0	839.8	3.5	76.5	76.5	0.1	0.7	21" AND 24' WIDE EOF	2008 XPSWMM model indicates roadway overtopping, however does not model EOF. EOF included in "MSE3" version.
SPP-P3.1.5	E	13	98	111	57	804.4	811.6	1.2	88.0	88.0	0.1	0.3	30"	Clear Channel Pond rock check dam
SPP-P3.1	E	2	111	113	8	798.0	806.3	1.6	57.3	57.3	0.3	0.6	18" SKIMMER WITH 24" OUTLET	Clear Channel Pond wet basin
SPP-P3.2	E	0	113	113	0	783.2	793.5	0.8	23.9	54.0	0.0	0.3	6" DRAINTILE INTO 48" OVERFLOW STRUCTURE WITH 18" OUTLET	Clear Channel Pond filtration basin. 23.94 cfs out of primary; 30.10 cfs out of EOF
SPP-4.1	E	16	0	16	77	940.8	944.1	3.2	5.2	5.2	0.7	1.2	12"	Pine Summit 1st pond
SPP-4.2	E	8	16	24	39	930.4	938.2	3.4	2.7	2.7	0.2	0.9	6"	Pine Summit 1st pond
SPP-P5	E	74	24	98	197	785.0	790.9	18.5	16.4	34.4	0.8	3.2	6-4" LOW FLOW AND 24" EOF	Existing Acorn Ridge pond with standpipe outlet to MnDOT 24" pipe. 16.4 cfs out of primary; 17.9 cfs out of EOF
SPP-P6	E	51	0	51	188	794.0	798.6	0.8	9.2	19.4	0.1	0.3	12" AND 15" OUTLETS AND 50' WIDE EOF	Hidden Oaks 4th pond - Cable concrete EOF at 797.5 utilized for 100-yr event. Storage curve combined as one basin. 9.2 cfs out of primary; 10.2 cfs out of EOF
SPP-P7.1	E	1	0	1	12	792.0	797.0	0.2	7.1	7.1	0.3	0.0	15"	Part of Legends Development - Underground Storage
SPP-P7.2	E	17	0	17	97	794.0	800.9	1.6	44.5	44.5	0.2	0.4	6" LOW FLOW BELOW 5' WIDE WEIR. 24" OUTLET	Part of White Pines Development - Central Pond
SPP-P7.3	E	14	0	14	32	808.0	814.4	0.5	12.4	12.4	0.0	0.2	12" AND 10' WIDE EOF	Part of White Pines Development / Proposed Camels Hump Trail
SPP-P7.4	E	2	0	2	20	787.0	798.7	0.5	8.9	8.9	0.0	0.3	15" AND 5' WIDE EOF	Part of White Pines Development
SPP-P7.5	E	12	35	46	37	781.0	786.0	1.3	131.4	131.4	0.0	0.9	48"	Roadside ditch north of HWY 61
SPP-P8	E	172	0	172	440	782.3	784.0	3.5	2.5	438.4	1.9	2.2	12" AND 30' WIDE EOF	Existing Saint Paul Park pond expanded and outlet revised. EOF at 793.0 utilized for 100-yr event. 2.5 cfs out of primary; 435.8 cfs out of EOF
SPP-P9.1	E	59	172	231	176	776.0	782.2	27.5	65.1	224.2	2.5	6.8	30" AND 10' WIDE EOF	65.1 cfs out of primary; 159.1 cfs out of EOF
SPP-P9.2A	E	9	46	56	61	776.0	785.2	10.5	17.1	19.4	1.3	2.7	48" AND 10' WIDE EOF	Gateway Pond Expansion. 17.1 cfs out of primary; 2.3 cfs out of EOF
SPP-P9.2	E	45	482	527	193	776.0	779.2	58.2	10.0	125.8	13.7	22.6	Proposed 10cfs PUMP AND 8' WIDE EOF	Existing wetland expanded to provide additional flood storage. Existing EOF to St. Paul Park at 777.3 utilized during 100-yr event. 10.03 cfs out of pump 115.8 cfs out of EOF
Seeger Creek District														
SC-P1.1	P	224	0	224	300	925.0	930.4	34.8	67.0	67.0	0.9	14.6	1-36" AND 50' WIDE EOF	Additional pond as part of 100th street improvement. 76.1 cfs out of primary; 48.0 cfs out of EOF
SC-P1.2	P	223	0	223	338	925.0	930.8	31.4	66.5	167.3	0.2	12.9	2-24" AND 50' WIDE EOF	Additional pond as part of 100th street improvement. 70.1 cfs out of primary; 210.9 cfs out of EOF
SC-P1.3	P	240	447	687	335	895.0	899.2	152.6	85.0	85.0	12.3	60.2	1' AND 10' WIDE COMPLEX WEIR.2-36" OUTLET	100th Street Crossing
SC-P2	P	538	687	1225	357	870.0	877.1	95.9	189.5	189.5	12.4	14.6	1.5' WIDE WEIR WITH 48"x72" BOX CULVERT OUTLET. 30' WIDE EOF	110th Street Crossing. 298.1 cfs out of primary; 54.5 cfs out of EOF

Appendix D - Pond Data

Pond ID	Existing (E); Proposed (P)	Tributary Area			Direct 100-year Peak Inflow	NWL	100-year Storm Event				Pond Area		Outlet Size	Comments
		Direct	Upstream	Total			HWL	Storage Volume	Peak Pipe Outflow	Peak Total Outflow	At NWL	At 100yr HWL		
		(acres)	(acres)	(acres)	(cfs)	(feet)	(feet)	(ac-ft)	(cfs)	(cfs)	(acres)	(acres)		
SC-P3.1	P	53	0	53	122	955.0	957.2	11.0	15.9	15.9	1.6	8.6	24"	Additional pond as part of 100th street improvement
SC-P3.2	P	619	53	672	234	930.0	936.1	76.3	157.1	157.1	7.0	17.9	24" AND 48" OUTLET. 50' WIDE EOF	Additional pond as part of 100th street improvement. 181.1 cfs out of primary; 53.5 cfs out of EOF
SC-P3.3	P	619	672	1290	234	900.0	907.5	99.0	250.0	291.4	7.1	19.4	42" AND 48" OUTLET. 50' WIDE EOF	Additional pond as part of 100th street improvement. 268.2 cfs out of primary; 180.1 cfs out of EOF
SC-P4.1	P	95	0	95	152	935.0	937.9	22.0	16.4	16.4	4.5	10.9	24"	Additional pond as part of 100th street improvement
SC-P4.2	P	78	95	174	125	-	-	-	-	-	-	-	-	-
SC-P5	P	83	0	83	191	904.0	910.7	11.1	67.6	67.6	0.3	2.9	36"	Additional pond as part of 100th street improvement.
SC-P6	P	31	0	31	79	895.0	897.5	4.6	26.5	26.5	1.0	2.7	30"	
SC-P7	E	565	2803	3368	382	845.0	854.0	43.6	544.4	544.4	0.9	16.8	8'x6' BOX CULVERT	Existing box culvert under TH 61
SC-P8.1	E	23	0	23	47	874.0	877.0	3.3	4.9	31.3	0.9	1.2	15"	North Basin - River Oaks Golf Course - Outlet configuration unknown
SC-P8.2	E	51	23	74	63	860.0	864.9	5.8	17.3	77.0	0.2	1.7	18"	Two constructed south wet ponds located modeled as one (SC-P8.2 and SC-P8.3) - River Oaks Golf Course - outlet configuration unknown
SC-P8.4	P	89	0	89	66	850.0	854.5	20.5	10.9	10.9	4.0	5.1	15"	
South District														
S-P2	E	251	0	251	300	713.0	717.2	42.6	31.0	31.0	5.3	10.1	120"x84" BOX CULVERT	Existing wetland. Box culvert matches normal water surface elevation.
S-P3	P	193	0	193	687	800.0	803.3	75.5	16.1	16.1	7.7	24.1	27"	Pond size at NWL based on 4% of the LDR drainage area.
S-P4	P	140	193	332	567	795.0	798.1	59.7	28.0	28.0	7.0	20.3	36"	Pond size at NWL based on 5% of the LDR drainage area.
S-P5	P	259	332	591	664	790.0	793.5	86.1	39.8	39.8	10.2	25.2	32" ORIFICE WITH 36" OUTLET	Pond size at NWL based on 4% of the LDR drainage area.
S-P6	P	278	0	278	774	776.0	779.2	121.0	20.2	20.2	16.8	39.4	24"	
S-P7.1	P	35	0	35	205	750.0	752.2	13.1	3.5	3.5	2.6	6.2	10" AND 12" OUTLET	
S-P7.2	P	70	0	70	373	768.0	770.9	27.4	5.9	5.9	4.2	9.9	12"	
S-P7.3	E	22	973	995	67	688.0	700.1	19.0	100.6	109.8	0.5	2.3	2-24" OUTLETS AND 200' WIDE EOF	Inverts and storage estimated from 3M model. 2nd 24" pipe added to increase capacity under tracks. 100.6 cfs out of primary; 9.1 cfs out of EOF
S-P8	E	8	0	8	23	694.0	695.6	0.7	7.7	7.7	0.2	0.6	18"	Estimated contours and inverts.
S-P9	P	87	0	87	296	785.0	788.2	27.0	6.9	6.9	3.1	9.0	15"	
S-P10	E	202	87	290	217	690.0	704.2	18.6	136.7	136.7	0.0	2.6	2-18" AND 18"x72" BOX CULVERT	Ponding against tracks
Southwest District														
SW-P1	P	76	0	76	339	810.0	813.8	24.6	6.2	6.2	4.5	6.8	12"	
SW-P2	P	90	76	167	467	747.0	751.6	33.1	10.6	10.6	3.6	7.7	21"	
SW-P3	P	36	167	203	203	747.0	748.9	15.6	13.0	13.0	1.4	8.4	24"	
SW-P4	E	68	0	68	293	800.5	807.9	18.0	5.0	5.0	3.2	6.4	15"	SW-P4 converted into a series of wetbasins/infiltration basins as part of Summers Landing Development. HWL and Peak Outflow reported from downstream-most basin. Storage volume and pond area based on total provided volume and areas. (SW-P4.1 - SW-P4.4)
SW-P5	E	65	0	65	133	800.0	806.3	15.5	7.6	7.6	3.4	5.6	18"	SW-P5 converted into a series of wetbasins/infiltration basins as part of Summers Landing Development. HWL and Peak Outflow reported from downstream-most basin. Storage volume and pond area based on total provided volume and areas. (SW-P5.1 - SW-P5.5)
SW-P6	P	78	336	414	233	745.0	749.3	9.1	51.7	51.7	1.4	2.4	36"	
SW-P7	P	45	0	45	180	747.0	748.8	12.1	3.4	3.4	1.8	7.2	12"	
SW-P8	E	64	459	523	295	734.0	738.9	19.2	62.9	62.9	3.4	4.4	36"	Existing Pond located in southwest corner of Baileys Nursery. SW-P8.1 - P8.2
SW-P9	P	33	523	556	144	730.0	733.7	21.9	50.4	50.4	2.6	7.6	36"	
SW-P10	P	26	0	26	105	727.0	729.1	6.3	2.1	2.1	1.1	3.2	8"	
SW-P11.1	E	74	0	74	368	802.5	811.4	29.9	9.1	9.1	1.6	3.5	18"	Mississippi Dunes ponds.
SW-P11.2	E	32	74	106	170	801.0	811.3	21.6	1.7	1.7	1.0	2.1	6" AND 20' WIDE EOF	Mississippi Dunes ponds. 1.7 cfs out of primary; 0.0 cfs out of EOF
SW-P12	E	39	106	145	127	747.0	751.8	11.6	1.5	1.5	2.0	2.9	6"	Northern most existing pond of Baileys Pond
SW-P13	E	11	145	156	41	742.0	743.6	2.3	5.7	5.7	0.6	0.8	15"	Existing small middle Baileys pond.
SW-P14	E	48	156	204	175	716.0	721.1	13.4	4.5	4.5	2.1	3.2	12" AND 10" OUTLET	Bailey Pond by 103rd St RR crossing - may need to raise berm along 103rd st
SW-P15	P	35	0	35	172	802.0	805.6	15.2	1.4	1.4	2.0	4.6	6"	
SW-P16	P	23	0	23	104	711.5	712.8	4.1	3.4	3.4	1.1	4.1	12"	Pond north of 103rd west of RR tracks. Outlets construted as part of 103rd Improvements Project.
SW-P17	E	53	0	53	59	709.0	711.7	5.4	7.3	39.0	1.0	2.7	24" AND 50' WIDE EOF	EOF at 711.0 utilized during 100-yr event. Golf Course Pond. 7.3 cfs out of primary; 31.7 cfs out of EOF
SW-P18	E	16	53	69	27	708.0	711.6	3.2	6.1	44.1	0.5	1.2	2-8" OUTLET AND 30' WIDE EOF	EOF at 711.0 utilized during 100-yr event. 6.1 cfs out of primary; 38.0 cfs out of EOF
SW-P19	E	11	69	80	28	697.0	704.3	1.7	33.0	33.0	0.1	0.5	24"	
Thompson Grove District														
TG-P1.1	E	25	0	25	134	858.7	864.1	5.7	6.2	6.2	0.2	2.2	4"	
TG-P1.2	E	12	10	22	98	854.9	865.4	4.9	3.5	3.5	0.2	0.7	6"	
TG-P1.3	E	2	25	27	10	853.9	863.3	4.7	6.3	6.3	0.2	0.6	12"	
TG-P1.4	E	25	0	25	128	865.7	868.2	2.1	4.6	107.1	0.3	1.6	12" AND 30' WIDE EOF	4.6 cfs out of primary; 102.4 cfs out of EOF
TG-P2	E	6	36	43	27	850.3	854.0	9.1	10.5	10.5	1.5	3.0	18"	
TG-P3	E	7	71	77	23	850.0	871.6	10.7	5.6	55.1	0.0	1.4	12" AND 10' WIDE EOF	5.62 cfs out of primary; 49.48 cfs out of EOF
TG-P4.1	E	32	40	72	168	781.7	784.9	1.4	109.4	109.4	0.6	0.8	54"	MnDOT Pond
TG-P4.2	E	74	4214	4287	329	781.7	786.5	163.7	634.3	634.3	19.3	45.3	40' TRAP CHANNEL	Hamlet Park ponding system - Upstream
TG-P4.3	E	77	0	77	362	777.5	786.2	29.0	4.3	274.4	2.3	5.29	18" OUTLET AND 10' WIDE EOF	Werner Electric Pond
TG-P4.4	E	114	4365	4478	381	777.5	786.2	161.4	231.3	231.3	3.3	43.8	48" & 30"	Hamlet Park ponding system - Downstream
TG-P4.6	E	5	0	5	42	804.0	804.6	0.3	3.9	40.7	0.4	0.4	18" AND 30' WIDE EOF	Walgreens Pond
TG-P4.8	E	5	0	5	32	807.5	809.2	0.6	1.1	1.1	0.3	0.4	6"	Bus Pond
TG-P4.9	E	7	0	7	31.8	783.0	786.7	6.5	7.6	7.6	0.5	4.250	24"	Existing Wetland
TG-4.9.14	E	7	0	7	52	797.0	800.9	0.7	4.0	4.0	0.0	1.0	6"	Park n Ride Pond
TG-P5.1	E	98	0	98	659	779.0	786.7	38.5	9.7	9.7	4.7	6.2	12"	Existing CP Rail pond on west side of site
TG-P5.2	E	29	0	29	222	777.4	781.1	20.3	9.6	9.6	0.9	3.9	6" LOW FLOW INTO 60" OVERFLOW STRUCTURE. 15" OUTLET.	Existing overflow grate at 780.7. Would need to be raised to 782.0 to contain the 7.4" event.
TG-P7	E	19	0	19	89	800.5	809.0	3.4	17.2	17.2	0.0	1.3	18"	Meadow Acres Pond
TG-P8	E	22	19	41	103	796.1	807.6	2.0	50.0	50.0	0.0	0.7	30"	Meadow Acres Pond
TG-P9	E	22	41	63	90	793.1	805.0	3.6	56.6	56.6	0.0	1.0	30"	Meadow Acres Pond
TG-P10	E	18	0	18	119	793.0	799.3	6.4	8.3	8.3	0.7	1.3	6" LOW FLOW BELOW 5' LONG WEIR. 12" OUTLET	
TG-P11	E	10	0	10	76	776.0	779.8	3.4	6.3	6.3	0.7	1.0	5" LOW FLOW BELOW 5' LONG WEIR. 12" OUTLET	
TG-P12	E	34	71	105	136	776.0	786.6	29.5	9.5	20.0	1.1	4.0	6" AND 24"x18" LOW FLOW INTO 24" OVERFLOW STRUCTURE. 18" OUTLET	City project to construct regional pond to accommodate flow from Garden World and Glencove Industrial Park
TG-P12.1	E	0	58	58	0	790.0	800.6	6.1	31.5	31.5	0.1	1.0	36" OVERFLOW STRUCTURE WITH 18" OUTLET. 10' WIDE EOF	Garden World expanded basin in conjunction with proposed glencove industrial park basin
TG-P12.2	E	6	0	6	39	792.0	800.6	1.5	36.7	36.7	0.0	0.2	10' WIDE WEIR	Garden World pretreatment and infiltration basin storage volumes combined
TG-P12.3	P	43	9	52	230	789.5	800.7	11.2	109.6	109.6	0.5	1.5	SHARP-CRESTED WEIR	Glencove industrial park basin

Appendix D - Pond Data

Pond ID	Existing (E); Proposed (P)	Tributary Area			Direct 100-year Peak Inflow	NWL	100-year Storm Event				Pond Area		Outlet Size	Comments
		Direct	Upstream	Total			HWL	Storage Volume	Peak Pipe Outflow	Peak Total Outflow	At NWL	At 100yr HWL		
		(acres)	(acres)	(acres)	(cfs)	(feet)	(feet)	(ac-ft)	(cfs)	(cfs)	(acres)	(acres)		
TG-P12.4	E	2	13	15	14	796.0	799.6	1.7	0.5	0.5	0.3	0.6	12"	Leafline infiltration basin
TG-P13.1	E	4	0	4	34	775.2	779.0	0.8	17.2	17.2	0.0	0.3	12" AND 10' WIDE EOF	Existing AGCO expansion pond
TG-P13.2	E	5	0	5	51	775.8	780.7	1.6	7.7	7.7	0.0	0.4	12"	Existing AGCO expansion pond
TG-P13.3	E	5	0	5	36	772.9	778.1	1.4	26.9	26.9	0.0	0.3	8" LOW FLOW WITHIN 24" OVERFLOW STRUCTURE. 24" OUTLET	Existing AGCO expansion pond.
TG-P14	E	144	0	144	958	773.4	780.1	63.3	33.3	33.3	8.1	9.7	12" LOW FLOW INTO 48" OVERFLOW STRUCTURE. 24" OUTLET	
TG-P15	E	6	0	6	44	777.0	780.5	2.4	10.1	10.1	0.0	0.5	6" LOW FLOW BELOW 5' LONG WEIR. 15" OUTLET	Existing Postal Annex and CCE pond.
TG-P16	E	16	0	16	106	773.0	778.5	5.3	13.8	13.8	0.6	1.3	10" LOW FLOW INTO 48" OVERFLOW STRUCTURE. 18" OUTLET	
TG-P17	E	41	0	41	249	775.0	781.0	13.8	12.7	12.7	1.7	2.8	18"	Existing Anderson Windows Pond
TG-P18	E	8	0	8	56	772.0	777.0	2.5	2.4	93.7	0.3	0.7	8" PRIMARY WITH 100' WIDE EOF	
TG-P19	E	17	5068	5084	74	769.0	778.9	55.9	359.1	359.1	0.0	24.6	72"x72" BOX CULVERT	
TG-P20	P	23	5084	5108	135	767.0	775.0	19.1	359.6	359.6	1.8	2.8	96"x60" BOX CULVERT	
West Draw District														
WD-P1	P	19	0	19	93	943.0	944.9	6.7	1.2	1.2	2.5	3.6	6" AND 12"	Existing Wetland. Modeled with proposed grading
WD-P2	P	62	19	81	229	934.0	936.2	23.2	1.3	1.3	7.6	11.2	6" LOW FLOW BELOW 3.5' WIDE WEIR. 12" OUTLET	Existing Wetland. Modeled with proposed grading
WD-P3	P	72	81	154	252	928.0	934.3	25.1	3.9	3.9	3.6	4.3	8" LOW FLOW WITH 12" OUTLET	Highland Hills Pond. Modeled with proposed grading
WD-P4.1	E	23	6	28	123	911.0	915.6	4.4	28.9	28.9	0.3	1.2	24"	Highland Hills Pond 1
WD-P4.2	E	39	28	67	180	900.3	910.5	11.3	30.7	30.7	0.6	1.8	24"	Highland Hills Pond 2
WD-P4.3	E	27	221	248	156	900.2	909.6	23.1	5.3	5.3	1.6	3.1	10"	Highland Hills Pond 3
WD-P4.4	E	10	248	258	43	872.5	877.1	6.2	13.6	13.6	0.7	2.0	36"	Highland Hills Pond 4
WD-P4.5	E	2	258	260	11	872.2	877.1	3.6	4.5	4.5	0.5	1.0	9" LOW FLOW WITH 18" OUTLET	Highland Hills Pond 5
WD-P4.7	E	12	768	780	36	853.0	860.6	4.8	0.0	0.0	0.0	1.1	30' WIDE EOF	Hadley Avenue Basin - Northwest; 758 acres from Woodbury
WD-P5	P	18	0	18	93	884.0	889.9	3.6	1.0	1.0	0.5	0.8	4" LOW FLOW WITH 48" OVERFLOW STRUCTURE. 12" OUTLET	
WD-P6.1	E	1	7	9	8	862.0	866.7	7.6	3.6	3.6	1.3	2.2	8" LOW FLOW WITH 12" OUTLET	Hadley Avenue Street and Utility Improvements Project - Northeast basin
WD-P6.2	P	10	18	28	42	878.0	881.4	1.3	8.2	8.2	0.3	0.5	4" LOW FLOW WITH 48" OVERFLOW STRUCTURE. 12" OUTLET	Hadley Avenue Street and Utility Improvements Project - Central east basin
WD-P6.3	P	3	1560	1563	10	864.0	864.2	1.3	6.2	6.2	0.2	0.2	4" LOW FLOW WITH 48" OVERFLOW STRUCTURE. 12" OUTLET	Hadley Avenue Street and Utility Improvements Project - West basin
WD-P7	P	67	616	683	247	886.0	894.9	38.7	21.6	21.6	3.8	4.9	18"	616 acres from Woodbury (WD-P19) added here.
WD-P8	P	32	683	715	131	848.0	853.1	15.6	21.6	21.6	2.8	3.3	21"	
WD-P9.1	E	20	0	20	101	938.0	942.5	6.6	18.7	18.7	0.6	1.3	10" LOW FLOW INTO 48" OVERFLOW STRUCTURE. 36" OUTLET	Existing Pinecliff 1st Pond
WD-P9.2	E	13	20	33	72	912.2	915.4	4.7	8.6	47.9	0.1	0.5	18" AND 120"x24" BOX CULVERT	Existing Pinecliff 1st Pond
WD-P9.3	E	12	0	12	82	912.2	915.4	15.4	3.2	3.2	1.4	1.9	12"	Existing Silverwood Pond
WD-P9.4	E	3	45	48	14	912.0	915.4	6.6	6.2	6.2	1.1	2.3	8" LOW FLOW WITH 15" OUTLET. 120"x24" BOX CULVERT	SWWD Manage 1 Wetland within Pinecliff/Silverwood Developments
WD-P9.5	E	32	48	79	220	910.0	913.4	37.2	1.7	1.7	3.5	4.4		Combined Pinecliff 1st and Silverwood Pond 6; pipe controls peak rates
WD-P10.1	E	7	0	7	57	970.0	979.6	2.3	0.5	0.5	0.1	0.7	5" LOW FLOW WITH 12" OUTLET	Calarosa Development ; West Basins
WD-P10.2	E	23	9	32	129	953.0	957.0	6.5	6.3	6.3	1.2	2.0	6" LOW FLOW INTO 60" OVERFLOW STRUCTURE WITH 15" OUTLET. 10' WIDE EOF	Pinecliff 2nd Pond 2
WD-P10.3	E	14	32	46	79	928.0	935.0	6.0	2.5	2.5	0.5	1.2	6" LOW FLOW INTO 48" OVERFLOW STRUCTURE. 36" OUTLET	Pinecliff 2nd Pond 3
WD-P10.4	E	96	125	221	496	897.0	903.2	36.4	6.7	6.7	1.0	12.4	15"	Existing Kemp Property Pond
WD-P11.1	E	8	0	8	53	924.5	926.8	1.1	29.1	29.1	0.3	0.5	36"x21.7" BOX CULVERT	Pine Summit 4th pond
WD-P11.2	E	3	8	11	21	923.0	925.7	1.8	16.3	16.3	0.3	0.6	48" OVERFLOW STRUCTURE WITH 18" OUTLET	Pine Summit 4th pond
WD-P11.3	E	21	11	32	129	910.0	916.2	10.4	4.1	4.1	0.8	2.2	8" LOW FLOW WITH 15" OUTLET	Pine Summit 6th/7th pond
WD-P12	E	48	32	79	239	823.5	831.8	26.0	3.1	3.1	1.2	3.2	8"	BPS revised Timber Ridge 6th Pond
WD-P13.1.1	E	1	0	1	7	933.0	937.5	0.0	3.2	7.4	0.0	0.0	24" AND 20' WIDE EOF	Shown as WD-P13.1 on Map 1. New Oltman Middle School Pond 2P (HydroCAD). 3.21 cfs out of primary; 4.13 cfs out of EOF
WD-P13.1.2	E	1	1	2	3	933.5	934.9	0.0	7.2	7.2	0.0	0.0	24" AND 20' WIDE EOF	Shown as WD-P13.1 on Map 1. New Oltman Middle School Pond CB 1P (HydroCAD)
WD-P13.1.3	E	3	0	3	23	933.4	935.6	0.1	19.3	20.5	0.0	0.1	36" AND 10' WIDE EOF	Shown as WD-P13.1 on Map 1. New Oltman Middle School Pond 5P (HydroCAD); 19.3 cfs out of primary; .9 cfs out of EOF
WD-P13.1.4	E	9	0	9	37	933.5	937.6	0.9	14.5	15.0	0.0	0.5	21" AND 10' WIDE EOF	Shown as WD-P13.1 on Map 1. New Oltman Middle School Pond SW (HydroCAD); 14.5 cfs out of primary; .6 cfs out of EOF
WD-P13.1.5	E	0	9	9	3	933.1	935.6	0.2	13.8	14.7	0.0	0.2	24" AND 20' WIDE EOF	Shown as WD-P13.1 on Map 1. New Oltman Middle School Pond 4P (HydroCAD); 13.8 cfs out of primary; 1 cfs out of EOF
WD-P13.2	E	10	14	24	66	932.2	934.8	2.1	43.9	43.9	0.7	1.1	2 - 29"x18" BOX CULVERT	Pine Summit 3rd/4th pond
WD-P13.3	E	7	24	31	54	932.0	934.4	7.2	5.3	5.3	2.1	3.7	12"	Pine Summit 2nd - wetland
WD-P13.4	E	16	31	47	111	927.0	930.9	5.9	5.7	5.7	1.2	1.8	12"	Pine Summit 2nd Add - Pond 3
WD-P13.5	E	7	47	53	46	925.4	928.0	2.0	6.2	6.2	0.6	1.0	15"	Pine Summit 2nd Add - Pond 6
WD-P13.6	E	33	53	86	168	894.0	900.5	8.8	36.0	36.0	0.6	2.1	2-12", 50' LONG WEIR	Lodges of Pine Summit pond without equilizer pipe
WD-P13.7	E	5	86	91	36	895.0	897.7	5.3	17.8	17.8	0.8	1.4	6" LOW FLOW BELOW 5' LONG WIDE WITH 12" OUTLET. 10' WIDE EOF	Timber Ridge 4th 1/2 of pond P31 w/ improved outlet
WD-P14.1	E	43	0	43	114	891.0	895.7	5.7	15.6	15.6	0.9	1.5	18" AND 20' WIDE EOF	Pine Summit 7th Addition water quality pond
WD-P14.2	E	3	43	46	12	890.5	894.0	2.6	23.8	23.8	0.4	0.9	24"	Pine Summit 7th Wetland basin
WD-P15.1	E	23	0	23	100	816.0	818.0	2.3	15.2	85.5	0.4	1.1	24" AND 30' WIDE EOF	Timber Ridge - north pond. 15.2 cfs out of primary; 70.3 cfs out of EOF
WD-P15.2	E	16	46	62	82	828.0	831.4	1.1	24.9	67.0	0.3	0.4	24" AND 20' WIDE EOF	Timber Ridge - south pond. 24.9 cfs out of primary; 42.1 cfs out of EOF
WD-P15.4	E	14	0	14	94	894.0	897.8	5.7	11.3	11.3	0.7	1.1	.7' WIDE SHARP-CRESTED WEIR	West Draw Elementary School pond
WD-P15.5	E	149	2232	2381	724	804.8	817.3	50.5	189.6	189.6	2.9	5.5	84"	Hidden Valley North Pond and Pine Arbor 1st Addition (WD-P15.5.1)
WD-P15.6.1	E	11	0	11	37	848.0	850.5	1.2	8.2	8.2	0.4	0.5	15"	Small pond east of intersection of H.V. Lane and 74th St.
WD-P15.6	E	63	2414	2477	199	805.2	817.3	49.4	107.4	107.4	3.7	5.5	48"	Hidden Valley Middle Pond
WD-P15.7.1	E	7	0	7	23	897.9	902.0	0.5	10.5	10.5	0.0	0.3	15"	
WD-P15.7	E	74	2545	2620	225	804.8	816.9	71.6	38.1	38.1	4.8	7.4	18" INTO 60" OVERFLOW STRUCTURE. 30" OUTLET	Hidden Valley South Pond
WD-P16	E	44	0	44	293	897.0	904.4	15.1	9.3	9.3	1.1	1.9	12"	Timber Ridge 3rd Pond west of P17. Model combines WD-P16.1 and WD-P16
WD-P17	E	49	44	93	247	808.0	815.1	33.4	1.8	1.8	2.3	5.2	6"	Hardwood pond
WD-P18.1	E	26	0	26	187	860.0	870.3	1.8	100.9	142.0	0.0	0.4	36" AND 100' WIDE EOF	Belgarde Pond. 100.9 cfs out of primary; 41.1 cfs out of EOF
WD-P18.2	E	4	26	30	20	854.0	863.5	6.8	11.1	51.7	0.2	1.8	15" AND 40' WIDE EOF	11.1 cfs out of primary; 40.6 cfs out of EOF
WD-P18.3	E	12	0	12	70	841.9	856.0	2.3	31.2	31.2	0.1	0.7	21"	
WD-P19.1	E	24	0	24	119	860.0	869.9	6.4	9.2	9.2	0.0	1.5	8" LOW FLOW BELOW 4' WIDE WEIR. 15" OUTLET	
WD-P19.2	E	11	24	35	39	852.5	857.3	4.8	5.3	9.5	0.5	1.3	12" OUTLET AND 10' WIDE EOF	5.3 cfs out of primary; 4.2 cfs out of EOF
WD-P19.3	E	37	76	114	124	827.0	836.8	29.8	9.8	9.8	0.1	6.0	15"	

Appendix E: Cost Estimates for Proposed Trunk System

Appendix E - Cost Estimates for Proposed Trunk System

Proposed Conveyance System						Proposed Pond Construction					Land Acquisition			
From	To	Ponded Design Flow	Pipe Size	Length	Total Conveyance Cost	Pond Name	Pond Excavation[2]	Excavation Cost	Pond Outlet Cost[3]	Total Ponding Cost	Pond Name	Pond Area	Pond Land Cost[4]	Comments
		(cfs)	(in.)	(ft.)	($)		(ac-ft)	($)	($)	($)		(ac)	($)	
East Ravine District														
ER-P1	ER-P2	53.0	36	1241	217,175									
ER-P3	ER-P5	6.1	Outlet Structure	N/A	20,000									
ER-P4.1	ER-P5	4.9	12" FM	2100	1,140,000	ER-P6	4	18,000	9,500	27,500	ER-P6	1	56,400	Cost for 4.7 cfs lift station and forcemain included in conveyance cost
ER-P8	ER-P19	750.0	8'X6' Box	100	125,900	ER-P8	72	347,100	9,500	356,600	ER-P8	11.0	441,600	Ponding provided behind roadway embankment
ER-P9	ER-P12	5.1	12	1700	161,500	ER-P9	36	173,300	9,500	182,800	ER-P9	4.5	180,000	
ER-P10	ER-N12.1	2.0	12	150	14,250	ER-P10	6	30,700	9,500	40,200	ER-P10	1.9	77,200	
ER-N12.1	ER-P12	10.8	21	1980	237,600									
ER-P11	ER-P12	7.0	15	3640	382,200	ER-P11	21	103,100	9,500	112,600	ER-P11	4.4	177,040	
ER-P12	ER-P14	42.5	27	150	18,750	ER-P12	79	382,900	9,500	392,400	ER-P12	17.6	704,000	
ER-P13	ER-P14	3.8	12	950	90,250	ER-P13	19	92,600	9,500	102,100	ER-P13	4.5	180,000	
						ER-P14	48	234,200	9,500	243,700	ER-P14	9.6	384,000	
ER-P15.1	ER-P15.2.4	2.2	12	300	28,500	ER-P15.1	10	46,000	9,500	55,500	ER-P15.1	2.4	96,000	
ER-P15.2.4	ER-P19	117.6	30	110	16,500									
ER-P17	ER-P18	15.1	21	740	88,800									
ER-P18	ER-P19	16.7	18	750	86,250									
ER-P19	ER-P24	808.5	2-66	125	875,000									Pipe costs includes jacking 2-66" pipes under the RR tracks
ER-P21.1	ER-P21.2	6.1	12	310	29,450	ER-P21.1	3	15,600	9,500	25,100	ER-P21.1	1.7	68,000	
Gables Lake District														
GL-P1	ER-P3	10	15" FM	3500	1,600,000									Cost for 10 cfs lift station and forcemain included in conveyance cost
Langdon District														
						L-P3	389	940,650	28,400	969,050	L-P3	53.4	2,137,760	Existing 12'x6' box is constructed, add rate control restriction to meet agreed upon HWL and rate of 770.0 and 370 cfs respectively, pond excavation cost reduced by 50% to account for existing flood storage in wetland, outlet cost includes modifying the existing 12'x6' box culvert
L-P4	L-N5.1	392.2	10'x5' Box	100	151,100	L-P4	193	468,200	18,900	487,100	L-P4	57.9	2,317,560	Existing roadway embankment will need to be raised significantly (roughly 10 feet) to provide flood storage, add 3' wide weir for small storm rate control and 20' wide weir for large storm rate control, pond excavation cost reduced by 50% to account for existing flood storage available in wetland, outlet cost increased to reflect 2- yr rate control weir
St. Paul Park District														
						SPP-P9.1	26	124,700	9,500	134,200				Existing depression expanded, existing EOF along south side of tracks at 780.5 is utilized during 100-year event., pond expansion on city owned property
SPP-P9.2	TG-P4	10.0	24" FM	3000	1,638,000	SPP-P9.2	60	145,300	9,500	154,800				Existing wetland expanded to provide additional flood storage, future 10 cfs lift station, existing EOF to St Paul Park at 777.3 is utilzed during 100-year event, excavation cost reduced by 50% to reflect existing flood storage in wetland, forcemain pipe cost includes a $1,000,000 cost estimate for the list station, pond expanded on city owned property
Seeger Creek District														
SC-P1.1	SC-P1.3	67.0	36.00	50	8,800	SC-P1.1	35	168,500	9,500	178,000	SC-P1.1	27.9	1,117,840	Future ponding when 100th Street is improved, add 1' wide weir for small storm rate control, outlet structure cost increased to reflect weir structure for 2-yr rate control
SC-P1.2	SC-P1.3	66.5	2-24	50	12,500	SC-P1.2	18	86,700	9,500	96,200	SC-P1.2	27.9	1,117,840	
SC-P1.3	SC-P2	85.0	2-36	60	21,000	SC-P1.3	117	567,300	9,500	576,800	SC-P1.3	27.9	1,117,840	
SC-P2	SC-N7.1	189.5	4'x6' Box	60	37,800	SC-P2	88	425,500	9,500	435,000	SC-P2	9.6	384,680	Future ponding when 100th Street is improved, add 1.5' wide weir for small storm rate control, outlet structure cost increased to reflect weir structure for 2-yr rate control
SC-P3.1	SC-P3.2	15.9	24	50	6,250	SC-P3.1	10	49,900	9,500	59,400	SC-P3.1	8.6	344,400	
SC-P3.2	SC-P3.3	157.1	24 & 48	50	12,500	SC-P3.2	37	178,200	9,500	187,700	SC-P3.2	17.9	715,960	
SC-P3.3	SC-P7	250.0	42 & 48	50	22,500	SC-P3.3	59	287,500	9,500	297,000	SC-P3.3	19.4	776,760	
SC-P4.1	SC-P4.1	16.4	24	40	5,000	SC-P4.1	21	100,700	9,500	110,200	SC-P4.1	10.9	436,600	
SC-P5	SC-P7	67.6	36	60	10,500	SC-P5	11	53,800	9,500	63,300	SC-P5	2.9	115,040	
SC-P6	SC-P7	26.5	30	100	15,000	SC-P6	4	18,000	9,500	27,500	SC-P6	2.7	107,040	
SC-P7	SC-N9.1	541.6	6'x8' Box	100	125,900	SC-P7	45	218,800	9,500	228,300	SC-P7	16.8	672,840	
SC-P8.4	SC-N9.1	10.9	15	400	42,000	SC-P8.4	21	99,300	9,500	108,800	SC-P8.4	5.1	204,000	Future ponding when 110th Street is improved, add 1.5' wide weir for small storm rate control, outlet structure cost increased to reflect weir structure for 2-yr rate control
South District														
S-P3	S-P4	17.2	27	1910	238,750	S-P3	75	365,300	9,500	374,800	S-P3	24.1	963,600	
S-P4	S-P5	36.8	36	2510	439,250	S-P4	60	289,000	9,500	298,500	S-P4	20.3	813,000	
S-P5	S-P7.3	64.0	36	2980	521,500	S-P5	86	416,900	9,500	426,400	S-P5	25.2	1,009,920	
S-P6	S-P7.3	31.9	24	110	13,750	S-P6	121	387,300	9,500	396,800	S-P6	39.4	1,574,840	Excavation cost reduced to account for existing 41 acres of flood storage available
S-P7.1	S-P7.3	5.2	12	180	17,100	S-P7.1	13	63,600	9,500	73,100	S-P7.1	6.2	249,720	
S-P7.2	S-P7.3	8.6	12	330	31,350	S-P7.2	27	132,800	9,500	142,300	S-P7.2	9.9	394,000	
S-P9	S-P10	0.0	15	250	26,250	S-P9	27	130,700	9,500	140,200	S-P9	9.0	358,440	

Appendix E - Cost Estimates for Proposed Trunk System

Proposed Conveyance System						Proposed Pond Construction					Land Acquisition			
From	To	Ponded Design Flow (cfs)	Pipe Size (in.)	Length (ft.)	Total Conveyance Cost ($)	Pond Name	Pond Excavation[2] (ac-ft)	Excavation Cost ($)	Pond Outlet Cost[3] ($)	Total Ponding Cost ($)	Pond Name	Pond Area (ac)	Pond Land Cost[4] ($)	Comments
Southwest District														
SW-P1	SW-P2	7.0	12	660	62,700	SW-P1	24	116,700	9,500	126,200	SW-P1	6.8	272,760	
SW-P2	SW-P3	10.9	21	690	82,800	SW-P2	34	124,400	9,500	133,900	SW-P2	7.7	307,640	Excavation cost reduced to account for existing 8.5 acres of flood storage available
SW-P3	SW-P6	16.5	24	370	46,250	SW-P3	10	36,300	9,500	45,800	SW-P3	8.4	337,280	Excavation cost reduced to account for existing 2 acres of flood storage available
SW-P6	SW-P8	40.0	36	2610	456,750	SW-P6	10	40,700	9,500	50,200	SW-P6	2.4	94,640	Excavation cost reduced to account for existing 2 acres of flood storage available
SW-P7	SW-P8	3.4	12	1300	123,500	SW-P7	12	42,600	9,500	52,100	SW-P7	7.2	289,280	Excavation cost reduced to account for existing 3 acres of flood storage available
SW-P8	SW-P9	64.8	36	580	101,500									Jack 36" pipe under RR tracks, pipe cost includes all jacking costs
SW-P9.2	SW-N10.1	60.3	36	1620	283,500	SW-P9.2	35	169,400	9,500	178,900	SW-P9.2	7.6	305,080	Utilize existing depression
SW-P10	SW-N10.1	3.1	8	160	8,900	SW-P10	6	28,600	9,500	38,100	SW-P10	3.2	126,320	
SW-N10.1	River	63.4	36	950	166,250									
SW-P14	SW-N16.1	4.5	12	120	11,400									
SW-P15	SW-N16.1	1.7	15	1130	118,650	SW-P15	14	65,900	9,500	75,400	SW-P15	4.6	185,160	
						SW-P16	4	14,100	9,500	23,600	SW-P16	4.1	164,840	Pond North of 103rd west of RR tracks, existing depression to be expanded, excavation cost reduced to reflect 1.5 acres of available flood storage in existing depression
Thompson Grove District														
TG-P1.1	TG-P1.3	5.4	18	510	58,650									
						TG-P14	46	221,800	9,500	231,300	TG-P14	9.4	376,840	TG-P14 is partially graded and the outlet is constructed. Existing overflow structure grate elevation lowered from 779.1 to 776.0, 12" pipe for small storm rate control
TG-P19	TG-P20	315.4	6'x6' Box	140	425,000									Box culvert cost accounts for material, end treatment, labor, equipment, utility relocation, and rock excavation
TG-P20	L-P3	350.0	8'x5' Box	90	107,700	TG-P20	14	67,600	9,500	77,100	TG-P20	2.7	106,160	
West Draw District														
WD-P1	WD-P2	1.2	12	380	36,100	WD-P1	7	32,600	9,500	42,100	WD-P1	3.6	144,000	
WD-P2	WD-P3	1.3	12	880	83,600	WD-P2	23	112,400	9,500	121,900	WD-P2	11.2	448,000	
WD-P5	WD-P6	2.1	12	365	34,675	WD-P5	1	4,900	9,500	14,400	WD-P5	0.6	24,000	
WD-P7	WD-P8	21.7	18	950	109,250	WD-P7	30	147,400	9,500	156,900	WD-P7	4.6	184,000	616 ac from Woodbury (WD-P19) added here, additional flood storage added to further
						WD-P8	10	47,400	9,500	56,900	WD-P8	3.1	124,000	
Proposed Improved Drainageway/Flume Costs														
Between Jamaica Avenue and L-P3 - $190/LF					114,000									
Between L-P3 and the Mississippi River - $260/LF					1,820,000									
Between S-P6 and S-P7.3 - $190/LF					342,000									
ER-P5.3 Downstream Channel Restoration - $130/LF					818,350									
North of 80th St (East Ravine District) to 24" FES from ER-P4 - $130/LF					780,000									
From ER-P14 to ER-P15.1 - $130/LF					260,000									
Conveyance Subtotal					$14,980,450	**Proposed Pond Construction Subtotal**				$8,928,750	**Land Acquisition Subtotal**		$22,783,920	
30% - Engineering, Interest, Administration					$4,494,135	30% - Engineering, Interest, Administration				$2,678,625	10% Design & Construction Contingencies		$2,278,392	
Conveyance Total					**$19,474,600**	**Proposed Pond Construction Total**				**$11,607,400**	**Land Acquisition Total**		**$25,062,400**	

[1] Pipe cost includes manholes

[2] Excavation costs (assumes all material remains on-site) = $ 3.00

[3] Outlet Structures include skimming and pipe connection = $ 9,500

[4] Land cost assumptions $40,000 /acre

Total System Cost = $56,144,400

Appendix F: Rules and Regulations of the South Washington Watershed District

Receipt:# 283321

RES $46.00

Return to:
SOUTH WASHINGTON
WATERSHED DISTRICT
2302 TOWER DRIVE
WOODBURY MN 55125

4019971

Certified Filed and/or recorded on:
3/30/2015 12:02 PM

4019971

Office of the County Recorder
Washington County, Minnesota
Jennifer Wagenius, County Recorder

Resolution

CERTIFICATE OF ADMINISTRATOR
SOUTH WASHINGTON WATERSHED DISTRICT
STATE OF MINNESOTA

STATE OF MINNESOTA)

COUNTY OF WASHINGTON)§

SOUTH WASHINGTON WATERSHED DISTRICT)

I, Matthew Moore, being the duly qualified and acting Administrator for the South Washington Watershed District, do hereby Certify that the attached Resolution **#2015- 111** is a true and correct copy of the Resolution as adopted by the South Washington Watershed Board of Managers on the **13th** day of **January, 2015.**

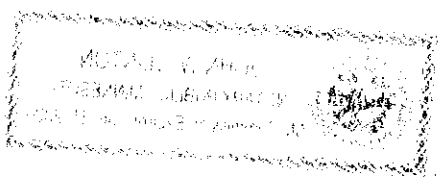
Matthew Moore, SWWD Administrator

On this **13th** day of **January, 2015**, before me a notary public within and for said County, personally appeared **Matthew Moore**, to me personally known, and by me duly sworn, did say that he is the **Administrator** of **South Washington Watershed District**, a body politic and corporate under the laws of Minnesota, named in the foregoing instrument, on behalf of said District by authority of its board of managers, and that he has executed the same as its free act and deed on behalf of the District.

South Washington WATERSHED District

Notary Public

JOHN W. CLINTON
NOTARY PUBLIC - MINNESOTA
My Commission Expires Jan. 31. 2020



South Washington WATERSHED District

RESOLUTION No. 2015-111

RESOLUTION OF THE ADOPTION OF DISTRICT RULES

WHEREAS, The District must prepare Rules in accordance to Minnesota Statutes Chapters 103B, 103D, 103E and Minnesota Rules 8410; and

WHEREAS, The South Washington Watershed District has identified the need to update the District's Rules to reflect recently adopted District Guidance Documents and newly issued MS4 permit; and

WHEREAS, The District has completed review of the draft Watershed District Rules pursuant to Minnesota Statutes 103B; and

WHEREAS, The District held a public hearing (1/13/2015) on the draft Watershed District Rules, pursuant to Minnesota Statutes 103B; and

WHEREAS, The District has responded, to any concerns expressed by the review agencies, municipalities, and citizens of the District;

NOW THEREFORE BE IT RESOLVED, that the South Washington Watershed District Board of Managers adopts the District Rules January 13, 2015 which will become effective February 1, 2015;

Manager Johnson moved the adoption of the foregoing Resolution #2015-111, and Manager Hanna seconded the adoption of the Resolution, and it was duly adopted by the Board on the 13th of January, 2015.

Jack A. Lavold, President

Brian Johnson, Vice President

L:\Resolutions\2015-111 Rules Adoption 2015.docx

2302 Tower Drive • Woodbury, MN 55125 • 651-714-3729 • Fax 651-714-3721
www.swwdmn.org

South Washington Watershed District
2015 Rules Hearing
Tuesday January 13, 2015

Rules Update Overview

SWWD's current rules were adopted December 13, 2011. Since that time, a new MS4 general permit has been issued, the District has updated its hydrologic guidance documents to include Atlas 14 rainfall rates, and the District updated its Ravine Lake management plan. All of these changes necessitate changes to District Rules. Additionally, SWWD committed to updating its rules as part of its application for continued coverage as an MS4.
Staff has prepared a Rules update which includes the following substantive changes:

- Clarification of definitions of public improvement and exempt public improvement project
- Extend volume control requirements to re-development projects as required in the District's MS4 permit.
- Require net reduction in TSS for development, re-development, and public improvement projects as required in the District's MS4 permit.
- Updated rate control requirements to reflect Atlas 14 rainfall rates, consistent with SWWD guidance documents.
- Updated total phosphorus unit/area loading rate for Ravine Lake from 0.04 lbs/ac/yr to 0.75 lbs/ac/yr, consistent with SWWD guidance documents.

Consistent with MN Statute 103D.341, the District provided a draft of proposed changes to review agencies for 45 day review and comment period. Staff has prepared responses to all comments received during the review period. A copy of comments received and accompanying responses is attached. Notice of public hearing was provided in the District's designated news letters on December 10, 2014 and December 17, 2014.

To fulfill requirements under MN Statute 103D.341, the District must hold a public hearing on the proposed changes.

Motion to open public hearing

South Washington Watershed District Rules

Adopted January 13, 2015

Effective February 1, 2015

South Washington WATERSHED District

CERTIFICATE OF RULES
SOUTH WASHINGTON WATERSHED DISTRICT
STATE OF MINNESOTA

STATE OF MINNESOTA)

COUNTY OF WASHINGTON)§

SOUTH WASHINGTON WATERSHED DISTRICT)

I, **Don Pereira**, Secretary of the South Washington Watershed District Board of Managers, certify that this is a true and correct copy of South Washington Watershed District Rules having been adopted by the South Washington Watershed District Board of Managers on the 13th Day of January 2015.

Don Pereira *Date*

STATE OF MINNESOTA)

COUNTY OF WASHINGTON)§

On this **13th** day of **January, 2015,** before me a notary public within, and for said County, personally appeared Don Pereira, to me personally known, and by me duly sworn, did say that he is the Secretary for the South Washington Watershed District, a body politic and corporate under the laws of Minnesota, named in the foregoing instrument, on behalf of said District by authority of its Board of Managers, and that he has executed the same as its free act and deed on behalf of the District.

Notary *Date*

CERTIFICATE OF RULES
SOUTH WASHINGTON WATERSHED DISTRICT
STATE OF MINNESOTA

STATE OF MINNESOTA)

COUNTY OF WASHINGTON)§

SOUTH WASHINGTON WATERSHED DISTRICT)

I, Don Pereira, Secretary of the South Washington Watershed District Board of Managers, certify that this is a true and correct copy of South Washington Watershed District Rules having been adopted by the South Washington Watershed District Board of Managers on the **13th** Day of **January 2015**.

2/20/2015

Don Pereira *Date*

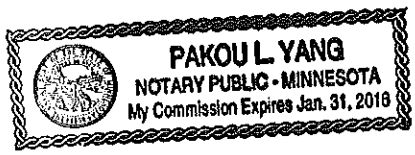
STATE OF MINNESOTA)

COUNTY OF WASHINGTON)§

On this **20th** day of **February, 2015,** before me a notary public within, and for said County, personally appeared Don Pereira, to me personally known, and by me duly sworn, did say that he is the Secretary for the South Washington Watershed District, a body politic and corporate under the laws of Minnesota, named in the foregoing instrument, on behalf of said District by authority of its Board of Managers, and that he has executed the same as its free act and deed on behalf of the District.

2/20/15

Notary *Date*



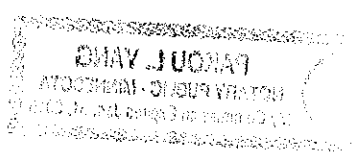

PAKOU L YANG
NOTARY PUBLIC - MINNESOTA

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Introduction

The South Washington Watershed District (the "District") adopts these Rules and Regulations as required by Minnesota Statute 103D.341 to accomplish the purposes in Chapter 103D, implement the powers of the managers, and the policies of the District as contained in the District Watershed Management Plan (the "Plan").

Statement of Need and Reasonableness

The Cottage Grove Ravine Watershed District was formed in 1993, changing its name to the South Washington Watershed District (SWWD) in 1995. SWWD adopted its first Watershed Management Plan (WMP) in 1997 and Rules in 1999.

In 2003, SWWD was enlarged to incorporate the former East Mississippi Watershed Management Organization (EMWMO), following recommendations from the 1999 Washington County Governance Study. In an effort to bring its standards up to date and to incorporate the new area, SWWD adopted its second and current WMP in 2007. The current WMP provides the basis for managing water resources and setting standards on a subwatershed or basin level rather than using a one size fits all approach. A Standards Manual was also completed in 2007 to "address and establish consistency in water quality and quantity modeling approaches" and "provide guidance on means and methods for achieving watershed standards. The Standards Manual was also meant to provide a foundation for a future rule update.

In 2010, after a two year process SWWD was again enlarged, this time to incorporate four of the five subwatersheds of the former Lower St. Croix Watershed Management Organization (LSCWMO). During the enlargement process, SWWD committed to managing the District on a subwatershed basis, rather than using a one size fits all approach. To that end, SWWD sets standards unique to the characteristics of each subwatershed when appropriate (i.e. when state or federal standards, or TMDL allocations require more stringent standards for individual subwatersheds). However, it remains SWWD's desire to streamline the regulatory process as much as feasible.

During the 2010 enlargement process, SWWD initiated a rule update. The update process was not meant to create new rules, but rather to consolidate and clarify existing Rules and Standards developed for the 1999 SWWD Rules, 2007 SWWD Standards Manual, and 2009 LSCWMO Rules and firmly establish the framework for managing the District's water resources on a subwatershed basis.

These current rules are the result of a 2015 update and reflect new requirements to ensure District compliance with its Municipal Separate Storm Sewer System (MS4) permit and incorporate additional guidance documents adopted by the District (i.e. Atlas 14 precipitation design events).

General Policy Statement

Under the Minnesota Watershed Law, MN State Statute 103D, the South Washington Watershed District (SWWD) exercises a series of powers to accomplish its statutory purpose. These Rules are adopted to implement those purposes for which the SWWD was formed. Purposes include carrying out the policies contained in the Watershed Management Plan ("the Plan"), coordinating SWWD activities with other governmental agencies, ensuring that water and natural resources are considered, protected, and preserved within the District, ensuring that future regional water management needs are considered in the development of individual subdivisions, developments, and local water management plans (LWMP), and to protect the public health, safety, and welfare.

Land alteration affects the rate, volume, and quality of surface runoff, which ultimately must be maintained in the District through a combination of evaporation and infiltration of stormwater and, if necessary, designing and construction a conveyance system to outlet stormwater to the Mississippi or St. Croix Rivers at the south and east borders of the District.

Land alteration and utilization can also degrade the quality of runoff entering water bodies of the District due to non-point source pollution. Sedimentation in lakes and streams from on-going erosion processes and construction activities reduces the hydraulic capacity of water bodies and degrades water quality. Projects which increase the rate of stormwater runoff or degrade runoff quality increase the need for storage and can aggravate existing water quality problems and contribute to new ones. Projects which fill floodplain or wetland areas can increase the need for storage by reducing stormwater storage and hydraulic capacity of water bodies and degrade water quality by eliminating the filtering capacity of such areas. Dredging projects can also degrade water quality and eliminate the natural appearance of shoreland areas.

These Rules seek to protect the public health, welfare, and natural resources of the District, reduce the need for additional storage capacity and the potential need for the construction of systems to convey storm water, preserve floodplains and wetland storage capacity, maintain or improve the chemical and physical quality of the surface and groundwater, reduce sedimentation, preserve the hydraulic and navigational capacity of water bodies, preserve natural shoreland features, and minimize the public expenditure to avoid or correct such problems in the future.

Relationship to Municipalities

The District recognizes that the primary control and determination of appropriate land uses is the responsibility of the municipalities. Accordingly, the District will coordinate development permit application reviews with the municipality where the property is located. Primary responsibility for management of water quality and stormwater runoff lies with the District.

It is the intention of the managers to ensure that development of land within the District proceeds in conformity with these Rules, in addition to conforming with the development guides and plans adopted by municipalities. The District shall exercise control over development through its permit program described in these Rules to ensure maintenance of natural water storage areas, their shorelines, and protection of existing natural topography and vegetative features in order to preserve them for present and future beneficial uses.

The managers desire to serve as technical advisors to the municipal officials in the preparation of local surface water management plans (LWMP) and the review of individual development proposals prior to investment of significant public or private funds. The District will also review projects sponsored or undertaken by municipalities and other governmental organizations, and will require compliance with these Rules for government projects that have an impact on water resources in the District. To promote a coordinated review process between the District and the municipalities, the managers request that the municipalities involve the District early in the planning process.

The District urges municipalities to develop, as rapidly as possible, a LWMP, providing a coordinated system of managing surface water on a regional or subwatershed basis consistent with these Rules. Where such a municipal plan is adopted, the requirements of the District's Rules which are met by the municipal plan shall be deemed satisfied upon issuance of an appropriate municipal permit. In the absence of a LWMP on a municipal or subwatershed level, or where required by a Municipal LWMP, SWWD will continue to require individual site-by-site SWWD permits for projects involving land alteration.

Definitions

For the purpose of these Rules and Regulations, the terms defined in this section shall have the meaning attached to them:

Critical Duration means the event duration that typically leads to the largest peak discharge.

Critical Duration Event Analysis means analysis to establish critical duration.

District means the South Washington Watershed District.

Drainage System means those features of the watershed such as lakes, ponds, streams and waterways, infrastructure, and pumps which contain and convey water resources of the District.

Exempted Public Improvement Project is a linear project on existing infrastructure which does not increase impervious area above one cumulative acre. Examples include mill and overlay or sewer or water system reconstructions.

Existing hydrologic conditions means those conditions in place prior to the start of the current project, except for wetlands where alterations have significantly changed the wetland hydrology in which case existing means those hydrologic conditions that established the current wetland

Floodplain is the area along channels and waterways, including the area around lakes, marshes, lowlands, and ponding areas which would become inundated as the result of a flood occurring on the average once every 100 years.

High Priority Wetlands are wetlands with high functional values as identified in the Watershed Management Plan.

Infiltration Basins are depressions that when inundated with surface water runoff have the capacity to pass water down into the subsurface at a relatively high rate.

Karst refers to a specific type of terrain, typically formed in carbonate rocks such as dolostone and limestone where groundwater has solutionally enlarged openings to form subsurface drainage systems. Karst areas are well connected to groundwater and have the propensity to allow surface water contaminants to rapidly reach the water table and drinking water supplies. Karstic regions are often characterized by a lack of surface drainage, and frequently have associated sinkholes, caves, springs, and sinking streams.

Karst Sensitive Areas are those with less than 50 feet of surficial materials overlying unconsolidated St. Peter Sandstone or the soluble dolomitic Prairie du Chien Group.

Lake Augmentation is any artificial addition of water to a lake, or a project which diverts water to a lake which did not previously drain naturally to the lake.

Landlocked area corresponds to a depression where there is no readily available surface overflow for stormwater drainage during a 100-year or larger event.

LGU means Local Government Unit.

Local Water Management Plan is the plan adopted by a municipality which is the criteria used by each municipality to address stormwater management.

Minimum Building Grade Elevation is the lowest ground elevation next to a building or structure.

100-year Flood Event means the amount of runoff as defined by SCS hydrology that has a one percent chance of occurring at a given location within a one year time period.

100-year Flood Level is the peak elevation of a water body resulting from a 100-year flood event.

Person means an individual, firm, partnership, association, private corporation, city, village, county, township, school district or other political subdivisions.

A **Plat** is a legal document used to subdivide property which includes a drawing or map of the subdivision, meeting all the requirements of the applicable Minnesota Statutes.

Public health, safety and welfare extends to and includes any act or thing tending to improve or benefit or in any way affect the general public either as a whole or as to a particular community or part thereof. This definition is to be construed liberally to give meaning and effect to the goals and purposes of the South Washington Watershed District and also statutes and ordinances relating to floodplain management and shoreland use.

Public Improvement Project is a linear project (i.e. roadways) establishing impervious area cumulatively above one acre as a result of the project, even if the project is phased over several years.

Rate of Runoff is the peak volume of runoff per unit of time for a given storm event.

Rules means the Rules and Regulations of the South Washington Watershed District

Runoff means the amount of excess precipitation or snowmelt that is not permanently stored in depressional areas, evaporated, intercepted, or infiltrated into the soil.

Semi-landlocked area corresponds to a depression where there is no available surface overflow or outlet for stormwater drainage up to a 25-year storm.

SCS means Soil Conservation Service or Natural Resource Conservation Service (NRCS).

Storage Volume is the maximum quantity of water that is stored in a ponding area during a storm event.

Technical Professional is the qualified representative designated by the Managers for the work being reviewed or performed.

Traditional Agriculture is agricultural practices that produce food or fiber. This type of agriculture does not include nurseries, feedlots, or tree farms.

Type II means the SCS rainfall distribution pattern typical of the District.

Volume of runoff is the amount of runoff in cubic units often noted as acre-feet.

Watershed Management Plan is the District's Watershed Management Plan, as defined by Minnesota Statutes 103B.231.

Water Resources of the District include lakes, ponds, streams, wetlands, landlocked and semi-landlocked areas, and other water features.

Watershed means an area bounded peripherally by a drainage divide, which collects precipitation and provides runoff to a particular drainage system.

Waterway means any natural or artificial channel including associated flood plains which provide a course for water flowing either continuously or intermittently.

WCA means Wetland Conservation Act (Minnesota Laws 1991 Chapter 354, as amended).

WCA Rules means Minnesota Board of Water and Soil Resources (BWSR) Minnesota Rules Chapter 8420, as amended.

Rule 1 Administrative Procedures

1.1 Applicability

Developers of proposed projects covered by these Rules must provide the District with the required submittals through the District website at www.swwdmn.org. However, review and permitting procedures, and associated fees, vary based on municipal management.

1.1.1 Areas managed under municipal LWMP approved by SWWD

It is the policy of SWWD to limit duplication of effort and minimize the expense incurred by SWWD, municipalities, and applicants. Generally, SWWD review and permitting will not be required for projects in Municipalities where a SWWD approved municipal LWMP is adopted and controls are up to date. In those Municipalities, the requirements of these Rules shall be deemed satisfied upon issuance of the appropriate Municipal permit and submission of final plans to the District. Projects will be subject to SWWD review and permitting, when required under the municipal LWMP, when the applicant is seeking a variance to LMWP requirements, when a new connection to the District's MS4 is proposed, or when the SWWD Board of Managers deems a permit necessary. Municipalities are responsible for maintaining all supporting documentation necessary to demonstrate compliance with these Rules and must make those documents available on request.

1.1.2 Areas not managed under municipal LWMP

Any person undertaking any activity for which a permit is required by these Rules in areas not covered under a SWWD approved municipal LWMP shall be subject to SWWD review and permitting.

1.2 Forms

Applicants must complete the Site Review/Permit Application Form on the SWWD website (www.swwdmn.org) in addition to supplying required exhibits.

1.3 Exhibits

Developers of proposed projects covered under these Rules must provide the following submittals in .pdf file format.

A) Existing conditions
B) Grading and utility plan
C) Erosion control plan
D) Engineering design calculations, including:
    1) Total project area and area of disturbance
    2) Volume of all constructed or modified water bodies
    3) Areas of delineated wetlands and of wetland impacts resulting from project
    4) Drainage divides and areas for existing and proposed conditions

5) Hydrologic model results for existing and proposed conditions using a 24 hour Type II storm event for return periods of 2, 10, and 100 years
6) The normal water surface elevation, 100 year flood elevation, dead storage volume, and flood storage volume for all ponds, or other water bodies involved
7) Supporting data used to calculate CN values
8) Floodplain alteration calculations
9) Water quality calculations
10) Rating curves for all outlets from water bodies within the development

E) Engineering design details
F) Landscape/vegetation plan
G) Soils borings and locations on site
H) Projects utilizing infiltration practices must also submit:
   1) Construction details and specifications
   2) Timing of construction of infiltration practices
   3) Operation and maintenance plan
   4) Calculations and supporting data for infiltration practices used in overall hydrologic calculations

1.4 Application Review

Complete applications are considered by the SWWD Board of Managers. The District Technical Professional must receive from the applicant a complete review/permit application and all necessary supporting documents a minimum of 22 days prior to a meeting at which the application is to be considered. Applications will not be considered complete until necessary applications are also filed with the Municipality where the project is to take place.

The District Technical Professional will place complete applications on the next applicable board meeting agenda when all required information is received. The Technical Professional will submit a report with recommendations to the Managers along with the complete application.

1.5 Action by Board

The Managers will approve or deny completed applications, in accordance with Minnesota Statutes, Section 15.99, as amended.

1.6 SWWD Permitting

1.6.1 Issuance of Permits

When required, the Board of Managers shall issue a permit when the applicant has satisfied all SWWD rules or a request for a variance is approved and all required fees have been paid and escrows established.

1.6.2 Expiration

All permits issued by SWWD shall remain valid unless:

A) Work is not initiated within one year of permit issuance

B) Work is idle for 12 consecutive months
C) Work is not completed within 3 years of permit issuance date

Any permittee may apply, in writing, for an extension. The application must state the reasons for extension and include any plan changes. Extension applications must be received at least 30 days prior to the permit's expiration. SWWD will consider the application based on the rules in effect on the date the application for extension is received.

1.6.3 Modifications

Modification of approved activity, plans, or specifications requires prior approval of the SWWD Board of Managers.

1.6.4 Project Suspension or Permit Revocation

The SWWD Board of Managers may suspend or revoke a permit that is approved in error or on the basis of incorrect information supplied by the applicant. Managers may also suspend or revoke a project or permit when contractors are violating SWWD Rules, or not fulfilling the conditions of the permit.

1.6.5 Fees and Escrows

SWWD shall charge fees and require escrows in accordance with a schedule adopted annually by written resolution of the Board of Managers and in accordance with Minnesota Statutes 103D.345. Private projects are subject to the SWWD Fee and Escrow Schedule established by written resolution of the Board of Managers. Unused escrows will be returned to project applicant based on a schedule adopted by written resolution of the Board of Managers. Return of unused escrows will be based on the schedule in place at the time the permit was issued.

1.7 Compliance

District or municipal approval of a project or issuance of a District or municipal permit based on incorrect plans, specifications or other data shall not prevent the District from thereafter requiring the correction of errors in the approved plans, specifications, and data, or from preventing any activity being carried on in violation of SWWD rules.

Rule 2 Erosion and Sediment Control

2.1 Policy

2.1.1 Establish consistent methods, procedures, and criteria for erosion and sediment control.

2.2 Applicability

A District permit under Rule 2 is required for the following activities within the District:

A) Land alterations that remove or cover surface vegetation of 1 acre or more,
B) Land disturbing activity on a slope of greater than 12%
C) Land disturbing activity that disturbs more than 100 lineal feet of road ditch, grass waterway, or other land area where surface drainage flows in a defined open channel; including the placement, repair, or removal of any underground pipe utility or other facility within the cross-section of the channel
D) Any new public or private roads or access drives longer than 125 feet
E) Development that requires a subdivision plat, as defined in the applicable local land division ordinance, or
F) Projects that could reasonably be expected to introduce sediment to water resources of the District.

2.3 Standards

2.3.1 Minimum Standards

The minimum sediment and erosion control requirements of the District are those specified in the current NPDES Phase II General Permit for construction activity, as established by the Minnesota Pollution Control Agency. Guidance for selecting appropriate best management practices is provided in the following:

- *SWWD Standards Manual*, 2007
- *Protecting Water Quality in Urban Areas, Best Management Practices for Dealing with Stormwater Runoff from Urban, Suburban and Developing Areas*, MPCA, 2000
- *Minnesota Small Sites BMP Manual, Stormwater Best Management Practices for Cold Climates*, Met Council/Barr Engineering Company, 2001

2.3.2 Municipal Responsibility

Each municipality shall develop an erosion and sediment control ordinance and incorporate erosion and sediment control standards into the municipality's inspection process and ensure that vegetative cover or comparable protection is established before a lot is recorded with the County. All municipalities must identify an Erosion Control Inspector/Specialist and perform inspections and other activities as required by applicable State and Federal Laws.

2.4 Exceptions

A permit under Rule 2 will not be required for traditional agricultural practices provided that a grass or natural vegetation buffer zone extending a minimum of sixteen (16) feet is maintained along any waterbody or wetland and no fertilizer is used in the zone. In addition, mowing or grazing within the buffer zone is prohibited.

Rule 3 Wetland Management

3.1 Policy

3.1.1 Use a functional assessment approach to define a wetlands best value allowing for multiple or singular use.

3.1.2 Maximize the preservation of wetlands providing critical flood control function.

3.1.3 Preserve high priority wetlands.

3.1.4 Participate in wetland permitting activities within the District, in support of the responsible local governmental unit (LGU).

3.2 Applicability

3.2.1 Activities within the District where the primary receiving water body is a wetland as defined by the United States Army Corps of Engineers Manual (1987) are subject to SWWD permit requirements under Rule 3. Wetlands without a SWWD designated management class will require delineation and functional assessment by a wetland professional prior to project application.

3.2.2 Wetlands which are clearly identified in historic local surface water management plans as integral to stormwater conveyance and management under full development may be granted a variance by the SWWD. However, all other applicable permits from other agencies still must be addressed.

3.2.3 Projects for which SWWD receives a Letter of Compliance are not subject to SWWD permitting, unless required under the municipal LWMP or the applicant requests a variance.

3.3 Standards

3.3.1 Wetland Conservation Act

The SWWD has adopted the provisions of the Wetland Conservation Act of 1991 and accompanying rules of the Minnesota Board of Water and Soil Resources (Minnesota Rules Chapter 8420, as amended). The SWWD intends that LGUs administer the Wetland Conservation Act, unless a particular city or township has elected not to assume that role in its jurisdictional area. In these cases, the SWWD will serve as the LGU for administration.

A) The SWWD shall appoint a person to serve on the technical evaluation panel (TEP) in accordance with WCA Rules part 8420.0240. The person must be a technical professional with expertise in administration of the WCA.

B) Exemption, No Loss determinations, and wetland boundary or type determinations under Minnesota Rules parts 8420.0210, 8420.0220, and 8420.0225 shall be made by the LGU. The LGU may seek the advice of the TEP on questions of wetland delineation and type. The LGU's decision is final unless appealed within thirty (30) days of its decision.

C) Sequencing and replacement plan decisions under Minnesota Rule part 8420.0520-8420.0550 shall be made following the same procedures as for SWWD permit review, plus the additional notice and time requirements of part 8420.0230 and as described in this section of the Rules.

D) The functions, values, and acreage lost as a result of a wetland alteration shall be replaced as required by the WCA Rules.

E) The applicant is responsible for ongoing monitoring of wetlands (natural and mitigated) for a period of 5 years to document no net loss due to altered hydrology. Reports will be submitted annually.

F) The SWWD shall ensure that the replacement plan monitoring, vegetative management and enforcement requirements of WCA Rules part 8420.0600-8420.0630 are fulfilled.

G) Any wetland alteration shall not reduce the existing storage volume in the immediate watershed. Storage volume will be determined as stated elsewhere in these Rules.

H) The applicant is to provide all copies needed for proper distribution and recording at the time application is made.

I) Wetland alterations shall meet all other requirements of these Rules.

J) Any requirements or conditions the SWWD deems necessary to ensure the procedures of this section must be carried out.

K) All wetlands within the property of the permitted project shall be:

   1) Delineated by the techniques described in the 1987 Corps of Engineers Wetland Delineation Manual,
   2) Delineated during the May 1 to October 15 growing season, unless otherwise accepted by the TEP,
   3) Evaluated with the Minnesota Routine Assessment Method for Evaluating Wetland Functions, Version 3.0 (MNRAM 3.0) or updated versions, and
   4) Classified according to SWWD's wetland management classification system in Appendix A. Based on the wetland's management classification, proposals must conform to the buffer width requirements, mitigation standards, and hydrologic guidelines in these Rules.

L) A pre-permit application meeting between the permit applicant and the SWWD or TEP is strongly encouraged for all projects involving wetlands and wetland banks.

M) The applicant shall submit five copies of the Combined Wetland Permit Application (CWPA) and one SWWD permit application form for consideration. Once the CWPA has been received, the SWWD with have up to 10 working days to review it for completeness and send a notice of application to the TEP. If the SWWD determines the CWPA is not complete, the permit applicant will be notified. The TEP will be given at least 15 working days to review and comment on the CWPA. The SWWD will review the

application based on the policies and standards of the SWWD Watershed Management Plan, the WCA, and these Rules. After the TEP has been given opportunity to review and comment on the CWPA, the SWWD will prepare and make recommendations to the LGU based on the TEP comments regarding the CEPA's conformance to the WCA rules and guidelines. The permit applicant and any TEP member can request a meeting to further discuss the CWPA at anytime. The LGU will review the TEP recommendations. A *Notice of Decision* will be sent within 10 working days of a decision, in accordance with the WCA Rules part 8420.0230, Subpart 2.

N) For projects requiring wetland replacement, a Wetland Replacement Plan shall be submitted with Part 1 and 2 of the CWPA. The permit review process will be as described in Standard 12.

O) For wetland banking applications, a Bank Application Form and appropriate BWSR forms and checklists shall be submitted. The permit review process will be as described in Standard 12, but a majority of the TEP members must meet on the site prior to the LGU decision. The permit applicant is responsible for obtaining all other permit approvals (i.e. U.S. Army Corps of Engineers)

P) The SWWD may permit the excavation of some wetlands. However, no excavation will be allowed in wetlands classified as Type 7 or Type 8 wetlands as defined by the Cowardin classification system developed by the U.S. Fish and Wildlife Service. The SWWD may permit excavation in existing wetlands when the following apply:

1) All property owners contiguous to the wetland or within 1000 feet of the proposed activity join in the application.
2) The excavated spoil material will not be placed within a wetland.
3) The wetland is a Manage 2 wetland, using SWWD criteria in Appendix B.
4) No more than 50 percent of a Type 1, 2, or 6 wetland is impacted, unless it is an approved action as stated in Minnesota Rules 8420.0541 and will not result in a conversion of wetland to upland or deep water habitat (greater than 2.0 meters).
5) No more than 5% of the total wetland area or one half acre, whichever is less, of a Type 3, 4, or 5 wetland is impacted.

Consideration will be given to allow excavations of excavations of existing wetland areas so that adjacent replacement wetlands are hydrologically and ecologically connected to existing wetlands or if the proposed excavation is certain to result in greater functions and values as determined by MNRAM 3.0 or an updated version.

Q) The decision of the SWWD to approve, approve with conditions, or reject a No Loss, Exemption or Wetland Replacement Plan Application becomes final thirty (30) days after the date on which the decision is mailed to those required to receive notice of the decision.

R) The determination, application, or decision made under these Rules may be appealed to the BWSR under WCA Rules part 8420.0250.

S) Prior to the SWWD issuing a permit for the construction of wetland replacement sites, the permit applicant must submit a draft *Declaration of Restrictions and Covenants*, an *Affidavit of Landowner*, and *Consent to Replacement Wetland*. Once the SWWD Attorney has approved the draft *Declaration of Restrictions and Covenants*, which shall include a metes and bounds survey of the wetland replacement area, the *Declaration of Restrictions and Covenants*, must be recorded. Proof of recording the *Declaration of Restrictions and Covenants* and *Consent to Replacement Wetland*, along with a signed and notarized *Affidavit of Landowner* must be submitted to the SWWD Attorney prior to impacting a wetland.

T) The applicant shall post a cash surety or letter of credit equivalent to 150 percent of the estimated construction cost of the replacement wetland or the cost of obtaining suitable wetland banking credits, to be determined by the permit applicant and approved by the SWWD Engineer. Additional cash sureties may be required based upon conditions imposed on the applicant by the SWWD.

U) Replacement wetlands will require monitoring, vegetation management, and annual reporting for 5 years after completion with possible extensions defined in the WCA Rules part 8420.0600-8420.0630. Monitoring programs are the responsibility of the applicant and to be performed according to the WCA Rules. The SWWD may perform this monitoring and vegetation management under some circumstances, at the expense of the applicant. If at the end of 5 years, the replacement wetland components meet the approved performance standards, future monitoring will not be required.

3.3.2 Water Quantity and Quality

SWWD designates a management class for each inventoried wetland based on its function and susceptibility to stormwater runoff. Water quantity and quality standards are assigned by management class and included in Appendix A. Water quality standards reflect annual conditions. Applicants are responsible for completion of a functional assessment for wetlands not currently inventoried and classified.

3.3.3 Buffer Strips

A) SWWD designates a management class for each inventoried wetland based on its function and susceptibility to stormwater runoff. Buffer standards are assigned by management class and wetland size. Buffer strip standards are listed in Appendix A.

B) Wetland buffer strip requirements apply to any project which has a wetland (as defined by the United States Army Corps of Engineers Manual 1987) wholly or partially within the project limits or is immediately adjacent to the project limits. If a delineated wetland is 100 feet or less from the proposed project limits as indicated by construction boundary, buffer standards will apply.

C) Buffer averaging can be used only when necessary, provided that the minimum buffer width is equal to or greater than one-half the average required buffer width. Additional buffer width is required for slopes greater than 15%; however, this additional width may

be credited towards the overall average width. Buffer width must be expanded horizontally 3-feet per every 1% increase in slope above 15% or to top of bluff, whichever is less.

D) Variances to buffer width requirements may be granted in cases where narrower buffer strips may be necessary to allow a reasonable use of the parcel, as defined by the SWWD, and where, in combination with other best management practices, equivalent water quality treatment performance is provided.

3.3.4 Wetland Mitigation

SWWD designates a management class for each inventoried wetland based on its function and susceptibility to stormwater runoff. Wetland mitigation standards are assigned by management class and are listed in table Appendix A. Applicants are responsible for completion of a functional assessment for wetlands not currently inventoried and classified.

A) Loss of wetland area is considered an impact will be mitigated on-site whenever practical. The project applicant is responsible for demonstrating that on-site mitigation is not technically feasible or sound by a sequencing analysis. Where on-site replacement is determined unsuitable, replacement of wetland impacts shall be located within the hydrologic subwatershed. In such cases, wetland replacements will target areas which exhibit flood prone conditions, as determined by the SWWD. Credits will be allowed for mitigating wetland impacts.

B) Replacement of wetland impacts on projects by public road authorities are provided through the State wetland bank, or through a separate wetland bank managed by the Minnesota Department of Transportation Metro Division.

C) Mitigation of wildlife impacts will be accomplished through maintaining connectivity to surrounding habitat areas.

D) For unavoidable wetland impacts to District "Protect" class wetlands, the associated buffer impact must also be mitigated or created in addition to the wetland mitigation.

3.4 Exceptions

A permit under Rule 3 will not be required for:

3.4.1 Use and maintenance of an unimproved access strip through a buffer, not more than 20 feet in width, for recreational access to a lake, stream, or wetland.

3.4.2 Streambank stabilization or lakeshore erosion control projects.

Rule 4 Waterbody Crossings

4.1 Policy

4.1.1 Minimize property damage and infrastructure loss associated with the overflow of the 100-year, critical duration event.

4.1.2 Protect natural waterways from channel instability induced by additional runoff.

4.2 Applicability

A District permit under Rule 4 is required for work on roads, highways, utilities, or associated structures that cross the bed or bank of any waterbody.

4.3 Standards

4.3.1 Crossings

The portion of a road, highway, utility, or associated structure that crosses the bed or bank of any waterbody shall not be installed, modified, or replaced without first demonstrating a public benefit and ensuring that the crossing will retain adequate hydraulic capacity and navigational capacity if applicable, preserve wildlife passage along each bank, not adversely affect water quality, and represent the "minimal impact" solution to a specific need with respect to all other reasonable alternatives. Projects must follow the DNR manual Best Practices for Meeting DNR General Public Waters Work Permit GP 2004-0001, when applicable. All applicable projects must meet the following:

A) Provide analysis demonstrating the stream's physical characteristics and the effect of the project on hydraulic capacity and water quality
B) Construction must be timed to take advantage of seasons with no or low stream flow.
C) Construction must be timed to avoid spawning seasons if applicable
D) Sizing and placement of stream crossings must meet the following:
    1) Regardless of the stream's width to depth ratio, minimum culvert width shall meet or exceed stream bankfull width. Combined width of multiple culverts is satisfactory
    2) Culvert length shall extend beyond side slope toe
    3) Slope of culvert shall match stream thalweg slope
    4) Culverts shall be buried $1/6^{th}$ of their height
    5) When using multiple culverts, offset culvert inverts. Use the fewest and largest multiples possible. A minimum vertical separation of 1 foot is required between the lowest placed culvert and multiples.
    6) Alignment of culvert shall match stream alignment

Rule 5 Floodplain Management

5.1 Policy

5.1.1 Maintain and explore requirements established for floodplain management, including floodplain alterations, development within floodplains, and minimum building elevations.

5.1.2 Manage floodplains in a manner that reflects the rate and volume of runoff from ultimate development.

5.1.3 Incorporate appropriate opportunities for multiple floodplain uses (e.g., greenspace, recreation, and ecological enhancement).

5.2 Applicability

5.2.1 A District permit under Rule 3 is required for the following activities within the District:

A) Land alterations that remove, cover, or disturb a surface area of one acre or more
B) All work within the waters or floodplains of the District
C) Subdivisions, plats, and developments within a floodplain of the District

5.3 Standards

5.3.1 Flood Level Determination

A) Ultimate development of the tributary watershed or a more critical interim situation shall be assumed.
B) For flood level determination, the design criteria shall be the 2, 10, and 100-year storm events as established in NOAA Atlas 14.
C) Critical storage areas shall be identified through hydrologic modeling and other means.

Flood levels shall be provided, if available, by the District Technical Professional upon request.

5.3.2 Minimum Building Elevations

A) Adjacent to all water resources of the District, the minimum low opening elevation on all buildings will be at least two feet above the 100-year flood elevation or one foot above the emergency overflow of the basin, whichever is greater. The emergency overflow elevation is the elevation at which water will be conveyed from a basin after it exceeds the 100-year flood level.
B) The minimum building elevation for each lot shall be noted on the grading plan.

5.3.3 Floodplain Alterations

The following floodplain alterations are prohibited:

A) Alterations, which are not consistent and in conformance with the Plan. Such alterations may include the outletting of landlocked areas and modifying lake outlet elevations or increasing lake/pond outlet size and discharge rate.
B) Alterations that will unreasonably impact other communities or resources.
C) Alterations, which will unreasonably impact the water resources of the District.
D) Alterations filling portions of the 100-year floodplain without 1:1 mitigation.
E) Alterations not in conformance with applicable Minnesota Law.

5.3.4 Floodplain Preservation and Uses

A) Floodplains adjacent to existing and future waters and waterways shall be preserved by dedication and/or perpetual easement to the community in which they are located. These easements shall cover those portions of the property which are adjacent to the water or waterway and which lie below one (1) foot above the 100-year flood elevation. The local governing unit shall be responsible for all necessary stormwater facility maintenance within the drainage easement.
B) The Board of Managers may determine that certain areas of the District are, or will be, in a flood situation and will designate those areas as critical storage areas.
C) Buildings or other improvements to be located in the floodplain or materials to be stored in the floodplain will be permitted only when:
    1) It can be shown that the building or improvements to be located in the floodplain will not be significantly damaged by flooding; or
    2) It can be shown that the improvements and materials will not unreasonably endanger life or property; or
    3) It can be shown that the improvements and materials will not unreasonably affect the water resource.

Rule 6 Landlocked Basins

6.1 Policy

6.1.1 Maintain requirements established (adopted) for floodplain management including floodplain alterations, development within floodplains, and minimum building elevations.

6.1.2 Maintain the post-development 2-year, 10-year, and 100-year peak rate of runoff at the pre-development level for the critical duration precipitation event, both on-site and at key regional locations identified by the District.

6.1.3 Minimize property damage and infrastructure loss associated with the overflow of the 100-year, critical duration event.

6.2 Applicability

A District permit under Rule 6 is required for the following activities within the District:

A) Land alterations that remove, cover, or disturb a surface area of one acre or more and drain to a landlocked basin, or
B) Projects that propose to outlet a landlocked basin.

6.3 Standards

6.3.1 Stormwater Runoff Volume

Stormwater runoff volume for applicable projects must not exceed the existing runoff volumes for the 2, 10, and 100 year 24 hour duration rainfall event. Projects are subject to Design Criteria in Rule 7.

6.3.2 Outletting

Outlets from landlocked basins are not allowed unless subwatershed planning which results in no negative impacts to downstream resources has been approved by the SWWD.

6.3.3 Minimum Building Elevations

Minimum low openings within areas draining to landlocked basins must be two feet above the natural overflow elevation of the landlocked basin.

Rule 7 Stormwater Management and Water Quality

7.1 Policy

7.1.1 Maintain the post-development 2-year, 10-year and 100-year peak rate of runoff at the pre-development level for the critical duration precipitation event, both on-site and at key regional locations identified by the District.

7.1.2 Reduce the probability of downstream flood damages through the use of maximum allowable inter-municipality / inter-jurisdictional peak discharges and runoff volumes.

7.1.3 Use consistent design standards, evaluation tools and performance measures for managing runoff.

7.1.4 Minimize property damage and infrastructure loss associated with the overflow of the 100-year, critical duration event.

7.1.5 Protect natural waterways from channel instability induced by additional runoff.

7.1.6 Use design criteria and performance standards to ensure appropriate best management practices (BMP) for mitigating development impacts to surface and groundwater resources.

7.1.7 Use innovative methods and techniques to maintain and improve water quality when appropriate.

7.2 Applicability

7.2.1 A District permit under Rule 7 is required for the following activities within the District:

A) Land alterations that remove, cover, or disturb a surface area of one acre or more, or
B) Result in the augmentation or diversion of stormwater to a receiving water body

7.2.2 In case of emergency action performed without a District Permit, the Managers shall be notified of the action and pertinent facts as soon as possible. A permit shall be required so that the action taken conforms to the Plan and Rules. In the event the Managers determine the facts do not warrant issuance of a permit (retroactive), the action will be considered a violation of these Rules and Regulations and treated accordingly.

7.3 Standards

7.3.1 Stormwater Peak Runoff Rate

The on-site rate of stormwater runoff for all proposed projects must not exceed the pre-project runoff rates for the 2, 10, and 100 year 24 hour duration rainfall events as estimated by NOAA Atlas 14 (http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=mn). Where timing of peak runoff is of particular concern, SWWD may require a critical duration event analysis. BMPs should be designed following guidance provided in the SWWD Standards Manual or MN Stormwater Manual.

7.3.2 Stormwater Runoff Volume

All projects must maintain the annual average existing conditions infiltration capacity of the site. Standard is applied to entire site, expressed as total annual runoff volume resulting from typical climatic conditions. Public Improvement projects are exempt from Rule 7.3.2. Requirement may be met through credits earned for projects within the same subwatershed. BMPs should be designed following guidance provided in the SWWD Standards Manual or MN Stormwater Manual.

7.3.3 Stormwater Quality

A) All projects must meet minimum NPDES Phase II Permit requirements for on-site treatment.

B) All projects must provide treatment necessary to meet applicable annual total phosphorus loading rates listed below, or maintain existing loading rates, whichever is less.

Receiving Water body	Maximum Allowable Total Phosphorus Loading Rate(lbs/ac/yr)
Armstrong Lake	0.18
Colby Lake	0.34
La Lake	1.65
Markgrafs Lake	0.61
Mississippi River	0.22
Powers Lake	0.06
Ravine Lake	0.075
Wilmes Lake	0.10

C) All projects must provide treatment necessary to provide a net reduction of off-site Total Suspended Solids (TSS) discharge rates from existing conditions on an average annual basis.

C) No direct (untreated) discharges of stormwater to natural or improved waterbodies are allowed.

D) BMPs should be designed following guidance provided in the SWWD Standards Manual or MN Stormwater Manual. Phosphorus removal rates in excess of maximum removal rates listed in table 10.6 of the MN Stormwater Manual may not be claimed.

7.3.4 Alternative Compliance Sequencing

Sites with the following characteristics are generally unsuitable for infiltration practices:

A) Runoff originating from fueling and vehicle maintenance areas;
B) Within HSG D type soils;
C) Within 100 feet of a private well or within the emergency response zone for a wellhead protection area;
D) Within 50 feet of a septic tank or drain field;
E) On areas with less than 3 feet vertical separation from the bottom of the infiltration system to the elevation of seasonal high groundwater or top of bedrock; or
F) Within 300 feet of an identified sinkhole or other karst feature.

For sites where infiltration practices are determined to be unsuitable for on-site infiltration, the following Alternative Compliance Sequencing steps shall be taken in the order shown:

A) Use of alternative volume control practices as described in the Minnesota Stormwater Manual, 2005, and as amended, sized according to Rule 7.3.2.
B) Use of on-site filtration practices and biofiltration using an impermeable liner and under drain, sized to filter a volume of runoff according to Rule 7.3.2.
C) Use of off-site volume control practices sized according to Rule 7.3.2. Off-site volume control practices can be used to provide for stormwater management based on the following criteria:
    1) New off-site practices shall be constructed within the same drainage area or subwatershed as the project site.
    2) Off-site practices are required to be constructed and operational prior to constructing imperviousness within the contributing drainage area.
    3) Routine maintenance of existing structural BMPs is not acceptable for mitigation.
D) Use of wet sediment basins sized per the standard described within the MPCA General Construction Permit, 2003, and as amended.

7.3.5 Maintenance and Easement

A) Stormwater management easements shall be provided by the applicant for access for facility inspections and maintenance and preservation of stormwater runoff conveyance, infiltration, and dentition areas and facilities, including the overflow route.
B) Land use for stormwater management facilities which lie below the 100 year flood elevation shall be preserved by dedication and or perpetual easement to the LGU.
C) A maintenance agreement shall be recorded with the County as part of the LGU development approval process. Minimum requirements for the maintenance agreement include:
    1) A list of the responsible party(s) (LGU and facility owner/manager)
    2) Contact information
    3) A formalized maintenance schedule, with scheduled activities
    4) A "Failure to Perform" provision laying out remedial actions if the responsible party does not perform as expected
    5) Maintenance debris handling plans
    6) Emergency response

D) Municipalities will determine responsibility for maintenance of stormwater management facilities within Municipal easements. SWWD will require maintenance or retrofitting of facilities when it can show failure of the facility to meet approved design specifications or standards. SWWD encourages municipalities to collect sureties from developers to be held in escrow for future stormwater maintenance or retrofitting or otherwise take steps to ensure maintenance.

7.3.6 Regional Assessment

SWWD will evaluate proposed projects for cumulative effects on a subwatershed basis, assuming full development to ensure there are no unanticipated, adverse downstream regional impacts. Based on Regional Assessment, SWWD may apply more stringent standards or require alternative design approaches for all future development in the subwatershed.

7.4 Trading and Credits

Non-residential development and non-residential re-development projects may earn credits for reducing flow volume from a site. Credits may be awarded as a reduction in the Storm Water Utility Fee, or may be transferred for use in meeting the SWWD volume standard on another project within the same subwatershed. Credit calculation methods and program requirements will be set by the SWWD Board of Managers.

7.5 Design Criteria

Applicable activities must comply with the following design criteria:

A) Applicants must follow modeling guidance provided in the Standards Manual (Appendix B)
B) Detention ponds are not acceptable for meeting volume control standards.
C) Regional infiltration facilities, those which receive drainage from greater than ten acres or can provide temporary maximum storage for more than one inch of runoff depth from the total contributing impervious area, should not be used in areas of low suitability (Map 6.5 SWWD WMP). Where suitability is marginal or low, regional infiltration basins should have contingency plans developed for how to manage and respond to chemical spills that may enter the drainage network.
D) Where new or increased discharges to open channels are proposed:
    1) It must be demonstrated that design velocities will not cause channel instability during the 100 year event.
    2) Appropriate energy dissipation at the outfall is required.
    3) A maintenance plan should be developed to illustrate how accumulated sediment will be handled or how channel failures will be remediated.
    4) Where possible, open channels should include buffers of herbaceous vegetation and should provide connectivity with adjacent upland habitat.
    5) For channels three feet or less in depth, one half foot of freeboard shall be provided.

6) For channels deeper than three feet and up to five feet in depth, one foot of freeboard shall be provided.

E) To the maximum extent practicable, the volume control rule shall be fully met onsite. Site conditions may make infiltration undesirable or impossible. The applicant must make soil corrections and/or investigate other locations on the site for feasible infiltration locations. Infiltration practices are not allowed in the following circumstances:
   1) For runoff from fueling and vehicle maintenance areas;
   2) Within HSG D type soils;
   3) Within 100 feet of a private well or within the emergency response zone for a wellhead protection area (1-year time of travel);
   4) Within 50 feet of a septic tank or drain field;
   5) On areas with less than 3 feet vertical separation from the bottom of the infiltration system to the elevation of seasonal high groundwater or top of bedrock; or
   6) Within 300 feet of an identified sink hole or other Karst feature.

F) If the applicant claims that infiltration is not feasible or allowed onsite, the applicant must provide supporting documentation and follow Rule 7.3.5.

G) A minimum buffer width of 60 feet is required for new developments along areas defined as a bluff or ravine.

7.6 Exceptions

The following projects or activities are generally exempt from the standards of Rule 7.

A) Traditional Agriculture

B) Exempt Public Improvements

Rule 8 Groundwater Management

8.1 Policy

8.1.1 Promote the use of optimal infiltration areas which achieve reasonable reductions in surface water runoff volume which minimize risk to groundwater quality.

8.2 Applicability

A District permit under Rule 4 is required for the following activities within the District:

A) Land alterations that remove, cover, or disturb a surface area of one acre or more, or
B) Proposed projects on sites with known karst features.

8.3 Standards

8.3.1 Karst

Karst sensitivity analysis is required for projects located in karst sensitive areas as defined by the SWWD. A map of karst sensitive areas shall be provided by the District technical professional. At a minimum, the following are required:

A) Site review to identify any active karst features including sinkholes, springs, caves, or sinking streams, and
B) All active karst features located during a project must be reported to SWWD upon discovery. Additionally, the following actions are recommended:
    1) Developers, communities, public works agents and others managing stormwater should conduct thorough geotechnical investigations prior to proceeding with projects or building in active karst areas. The level of geotechnical investigation will depend on the likelihood of active karst being present. Karst features should be identified and reported to the appropriate state (such as DNR and MGS) and local agencies (such as the city, township or county). Any known occurrences should be surveyed for specific location and permanently recorded on the property deed. For transition karst areas, local discretion and the likelihood of karstic features should be used to determine the amount of geotechnical investigation.
    2) Knowledge of or the presence of sinkholes is an absolute indication of active karst. In these cases, an easement or reserve area should be identified on the development plats for the project so that all future landowners know of the presence of active karst on their property.
    3) In many cases, identified sinkholes can and should be remediated and stormwater directed away. In other cases, remediation is not possible and the normal regional hydrologic patterns must be maintained. In this case, however, precautions should be taken to extensively pretreat any water that drains into a known sinkhole area. If at all possible, runoff should be routed away from active karst features.
    4) Discharges from stormwater management facilities or directly from impervious surfaces should not be routed directly to a sinkhole.

5) Sinkholes developing within stormwater management facilities should be reported to the MGS and MDH as soon as possible after the first observation of occurrence. They should then be repaired, abandoned, adapted, managed and/or observed for future changes, whichever of these are appropriate.
6) Where ponds and wetlands are deemed necessary, they should be designed and constructed with a properly engineered liner approved by the District. A minimum of three feet of unconsolidated soil material should exist between the bottom of the pond or wetland and the surface of the bedrock layer. Pond and wetland depths should be fairly uniform and limited to no more than ten feet in depth.

Rule 9 Water Appropriation

9.1 Policy

9.1.1 Manage groundwater using a regional and local approach.

9.2 Applicability

All proposed appropriations of surface or groundwater are subject to permit under Rule 9.

9.3 Standards

9.2.1 In all cases of appropriation of waters requiring a DNR permit, a copy of the permit application must be filed with the Managers for their review and approval.

9.2.2 The Managers will act on the DNR permit application within 30 days, or as required by the DNR, after receipt of the complete application.

Rule 10 Greenways and Open Spaces

10.1 Policy

10.1.1 Coordinate placement of stormwater management practices such as ponds to minimize potential negative impacts to greenways or open spaces due to seasonal aesthetic concerns, or to minimize potential functional (fragmentation) issues with the landscape.

10.1.2 Identify and protect key natural areas with multiple benefits including groundwater recharge.

10.2 Applicability

A District permit under Rule 10 is required for the following activities within the District:

A) Land alterations that remove, cover, or disturb a surface area of one acre or more, or
B) Result in the augmentation or diversion of stormwater to a receiving water body

10.3 Standards

10.3.1 Greenway and Open Space Protection

Greenways and open space protection will be considered by the SWWD Board of Managers when evaluating applications for alterations to wetlands, buffer areas, floodplains, shoreline areas and for water crossings and placement of stormwater management practices.

Rule 11 Illicit Discharge and Connection

11.1 Policy

11.1.1 Use design criteria and performance standards to ensure appropriate best management practices (BMP) for mitigating development impacts to surface and groundwater resources

11.2 Applicability

This Rule shall apply to all water entering the storm drain system of the District's MS4 generated on any developed and undeveloped lands unless explicitly exempted by the District. A permit and stormwater management plan is required under this rule for new direct connections and replacement of existing connections to the District's MS4.

11.3 Standards

11.3.1 Connection to the District's MS4 System

A) New direct connections and replacement of existing connections will be completed using a method that is approved by the District.

B) Peak flow rate, the total volume of flow, and the timing of the flow for new connections must be managed to not cause new water conveyance problems or exacerbate existing water conveyance problems. Enlargement of existing connections is considered a new connection.

11.3.2 Discharge Prohibitions

A) No person or political subdivision shall discharge or cause to be discharged into the municipal storm drain system or watercourses any materials, including but not limited to pollutants that cause or contribute to a violation of applicable water quality standards, other than stormwater.

B) The construction, use, maintenance or continued existence of illicit connections to the storm drain system without a District permit is prohibited.

   a. This prohibition expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.

   b. A person is considered to be in violation of this Rule if the person connects a line conveying sewage to the District's MS4, or allows such a connection to continue.

11.3.3 Suspension of MS4 Access

A) The District may, without prior notice, suspend MS4 discharge access when such suspension is necessary to stop an actual or threatened discharge which presents or may present imminent and substantial danger to the environment, or to the health or welfare of persons, or to the District's MS4 or Waters of the United States. If the violator fails to comply with a suspension order issued in an emergency, the District may

take steps as deemed necessary to prevent or minimize damage to the District's MS4 or Waters of the United States, or to minimize danger to persons or the environment.

B) Any person discharging to the District's MS4 in violation of this Rule may have their MS4 access terminated if such termination would abate or reduce an illicit discharge. The District will notify a violator of the proposed termination of its MS4 access. The violator may petition the District for a reconsideration and hearing. A person commits an offense subject to enforcement if the person reinstates MS4 access to premises terminated pursuant to this Section, without the prior approval of the District.

11.3.4 Monitoring of Discharges

All facilities that have storm water discharges associated with industrial activity, including construction activity, shall comply with the following:

A) The District shall be permitted to enter and inspect facilities subject to regulation under this Rule as often as may be necessary to determine compliance with this Rule. The discharger shall make the necessary arrangements to allow access to representatives of the District.

B) Facility operators shall allow the District ready access to all parts of the premises for the purposes of inspection, sampling, examination and copying of records that must be kept under conditions of an NPDES permit to discharge storm water, and the performance of any additional duties as defined by state and federal law.

C) If the District has been refused access to any part of the premises from which stormwater is discharged, then the District may seek issuance of a search warrant from any court of competent jurisdiction.

11.3.5 Requirement to Prevent, Control, and Reduce Stormwater Pollutants by the Use of Best Management Practices.

The owner or operator of a commercial or industrial establishment shall provide, at their own expense, reasonable protection from accidental discharge of prohibited materials or other wastes into the municipal storm drain system or watercourses through the use of these structural and non-structural BMPs. Any person responsible for a property or premise, which is, or may be, the source of an illicit discharge, may be required by the District to implement, at said person's expense, additional structural and non-structural BMPs to prevent the further discharge of pollutants to the municipal separate storm sewer system.

11.3.6 Watercourse Protection

Every person owning property, through which a watercourse passes, shall keep and maintain that part of the watercourse within the property free of trash, debris, and other obstacles that would pollute, contaminate, or significantly retard the flow of water through the watercourse. In addition, the owner or lessee shall maintain existing privately owned structures within or adjacent to a watercourse, so that such structures will not become a hazard to the use, function, or physical integrity of the watercourse.

11.3.7 Notification of Spills

Notwithstanding other requirements of law, as soon as any person responsible for a facility or operation, or responsible for emergency response for a facility or operation has information of any known or suspected release of materials which result or may result in illegal discharges or pollutants discharging into storm water, the storm drain system, or water of the U.S., said person shall take all necessary steps to ensure the containment and cleanup of such release. In the event of such a release of hazardous materials, said person shall immediately notify emergency response agencies of the release. In the event of a release of non-hazardous materials, said person shall notify the District in person or by phone or facsimile no later than the next business day following discovery of the release.

11.4 Enforcement

11.4.1 Notice of Violation

Whenever the District finds that a person has violated a prohibition or failed to meet a requirement of this Rule, the District may order compliance by written notice of violation to the responsible person. Such notice may require without limitation:

A) The performance of monitoring, analyses, and reporting;
B) The elimination of illicit connections or discharges;
C) That violating discharges, practices, or operations shall cease and desist;
D) Payment of fee to cover administrative and remediation costs;
E) The implementation of source control or treatment BMPs.

11.4.2 Abatement

If abatement of a violation and/or restoration of affected property is required, the notice shall set forth a deadline within which such remediation or restoration must be completed. Said notice shall further advise that, should the violator fail to remediate or restore within the established deadline, the work will be done by a designated governmental agency or a contractor and the expense thereof shall be charged to the violator.

11.4.3 Appeal of Notice of Violation

Any person receiving a Notice of Violation may appeal the determination of the Disctrict. The notice of appeal must be received within 5 days from the date of the Notice of Violation. Hearing on the appeal before the District Board of Managers shall take place within 15 days from the date of receipt of the notice of appeal. The decision of the District shall be final.

11.4.4 Enforcement Measures after Appeal

If the violation has not been corrected pursuant to the requirements set forth in the Notice of Violation, or, in the event of an appeal, within 3 days of the decision of the District Board of Managers, then representatives of the District are authorized to take any and all measures necessary to abate the violation and/or restore the property. It shall be unlawful for any person, owner, agent or person in possession of any premises for the purposes set forth above.

11.4.5 Cost of Abatement

Within 30 days after abatement of the violation, the District shall notify the property owner of the cost of abatement, including administrative costs. The property owner may file a written protest objecting to the amount of the assessment within 10 days. If the amount due is not paid within a timely manner as determined by the decision of the District Board of Managers, the charges shall become a special assessment against the property and shall constitute a lien on the property for the amount of the assessment.

11.4.6 Injunctive Relief

It shall be unlawful for any person to violate any provision or fail to comply with any of the requirements of this Rule. If a person has violated or continues to violate the provisions of this Rule, the District may petition for a preliminary or permanent injunction restraining the person from activities which would create further violations or compelling the person to perform abatement or remediation of the violation.

11.4.7 Violations Deemed a Public Nuisance

In addition to the enforcement processes and penalties provided, any condition caused or permitted to exist in violation of the provisions of this Rule is a threat to public health, safety, and welfare, and is declared and deemed a nuisance, and may be summarily abated or restored at the violator's expense, and/or a civil action to abate, enjoin, or otherwise compel the cessation of such nuisance may be taken.

11.4.8 Relation to Other Rules

None of the enforcement provisions of this Rule shall abridge or alter the right of the District to seek remedies provided for under Rule 11 herein.

11.5 Exceptions

A) The following discharges are exempt from discharge prohibitions established by this Rule:
   1) Water line flushing or other potable water sources;
   2) Landscape irrigation or lawn watering;
   3) Diverted stream flows;
   4) Rising ground water;
   5) Ground water infiltration to storm drains;
   6) Uncontaminated pumped ground water;
   7) Foundation or footing drains (not including active ground water dewatering systems);
   8) Crawl space pumps;
   9) Air conditioning condensation;
   10) Springs;
   11) Non-commercial washing of vehicles;
   12) Natural riparian habitat or wetland flows;
   13) Swimming pools (if dechlorinated – typically less than one PPM chlorine);

14) Firefighting activities;
15) Street wash water;
16) And any other water source not containing pollutants.

B) Discharges specified in writing by the District as being necessary to protect public health and safety.

C) Dye testing is an allowable discharge, but requires a verbal notification to the District prior to the time of the test.

D) Any non-storm water discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for any discharge to the storm drain system.

Rule 12 Variances

12.1 Applicability

The Board of Managers may grant variances from these Rules when they find that due to unique physical conditions of the land or waters involved, extraordinary and unnecessary hardship may result from strict compliance. Such variances will not have the effect of nullifying the intent and purpose of these Rules or the WMP.

12.2 Standards

12.2.1 Application

An application for a variance shall be submitted to the Managers and shall document the exceptional conditions and peculiar hardship claimed and resulting impacts for approval of the variance.

12.2.2 Board Action

The Board shall approve or deny the variance within 60 days of receipt of a variance request in accordance with MN statute 15.99, as amended.

12.2.3 Expiration

A variance shall become void one year after granted unless used.

Rule 13 Enforcement and Severability

13.1 Enforcement

13.1.1 Violations

Violation of these Rules, a stipulation agreement made with the District, or a permit issued by the Board of Managers pursuant these Rules is a misdemeanor.

13.1.2 District Court Action

The Board of Managers may exercise all powers conferred upon it by Minnesota Statutes Chapter 103D in enforcing these Rules, including criminal prosecution, injunction, action to compel performance, restoration, abatement, or other appropriate action.

13.1.3 Administrative Order

The District may issue a cease and desist order when it finds that a proposed or initiated project presents a serious threat of flooding, soil erosion, sedimentation, or adverse effect on water quality or otherwise violates any Rule of the District.

13.2 Severability

If for any reason a section or subdivision of these Rules should be held invalid, such designation shall not affect the validity of the remaining Rules.

Appendix A

Figure VI.3.3.1
SWWD Wetland Management Plan
Decision Flow Chart

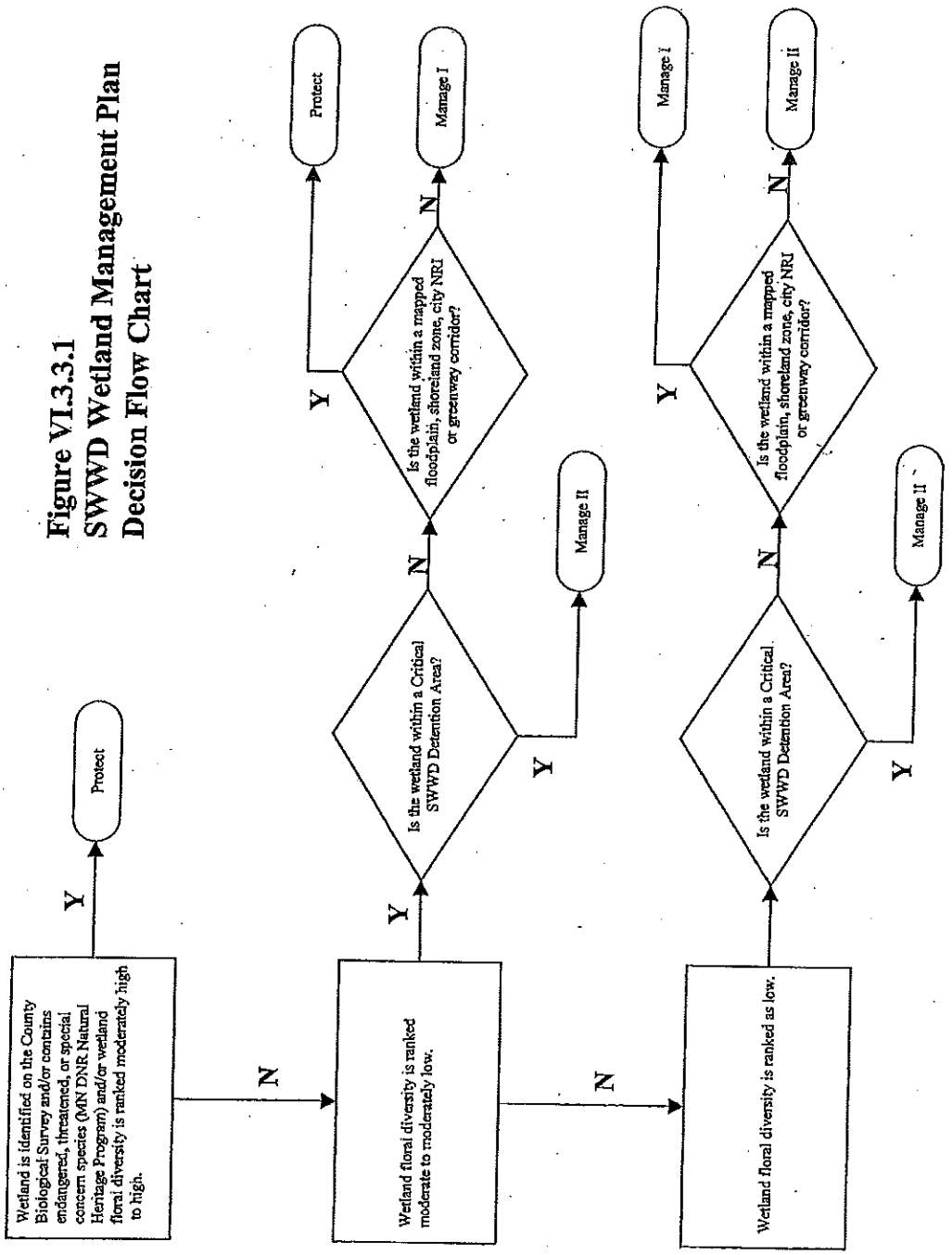


Table 5.3: Protection standards for wetland management classes

Criteria	Protect	Manage 1	Manage 2
Water Quality			
Phosphorus Inflow Load (average annual pounds)	Maintain predevelopment	60% post-development load reduction	60% post-development load reduction
Water Quantity			
Storm bounce 10-year rainfall	Existing	Existing plus 1.0 foot	No limit
Discharge rate (inflow) 2-year & 100-year rainfall	Existing	Existing or less	Existing or less
Inundation period 1-year rainfall	Existing	Existing plus 2 days	Existing plus 7 days
Inundation period 2-year rainfall	Existing	Existing plus 14 days	Existing plus 14 days
Run-out control elevation (free flowing)	No change	0 to 1.0 feet above existing run out	0 to 4.0 feet above existing run out
Run-out control elevation (landlocked)	Based on SWWD Floodplain Map	Based on SWWD Floodplain Map	Based on SWWD Floodplain Map
Buffer Width			
Wetlands < 1 acre	75 feet	50 feet	25 feet
Wetlands > 1 acre	100 feet	75 feet	50 feet
Impact Mitigation			
Area replacement ratio	3:1	2:1	2:1
Volume replacement ratio	2:1	2:1	2:1

1) Proposed developments that may affect a wetland area must maintain the annual average predevelopment infiltration capacity of the site. Predevelopment infiltration capacity will be evaluated over the entire site and expressed as total annual runoff volume resulting from typical climatic conditions. Maximum phosphorus runoff concentrations for predevelopment conditions cannot exceed 0.320 mg/L.
2) Rainfall events are 24-hour duration, following Rule 7.3.1.

Appendix G: System Improvements for Water Quality

Appendix G - System Improvements for Water Quality
(Based on Recommendations in the 2000 Draft SWMP)

2008/2018 Draft SWMP Pond Name	1999 Draft SWMP Pond Name	Pond Excavation	Pond Cost	Special Structure Cost	15% Engineering Costs	10% Admin./ Legal Costs	10% Contingency Costs	Total Cost	Rounded Total Cost
		(acre-feet)	($)	($)	($)	($)	($)	($)	($)
Central District									
C-P2	C-P73.1	4.5	$36,564	$5,036	$6,240	$4,784	$5,262	$57,886	$57,900
C-P3	C-P74.1	0	$0	$5,036	$755	$579	$637	$7,008	$7,100
C-P4	C-P72.1	3.3	$26,813	$8,813	$5,344	$4,097	$4,507	$49,574	$49,600
C-P5	C-P70.1	3.75	$30,470	$5,036	$5,326	$4,083	$4,491	$49,406	$49,500
C-P8	C-P77.1	5	$40,626	$5,036	$6,849	$5,251	$5,776	$63,539	$63,600
East Draw District									
ED-P1	ED-P81.1	0.2	$1,625	$5,036	$999	$766	$843	$9,269	$9,300
ED-P3	ED-P82.1	3	$24,376	$5,036	$4,412	$3,382	$3,721	$40,926	$41,000
ED-P4	ED-P82.2	0.2	$1,625	$5,036	$999	$766	$843	$9,269	$9,300
ED-P8	ED-P84.1	5.5	$44,689	$5,036	$7,459	$5,718	$6,290	$69,192	$69,200
Langdon District									
L-P1	L-P93.1	0.6	$4,875	$0	$731	$561	$617	$6,784	$6,800
L-P5	L-P100.1	5.5	$44,689	$0	$6,703	$5,139	$5,653	$62,185	$62,200
Thompson Grove District									
TG-P1.2	WD-P46.1	1	$8,125	$5,040	$1,975	$1,514	$1,665	$18,319	$18,400
TG-P2	WD-P48.1	1.05	$8,532	$5,040	$2,036	$1,561	$1,717	$18,885	$18,900
TG-P3	WD-P49.1	2	$16,251	$5,040	$3,194	$2,448	$2,693	$29,626	$29,700
TG-P4	TG-P53.1	22.5	$182,818	$5,040	$28,179	$21,604	$23,764	$261,405	$261,500

Notes:

1. The cost information above is taken directly from the 2000 draft SWMP - Appendix E (Design Trunk/Pond Cost), and revised to reflect 2019 RSMeans Construction Cost Index adjustments.

2. All of the ponds identified above are existing ponds.

3. Cost information (included future trunk pipe costs, excavation costs for future ponds, and outlet costs for future ponds) identified in the 2000 draft SWMP Appendix E (Design Trunk/Pond Cost) are not shown above. This information has been revised since the 2000 plan and can be found in Appendix D of this SWMP.

4. The first column above titled "2008 Draft SWMP Pond Name" links the current SWMP pond name to the name of the same pond in the 2000 draft SWMP, for the pond naming scheme has been revised since the 2000 plan.

5. The improvement costs above should be reviewed and re-evaluated in the context of new regulations, requirements, and priorities that have arisen since these costs were developed, including NPDES, non-degradation and TMDLs.

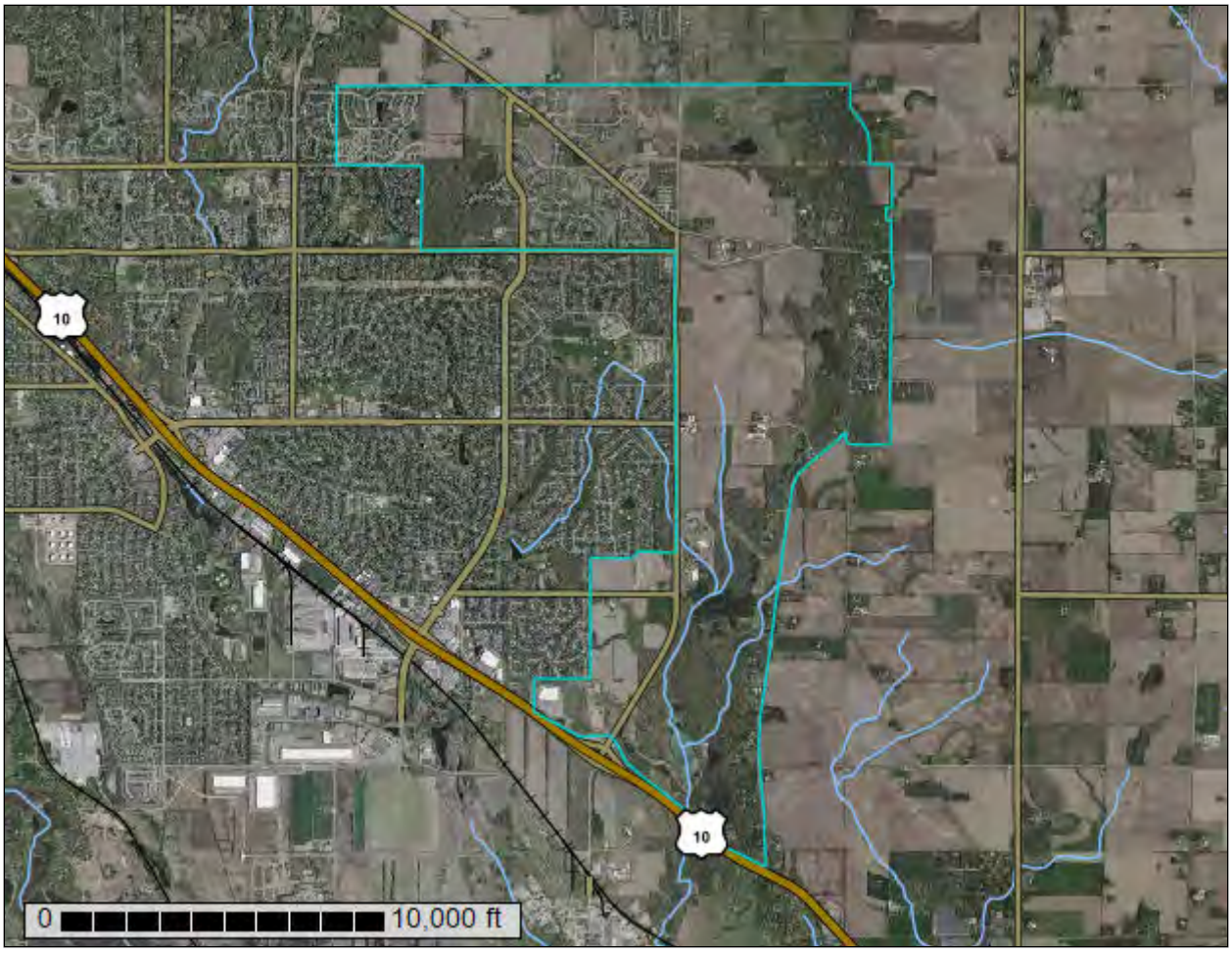
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Washington County, Minnesota



July 21, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

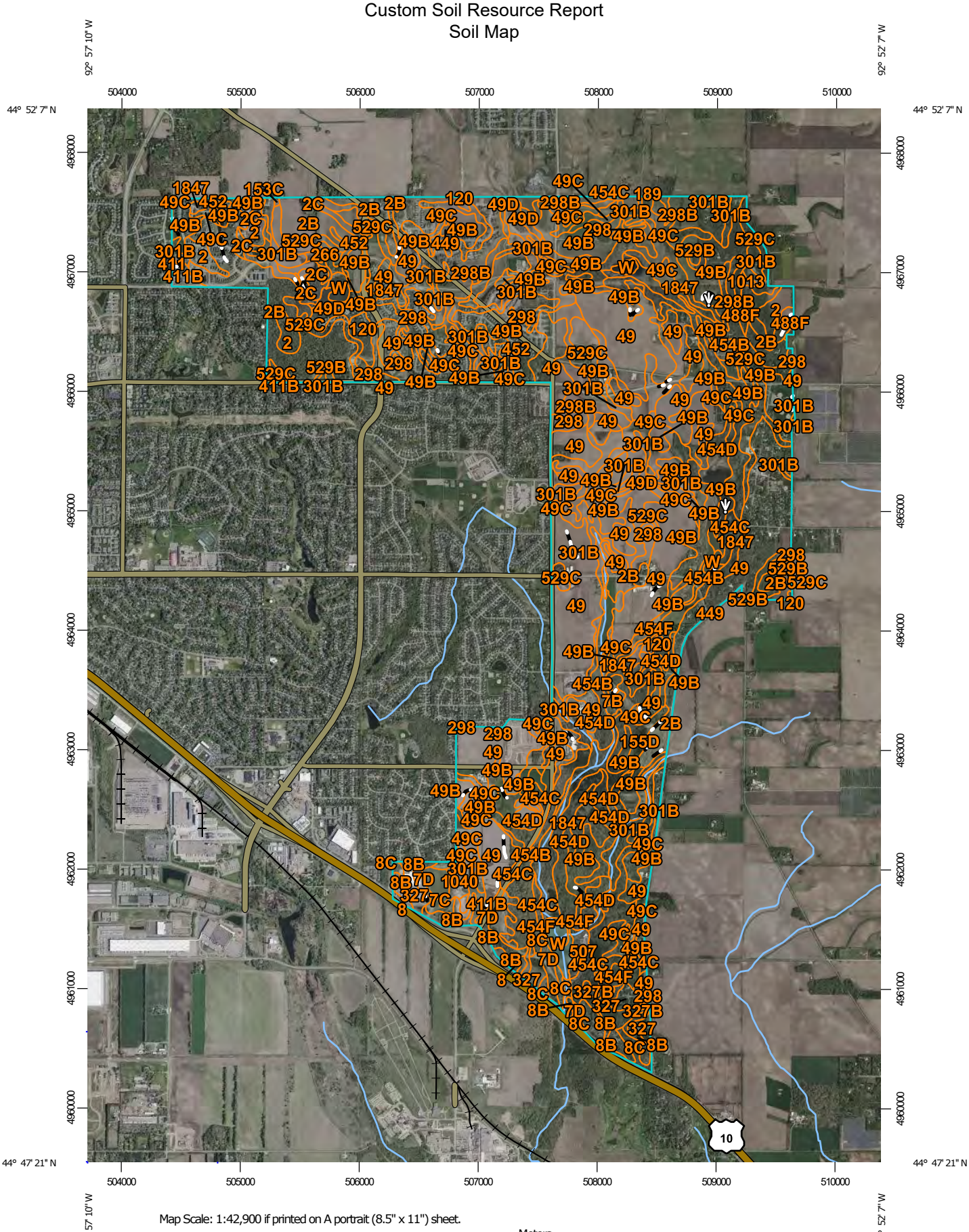
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:42,900 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 500 1000 2000 3000

Feet
0 2000 4000 8000 12000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washington County, Minnesota
Survey Area Data: Version 20, Sep 7, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 1, 2024—Jul 1, 2024

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
2	Ostrander silt loam, 0 to 2 percent slopes	50.4	1.3%
2B	Ostrander silt loam, 2 to 6 percent slopes	259.4	6.5%
2C	Ostrander silt loam, 6 to 12 percent slopes	13.4	0.3%
7B	Hubbard loamy sand, 1 to 6 percent slopes	1.9	0.0%
7C	Hubbard loamy sand, 6 to 12 percent slopes	4.8	0.1%
7D	Hubbard loamy sand, 12 to 18 percent slopes	44.5	1.1%
8	Sparta loamy sand, 0 to 2 percent slopes	3.8	0.1%
8B	Sparta loamy sand, 2 to 6 percent slopes	60.0	1.5%
8C	Sparta loamy sand, 6 to 15 percent slopes	21.2	0.5%
49	Antigo silt loam, 0 to 2 percent slopes	834.9	20.8%
49B	Antigo silt loam, 2 to 6 percent slopes	966.7	24.1%
49C	Antigo silt loam, 6 to 15 percent slopes	296.7	7.4%
49D	Antigo silt loam, 15 to 35 percent slopes	54.1	1.3%
120	Brill silt loam	29.1	0.7%
153C	Santiago silt loam, 6 to 15 percent slopes	0.7	0.0%
155D	Chetek sandy loam, 12 to 25 percent slopes	23.1	0.6%
189	Auburndale silt loam, 0 to 2 percent slopes	8.5	0.2%
266	Freer silt loam	7.1	0.2%
298	Richwood silt loam, 0 to 2 percent slopes	78.9	2.0%
298B	Richwood silt loam, 2 to 6 percent slopes	75.0	1.9%
301B	Lindstrom silt loam, glaciated, 2 to 4 percent slopes	185.9	4.6%
327	Dickman sandy loam, 0 to 2 percent slopes	29.4	0.7%
327B	Dickman sandy loam, 2 to 6 percent slopes	2.6	0.1%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
411	Waukegan silt loam, 0 to 2 percent slopes	12.9	0.3%
411B	Waukegan silt loam, 2 to 6 percent slopes	12.8	0.3%
449	Crystal Lake silt loam, 0 to 3 percent slopes	13.2	0.3%
452	Comstock silt loam, 0 to 3 percent slopes	17.4	0.4%
454B	Mahtomedi loamy sand, 0 to 6 percent slopes	21.5	0.5%
454C	Mahtomedi loamy sand, 6 to 12 percent slopes	56.1	1.4%
454D	Mahtomedi loamy sand, 12 to 25 percent slopes	248.5	6.2%
454F	Mahtomedi loamy sand, 25 to 40 percent slopes	235.7	5.9%
488F	Brodale flaggy loam, 20 to 50 percent slopes	21.2	0.5%
507	Poskin silt loam	1.2	0.0%
529B	Ripon silt loam, 2 to 6 percent slopes	9.3	0.2%
529C	Ripon silt loam, 6 to 12 percent slopes	146.5	3.6%
541	Rifle muck	3.8	0.1%
543	Markey muck	15.2	0.4%
857C	Urban land-Waukegan complex, 3 to 15 percent slopes	12.2	0.3%
1013	Pits,quarry	2.6	0.1%
1040	Udorthents	13.6	0.3%
1847	Barronett silt loam, sandy substratum	94.8	2.4%
W	Water	24.6	0.6%
Totals for Area of Interest		**4,015.0**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some

observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The

pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Washington County, Minnesota

2—Ostrander silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1t92z
Elevation: 850 to 1,030 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ostrander and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ostrander

Setting

Landform: Loess hills
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over till

Typical profile

Ap,A - 0 to 14 inches: silt loam
Bw1 - 14 to 30 inches: silt loam
2Bw2 - 30 to 36 inches: loam
2C - 36 to 60 inches: clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Ecological site: F090AY015WI - Loamy Upland with Carbonates
Forage suitability group: Sloping Upland, Acid (G090XN006MN)
Other vegetative classification: Sloping Upland, Acid (G090XN006MN)
Hydric soil rating: No

Minor Components

Baytown

Percent of map unit: 4 percent

Hydric soil rating: No

Waukegan

Percent of map unit: 3 percent
Hydric soil rating: No

Gale

Percent of map unit: 3 percent
Hydric soil rating: No

2B—Ostrander silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1t930
Elevation: 840 to 1,050 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ostrander and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ostrander

Setting

Landform: Loess hills
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over till

Typical profile

Ap,A - 0 to 14 inches: silt loam
Bw1 - 14 to 30 inches: silt loam
2Bw2 - 30 to 36 inches: loam
2C - 36 to 60 inches: clay loam

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F090AY015WI - Loamy Upland with Carbonates
Forage suitability group: Sloping Upland, Acid (G090XN006MN)
Other vegetative classification: Sloping Upland, Acid (G090XN006MN)
Hydric soil rating: No

Minor Components

Baytown

Percent of map unit: 4 percent
Hydric soil rating: No

Gale

Percent of map unit: 3 percent
Hydric soil rating: No

Waukegan

Percent of map unit: 3 percent
Hydric soil rating: No

2C—Ostrander silt loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 1t931
Elevation: 900 to 1,050 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Ostrander and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ostrander

Setting

Landform: Loess hills
Landform position (two-dimensional): Backslope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess over till

Typical profile

Ap,A - 0 to 14 inches: silt loam
Bw1 - 14 to 30 inches: silt loam
2Bw2 - 30 to 36 inches: loam

2C - 36 to 60 inches: clay loam

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 25 percent
Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F090AY015WI - Loamy Upland with Carbonates
Forage suitability group: Sloping Upland, Acid (G090XN006MN)
Other vegetative classification: Sloping Upland, Acid (G090XN006MN)
Hydric soil rating: No

Minor Components

Ripon

Percent of map unit: 4 percent
Hydric soil rating: No

Baytown

Percent of map unit: 3 percent
Hydric soil rating: No

Lindstrom

Percent of map unit: 3 percent
Hydric soil rating: No

7B—Hubbard loamy sand, 1 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1t932
Elevation: 700 to 1,500 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Hubbard and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hubbard

Setting

Landform: Outwash plains
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Outwash

Typical profile

Ap,AB - 0 to 20 inches: loamy sand
Bw - 20 to 35 inches: sand
C - 35 to 60 inches: sand

Properties and qualities

Slope: 1 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): 4s
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F090AY019WI - Dry Sandy Upland
Forage suitability group: Sandy (G090XN022MN)
Other vegetative classification: Sandy (G090XN022MN)
Hydric soil rating: No

Minor Components

Sparta

Percent of map unit: 5 percent
Hydric soil rating: No

Dickman

Percent of map unit: 5 percent
Hydric soil rating: No

7C—Hubbard loamy sand, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 1t933
Elevation: 700 to 1,500 feet
Mean annual precipitation: 28 to 36 inches

Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Hubbard and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hubbard

Setting

Landform: Outwash plains
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Outwash

Typical profile

Ap,AB - 0 to 20 inches: loamy sand
Bw - 20 to 35 inches: sand
C - 35 to 60 inches: sand

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F090AY019WI - Dry Sandy Upland
Forage suitability group: Sandy (G090XN022MN)
Other vegetative classification: Sandy (G090XN022MN)
Hydric soil rating: No

Minor Components

Dickman

Percent of map unit: 10 percent
Hydric soil rating: No

7D—Hubbard loamy sand, 12 to 18 percent slopes

Map Unit Setting

National map unit symbol: 1t934
Elevation: 700 to 1,500 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Hubbard and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hubbard

Setting

Landform: Outwash plains
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Outwash

Typical profile

Ap,AB - 0 to 20 inches: loamy sand
Bw - 20 to 35 inches: sand
C - 35 to 60 inches: sand

Properties and qualities

Slope: 12 to 18 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F090AY019WI - Dry Sandy Upland
Forage suitability group: Sandy (G090XN022MN)
Other vegetative classification: Sandy (G090XN022MN)
Hydric soil rating: No

8—Sparta loamy sand, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1t935
Elevation: 700 to 1,200 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Sparta and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sparta

Setting

Landform: Outwash terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciofluvial deposits

Typical profile

Ap,AB - 0 to 16 inches: loamy sand
Bw - 16 to 28 inches: loamy sand
C - 28 to 60 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F090AY019WI - Dry Sandy Upland
Forage suitability group: Sandy (G090XN022MN)
Other vegetative classification: Sandy (G090XN022MN)
Hydric soil rating: No

Minor Components

Dickman

Percent of map unit: 4 percent

Hydric soil rating: No

Sparta, bedrock substratum
Percent of map unit: 3 percent
Hydric soil rating: No

Hubbard
Percent of map unit: 3 percent
Hydric soil rating: No

8B—Sparta loamy sand, 2 to 6 percent slopes

Map Unit Setting
National map unit symbol: 1t936
Elevation: 700 to 1,200 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition
Sparta and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sparta

Setting
Landform: Outwash terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy glaciofluvial deposits

Typical profile
Ap,AB - 0 to 16 inches: loamy sand
Bw - 16 to 28 inches: loamy sand
C - 28 to 60 inches: sand

Properties and qualities
Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Interpretive groups
Land capability classification (irrigated): 2e

Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F090AY019WI - Dry Sandy Upland
Forage suitability group: Sandy (G090XN022MN)
Other vegetative classification: Sandy (G090XN022MN)
Hydric soil rating: No

Minor Components

Dickman
Percent of map unit: 4 percent
Hydric soil rating: No

Sparta, bedrock substratum
Percent of map unit: 3 percent
Hydric soil rating: No

Hubbard
Percent of map unit: 3 percent
Hydric soil rating: No

8C—Sparta loamy sand, 6 to 15 percent slopes

Map Unit Setting
National map unit symbol: 1t937
Elevation: 700 to 1,200 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition
Sparta and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sparta

Setting
Landform: Outwash terraces
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy glaciofluvial deposits

Typical profile
Ap,AB - 0 to 16 inches: loamy sand
Bw - 16 to 28 inches: loamy sand
C - 28 to 60 inches: sand

Properties and qualities
Slope: 6 to 15 percent

Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F090AY019WI - Dry Sandy Upland
Forage suitability group: Sandy (G090XN022MN)
Other vegetative classification: Sandy (G090XN022MN)
Hydric soil rating: No

Minor Components

Hubbard

Percent of map unit: 5 percent
Hydric soil rating: No

Dickman

Percent of map unit: 5 percent
Hydric soil rating: No

49—Antigo silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2tnz7
Elevation: 690 to 1,900 feet
Mean annual precipitation: 27 to 36 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 80 to 150 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Antigo and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Antigo

Setting

Landform: Flats, terraces
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear

Parent material: Loess and/or silty glaciofluvial deposits over loamy glaciofluvial deposits over stratified sandy and gravelly outwash

Typical profile

Ap - 0 to 9 inches: silt loam
E - 9 to 12 inches: silt loam
B/E - 12 to 19 inches: silt loam
Bt1 - 19 to 28 inches: silt loam
2Bt2 - 28 to 31 inches: loam
2Bt3 - 31 to 33 inches: very gravelly sandy loam
3C - 33 to 79 inches: stratified sand to very gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F090BY016WI - Loamy Upland
Forage suitability group: Mod AWC, adequately drained (G090BY005WI)
Other vegetative classification: Mod AWC, adequately drained (G090BY005WI), Acer saccharum / Hydrophyllum virginianum , Sugar Maple / Virginia Waterleaf (AH)
Hydric soil rating: No

Minor Components

Billyboy

Percent of map unit: 8 percent
Landform: Flats, terraces
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F090BY016WI - Loamy Upland
Other vegetative classification: Mod AWC, adequately drained (G090AY005WI), Acer saccharum / Hydrophyllum virginianum , Sugar Maple / Virginia Waterleaf (AH)
Hydric soil rating: No

Sconsin

Percent of map unit: 5 percent
Landform: Flats, terraces
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F090BY016WI - Loamy Upland

Other vegetative classification: High AWC, adequately drained (G090AY008WI), Acer saccharum / Hydrophyllum virginianum , Sugar Maple / Virginia Waterleaf (AH)
Hydric soil rating: No

Rosholt

Percent of map unit: 3 percent
Landform: Flats, terraces
Landform position (three-dimensional): Tread, rise
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F090BY016WI - Loamy Upland
Other vegetative classification: Mod AWC, adequately drained (G090AY005WI), Acer saccharum - Tsuga canadensis / Maianthemum canadense , Sugar Maple - Eastern Hemlock / Qild Lily-of-the-valley (ATM), Acer saccharum / Vaccinium angustifolium - Desmodium glutinosum , Sugar Maple / Low Sweet Blueberry - Pointed-leaved Tick Trefoil (AVDe)
Hydric soil rating: No

Brill

Percent of map unit: 2 percent
Landform: Flats, terraces
Landform position (three-dimensional): Tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F090BY016WI - Loamy Upland
Other vegetative classification: Acer saccharum / Caulophyllum thalictroides - Circaea quadrisulcata , Sugar Maple / Blue Cohosh - Enchanter's Nightshade (ACaCi), High AWC, adequately drained (G090BY008WI)
Hydric soil rating: No

Ossmer

Percent of map unit: 2 percent
Landform: Flats, terraces
Landform position (three-dimensional): Tread, talf
Down-slope shape: Concave, linear
Across-slope shape: Linear
Ecological site: F090BY011WI - Moist Loamy Lowland
Other vegetative classification: Acer rubrum - Abies balsamea / Cornus canadensis , Red Maple - Balsam Fir / Bunchberry (ArAbCo), High AWC, high water table (G090AY007WI), Acer saccharum / Hydrophyllum virginianum - Impatiens capensis , Sugar Maple / Virginia Waterleaf - Jewelweed (AHI)
Hydric soil rating: No

49B—Antigo silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 2tnz8
Elevation: 740 to 1,900 feet
Mean annual precipitation: 27 to 36 inches

Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 80 to 150 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Antigo and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Antigo

Setting

Landform: Terraces, flats, hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, riser, rise
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess and/or silty glaciofluvial deposits over loamy glaciofluvial deposits over stratified sandy and gravelly outwash

Typical profile

Ap - 0 to 9 inches: silt loam
E - 9 to 12 inches: silt loam
B/E - 12 to 19 inches: silt loam
Bt1 - 19 to 28 inches: silt loam
2Bt2 - 28 to 31 inches: loam
2Bt3 - 31 to 33 inches: very gravelly sandy loam
3C - 33 to 79 inches: stratified sand to very gravelly coarse sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F090AY016WI - Loamy Upland
Forage suitability group: Mod AWC, adequately drained (G090BY005WI)
Other vegetative classification: Acer saccharum / Hydrophyllum virginianum , Sugar Maple / Virginia Waterleaf (AH), Mod AWC, adequately drained (G090BY005WI)
Hydric soil rating: No

Minor Components

Sconsin

Percent of map unit: 5 percent
Landform: Hillslopes, terraces, flats

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve, tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F090AY016WI - Loamy Upland
Other vegetative classification: Acer saccharum / Hydrophyllum virginianum , Sugar Maple / Virginia Waterleaf (AH), High AWC, adequately drained (G090AY008WI)
Hydric soil rating: No

Rosholt

Percent of map unit: 5 percent
Landform: Hillslopes, flats, terraces
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope, riser, rise
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F090AY016WI - Loamy Upland
Other vegetative classification: Acer saccharum - Tsuga canadensis / Maianthemum canadense , Sugar Maple - Eastern Hemlock / Qild Lily-of-the-valley (ATM), Acer saccharum / Vaccinium angustifolium - Desmodium glutinosum , Sugar Maple / Low Sweet Blueberry - Pointed-leaved Tick Trefoil (AVDe), Mod AWC, adequately drained (G090AY005WI)
Hydric soil rating: No

Billyboy

Percent of map unit: 5 percent
Landform: Hillslopes, terraces, flats
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F090AY016WI - Loamy Upland
Other vegetative classification: Acer saccharum / Hydrophyllum virginianum , Sugar Maple / Virginia Waterleaf (AH), Mod AWC, adequately drained (G090AY005WI)
Hydric soil rating: No

Brill

Percent of map unit: 3 percent
Landform: Hillslopes, terraces, flats
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve, tread, rise
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F090AY016WI - Loamy Upland
Other vegetative classification: High AWC, adequately drained (G090BY008WI), Acer saccharum / Caulophyllum thalictroides - Circaea quadrisulcata , Sugar Maple / Blue Cohosh - Enchanter's Nightshade (ACaCi)
Hydric soil rating: No

Ossmer

Percent of map unit: 2 percent
Landform: Hillslopes, terraces, flats
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread, talf

Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F090AY011WI - Moist Loamy Lowland
Other vegetative classification: Acer saccharum / Hydrophyllum virginianum - Impatiens capensis , Sugar Maple / Virginia Waterleaf - Jewelweed (AHI), Acer rubrum - Abies balsamea / Cornus canadensis , Red Maple - Balsam Fir / Bunchberry (ArAbCo), High AWC, high water table (G090AY007WI)
Hydric soil rating: No

49C—Antigo silt loam, 6 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2tnz9
Elevation: 690 to 1,900 feet
Mean annual precipitation: 27 to 36 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 80 to 150 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Antigo and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Antigo

Setting

Landform: Hillslopes, terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess and/or silty glaciofluvial deposits over loamy glaciofluvial deposits over stratified sandy and gravelly outwash

Typical profile

A - 0 to 3 inches: silt loam
E - 3 to 6 inches: silt loam
B/E - 6 to 19 inches: silt loam
Bt1 - 19 to 28 inches: silt loam
2Bt2 - 28 to 31 inches: loam
2Bt3 - 31 to 33 inches: very gravelly sandy loam
3C - 33 to 79 inches: stratified sand to very gravelly coarse sand

Properties and qualities

Slope: 6 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F090AY016WI - Loamy Upland
Forage suitability group: Mod AWC, adequately drained (G090BY005WI)
Other vegetative classification: Acer saccharum / Hydrophyllum virginianum , Sugar Maple / Virginia Waterleaf (AH), Mod AWC, adequately drained (G090BY005WI)
Hydric soil rating: No

Minor Components

Sconsin

Percent of map unit: 5 percent
Landform: Hillslopes, terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve, tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F090AY016WI - Loamy Upland
Other vegetative classification: High AWC, adequately drained (G090AY008WI), Acer saccharum / Hydrophyllum virginianum , Sugar Maple / Virginia Waterleaf (AH)
Hydric soil rating: No

Rosholt

Percent of map unit: 5 percent
Landform: Hillslopes, terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F090AY016WI - Loamy Upland
Other vegetative classification: Acer saccharum / Vaccinium angustifolium - Desmodium glutinosum , Sugar Maple / Low Sweet Blueberry - Pointed-leaved Tick Trefoil (AVDe), Acer saccharum - Tsuga canadensis / Maianthemum canadense , Sugar Maple - Eastern Hemlock / Qild Lily-of-the-valley (ATM), Mod AWC, adequately drained (G090AY005WI)
Hydric soil rating: No

Chetek

Percent of map unit: 3 percent
Landform: Hillslopes, terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F090AY021WI - Dry Loamy Upland

Other vegetative classification: Acer saccharum / Vaccinium angustifolium - Desmodium glutinosum , Sugar Maple / Low Sweet Blueberry - Pointed-leaved Tick Trefoil (AVDe), Low AWC, adequately drained (G090AY002WI)
Hydric soil rating: No

Ossmer

Percent of map unit: 2 percent
Landform: Hillslopes, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F090AY011WI - Moist Loamy Lowland
Other vegetative classification: Acer rubrum - Abies balsamea / Cornus canadensis , Red Maple - Balsam Fir / Bunchberry (ArAbCo), Acer saccharum / Hydrophyllum virginianum - Impatiens capensis , Sugar Maple / Virginia Waterleaf - Jewelweed (AHI), High AWC, high water table (G090AY007WI)
Hydric soil rating: No

49D—Antigo silt loam, 15 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2tnzb
Elevation: 770 to 1,640 feet
Mean annual precipitation: 27 to 36 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 80 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition

Antigo and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Antigo

Setting

Landform: Hillslopes, terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess and/or silty glaciofluvial deposits over loamy glaciofluvial deposits over stratified sandy and gravelly outwash

Typical profile

A - 0 to 3 inches: silt loam
E - 3 to 6 inches: silt loam
B/E - 6 to 19 inches: silt loam

Bt1 - 19 to 28 inches: silt loam
2Bt2 - 28 to 31 inches: loam
2Bt3 - 31 to 33 inches: very gravelly sandy loam
3C - 33 to 79 inches: stratified sand to very gravelly coarse sand

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F090AY016WI - Loamy Upland
Forage suitability group: Mod AWC, adequately drained (G090BY005WI)
Other vegetative classification: Acer saccharum / Hydrophyllum virginianum , Sugar Maple / Virginia Waterleaf (AH), Mod AWC, adequately drained (G090BY005WI)
Hydric soil rating: No

Minor Components

Rosholt

Percent of map unit: 5 percent
Landform: Hillslopes, terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F090AY016WI - Loamy Upland
Other vegetative classification: Mod AWC, adequately drained (G090AY005WI), Acer saccharum - Tsuga canadensis / Maianthemum canadense , Sugar Maple - Eastern Hemlock / Qild Lily-of-the-valley (ATM), Acer saccharum / Vaccinium angustifolium - Desmodium glutinosum , Sugar Maple / Low Sweet Blueberry - Pointed-leaved Tick Trefoil (AVDe)
Hydric soil rating: No

Chetek

Percent of map unit: 3 percent
Landform: Hillslopes, terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F090AY021WI - Dry Loamy Upland
Other vegetative classification: Low AWC, adequately drained (G090AY002WI), Acer saccharum / Vaccinium angustifolium - Desmodium glutinosum , Sugar Maple / Low Sweet Blueberry - Pointed-leaved Tick Trefoil (AVDe)

Hydric soil rating: No

Padus

Percent of map unit: 2 percent
Landform: Hillslopes, terraces
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F090AY016WI - Loamy Upland
Other vegetative classification: Mod AWC, adequately drained (G090AY005WI), Acer saccharum / Vaccinium angustifolium - Viburnum acerifolium , Sugar Maple / Low Sweet Blueberry - Maple-leaved Viburnum (AVVb), Acer saccharum - Tsuga canadensis / Maianthemum canadense , Sugar Maple - Eastern Hemlock / Qild Lily-of-the-valley (ATM)
Hydric soil rating: No

120—Brill silt loam

Map Unit Setting

National map unit symbol: 1t93l
Elevation: 800 to 1,950 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Brill and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brill

Setting

Landform: Drainageways on outwash plains
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loess over outwash

Typical profile

A - 0 to 3 inches: silt loam
E - 3 to 11 inches: silt loam
B/E - 11 to 14 inches: silt loam
Bt - 14 to 35 inches: silt loam
2C - 35 to 60 inches: stratified sand to coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: C
Ecological site: F090AY016WI - Loamy Upland
Forage suitability group: Sloping Upland, Acid (G090XN006MN)
Other vegetative classification: Sloping Upland, Acid (G090XN006MN)
Hydric soil rating: No

Minor Components

Barronett

Percent of map unit: 5 percent
Landform: Drainageways on lake plains, depressions on lake plains
Hydric soil rating: Yes

Antigo

Percent of map unit: 5 percent
Hydric soil rating: No

153C—Santiago silt loam, 6 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1t93v
Elevation: 770 to 1,080 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Santiago and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Santiago

Setting

Landform: Moraines
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess over till

Typical profile

Ap - 0 to 7 inches: silt loam
E - 7 to 10 inches: silt loam
Bt - 10 to 25 inches: silt loam
2Bt - 25 to 40 inches: sandy loam
2C - 40 to 60 inches: sandy loam

Properties and qualities

Slope: 6 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.14 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F090AY016WI - Loamy Upland
Forage suitability group: Sloping Upland, Acid (G090XN006MN)
Other vegetative classification: Sloping Upland, Acid (G090XN006MN)
Hydric soil rating: No

Minor Components

Kingsley

Percent of map unit: 5 percent
Hydric soil rating: No

Freeon

Percent of map unit: 5 percent
Hydric soil rating: No

155D—Chetek sandy loam, 12 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2zytj
Elevation: 670 to 1,330 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Chetek and similar soils: 90 percent
Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chetek

Setting

Landform: Terraces, outwash plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Loamy glaciofluvial deposits over stratified sandy and gravelly outwash

Typical profile

A - 0 to 3 inches: sandy loam
E - 3 to 8 inches: sandy loam
Bt1 - 8 to 16 inches: sandy loam
2Bt2 - 16 to 20 inches: gravelly loamy sand
2C - 20 to 79 inches: stratified sand to very gravelly coarse sand

Properties and qualities

Slope: 12 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Ecological site: F090AY021WI - Dry Loamy Upland
Forage suitability group: Low AWC, adequately drained (G090AY002WI)
Other vegetative classification: Acer saccharum / Vaccinium angustifolium - Desmodium glutinosum , Sugar Maple / Low Sweet Blueberry - Pointed-leaved Tick Trefoil (AVDe), Low AWC, adequately drained (G090AY002WI)
Hydric soil rating: No

Minor Components

Rosholt

Percent of map unit: 5 percent
Landform: Terraces, outwash plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F090AY016WI - Loamy Upland
Other vegetative classification: Acer saccharum - Tsuga canadensis / Maianthemum canadense , Sugar Maple - Eastern Hemlock / Qild Lily-of-the-valley (ATM), Acer saccharum / Vaccinium angustifolium - Desmodium

glutinosum , Sugar Maple / Low Sweet Blueberry - Pointed-leaved Tick Trefoil (AVDe), Mod AWC, adequately drained (G090AY005WI)
Hydric soil rating: No

Mahtomedi
Percent of map unit: 5 percent
Landform: Terraces, outwash plains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F090AY013WI - Sandy Upland
Other vegetative classification: Low AWC, adequately drained with limitations (G090AY003WI), Pinus strobus - Quercus spp. / Gaultheria procumbens - Ceanothus americanus , Eastern White Pine - Oak spp. / Wintergreen - New Jersey Tea (PQGCe), Pinus strobus - Acer rubrum / Vaccinium angustifolium - Amphicarpa bracteata , Eastern White Pine - Red Maple / Low Sweet Blueberry - Hog-peanut (PArVAm)
Hydric soil rating: No

189—Auburndale silt loam, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: 2tnzk
Elevation: 820 to 1,390 feet
Mean annual precipitation: 27 to 36 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 80 to 150 days
Farmland classification: Not prime farmland

Map Unit Composition
Auburndale and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Auburndale

Setting
Landform: Depressions on ground moraines, drainageways on ground moraines
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Loess and/or silty alluvium over dense loamy till

Typical profile
A - 0 to 5 inches: silt loam
Eg - 5 to 12 inches: silt loam
Btg1 - 12 to 41 inches: silt loam
2Btg2 - 41 to 53 inches: loam
2C - 53 to 65 inches: sandy loam

2Cd - 65 to 79 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 59 to 77 inches to densic material
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.01 to 0.06 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 11.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: B/D
Ecological site: F090BY006WI - Wet Loamy Lowland
Forage suitability group: High AWC, high water table (G090AY007WI)
Other vegetative classification: Fraxinus nigra-Acer rubrum/Impatience capensis , Black Ash-Red Maple/Spotted Touch-me-not (3FnArI), High AWC, high water table (G090AY007WI)
Hydric soil rating: Yes

Minor Components

Almena

Percent of map unit: 5 percent
Landform: Ground moraines
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F090BY011WI - Moist Loamy Lowland
Other vegetative classification: Acer saccharum / Sanguinaria canadensis - Impatiens capensis , Sugar Maple / Bloodroot - Jewelweed (ASaI), High AWC, high water table (G090AY007WI), Acer rubrum - Abies balsamea / Cornus canadensis , Red Maple - Balsam Fir / Bunchberry (ArAbCo), Acer saccharum / Hydrophyllum virginianum - Impatiens capensis , Sugar Maple / Virginia Waterleaf - Jewelweed (AHI)
Hydric soil rating: No

Capitola

Percent of map unit: 5 percent
Landform: Depressions on ground moraines, drainageways on ground moraines
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Concave
Ecological site: F090BY006WI - Wet Loamy Lowland
Other vegetative classification: Fraxinus nigra-Acer rubrum/Impatience capensis , Black Ash-Red Maple/Spotted Touch-me-not (3FnArI), Mod AWC, high water table (G090AY004WI)
Hydric soil rating: Yes

Cathro

Percent of map unit: 3 percent
Landform: Depressions on ground moraines

Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F090BY001WI - Poor Fen
Other vegetative classification: Picea mariana-Larix laricina/Nemopanthus mucronata , Black Spruce-Tamarack/Mountain Holly (3PmLNe)
Hydric soil rating: Yes

Auburndale, briefly flooded

Percent of map unit: 2 percent
Landform: Drainageways on ground moraines
Landform position (three-dimensional): Dip
Down-slope shape: Concave, linear
Across-slope shape: Concave
Ecological site: F090BY006WI - Wet Loamy Lowland
Other vegetative classification: Fraxinus nigra-Acer rubrum/Impatience capensis , Black Ash-Red Maple/Spotted Touch-me-not (3FnArI), High AWC, high water table (G090AY007WI)
Hydric soil rating: Yes

266—Freer silt loam

Map Unit Setting

National map unit symbol: 1t94n
Elevation: 700 to 1,500 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Freer and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freer

Setting

Landform: Moraines
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over till

Typical profile

Ap - 0 to 8 inches: silt loam
E - 8 to 12 inches: silt loam
Bt1 - 12 to 23 inches: loam
2Bt2 - 23 to 37 inches: sandy loam
2C - 37 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: C/D
Ecological site: F090AY011WI - Moist Loamy Lowland
Forage suitability group: Level Swale, Acid (G090XN005MN)
Other vegetative classification: Level Swale, Acid (G090XN005MN)
Hydric soil rating: No

Minor Components

Freeon

Percent of map unit: 5 percent
Hydric soil rating: No

Auburndale

Percent of map unit: 5 percent
Landform: Drainageways on moraines, depressions on moraines
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: Yes

298—Richwood silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1t94p
Elevation: 700 to 1,950 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Richwood and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Richwood

Setting

Landform: Outwash plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over outwash

Typical profile

Ap,A - 0 to 19 inches: silt loam
Bt - 19 to 49 inches: silt loam
2C - 49 to 60 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Ecological site: F090AY016WI - Loamy Upland
Forage suitability group: Sloping Upland, Acid (G090XN006MN)
Other vegetative classification: Sloping Upland, Acid (G090XN006MN)
Hydric soil rating: No

Minor Components

Lindstrom

Percent of map unit: 10 percent
Hydric soil rating: No

298B—Richwood silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1t94q
Elevation: 700 to 1,950 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Richwood and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Richwood

Setting

Landform: Outwash plains
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over outwash

Typical profile

Ap,A - 0 to 19 inches: silt loam
Bt - 19 to 49 inches: silt loam
2C - 49 to 60 inches: sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F090AY016WI - Loamy Upland
Forage suitability group: Sloping Upland, Acid (G090XN006MN)
Other vegetative classification: Sloping Upland, Acid (G090XN006MN)
Hydric soil rating: No

Minor Components

Lindstrom

Percent of map unit: 5 percent
Hydric soil rating: No

Campia

Percent of map unit: 5 percent
Hydric soil rating: No

301B—Lindstrom silt loam, glaciated, 2 to 4 percent slopes

Map Unit Setting

National map unit symbol: 2zwnh
Elevation: 790 to 1,970 feet
Mean annual precipitation: 27 to 36 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 80 to 150 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Lindstrom, glaciated, and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lindstrom, Glaciated

Setting

Landform: Drainageways
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Silty slope alluvium

Typical profile

Ap - 0 to 9 inches: silt loam
A - 9 to 29 inches: silt loam
Bw - 29 to 60 inches: silt loam
C - 60 to 79 inches: silt loam

Properties and qualities

Slope: 2 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very high (about 13.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F090AY016WI - Loamy Upland
Forage suitability group: Sloping Upland, Acid (G090XN006MN)
Other vegetative classification: Sloping Upland, Acid (G090XN006MN)

Hydric soil rating: No

Minor Components

Quam

Percent of map unit: 4 percent
Landform: Drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: F090AY006WI - Wet Loamy Lowland
Other vegetative classification: Ponded If Not Drained (G090XN013MN)
Hydric soil rating: Yes

Richwood, cool

Percent of map unit: 3 percent
Landform: Drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F090AY016WI - Loamy Upland
Other vegetative classification: Sloping Upland, Acid (G090XN006MN)
Hydric soil rating: No

Rockton, cool

Percent of map unit: 3 percent
Landform: Drainageways
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F090AY014WI - Loamy Bedrock Upland
Other vegetative classification: Sloping Upland, Low AWC, Acid (G090XN008MN)
Hydric soil rating: No

327—Dickman sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1t94w
Elevation: 700 to 1,600 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Dickman and similar soils: 90 percent
Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dickman

Setting

Landform: Outwash terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Outwash

Typical profile

Ap,A - 0 to 14 inches: sandy loam
Bw - 14 to 17 inches: sandy loam
2BC,2C - 17 to 60 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A
Ecological site: F090AY019WI - Dry Sandy Upland
Forage suitability group: Sandy (G090XN022MN)
Other vegetative classification: Sandy (G090XN022MN)
Hydric soil rating: No

Minor Components

Hubbard

Percent of map unit: 5 percent
Hydric soil rating: No

Sparta

Percent of map unit: 5 percent
Hydric soil rating: No

327B—Dickman sandy loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1t94x
Elevation: 700 to 1,600 feet
Mean annual precipitation: 28 to 36 inches

Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Dickman and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dickman

Setting

Landform: Outwash terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Outwash

Typical profile

Ap,A - 0 to 14 inches: sandy loam
Bw - 14 to 17 inches: sandy loam
2BC,2C - 17 to 60 inches: sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: F090AY019WI - Dry Sandy Upland
Forage suitability group: Sandy (G090XN022MN)
Other vegetative classification: Sandy (G090XN022MN)
Hydric soil rating: No

Minor Components

Hubbard

Percent of map unit: 5 percent
Hydric soil rating: No

Sparta

Percent of map unit: 5 percent
Hydric soil rating: No

411—Waukegan silt loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 1t958
Elevation: 900 to 1,400 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Waukegan and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Waukegan

Setting

Landform: Outwash plains, outwash terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Glaciofluvial sediments over outwash

Typical profile

Ap - 0 to 10 inches: silt loam
Bw - 10 to 24 inches: silt loam
2BC,2C - 24 to 60 inches: coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F090AY016WI - Loamy Upland
Forage suitability group: Sloping Upland, Acid (G090XN006MN)
Other vegetative classification: Sloping Upland, Acid (G090XN006MN)
Hydric soil rating: No

Minor Components

Chetek

Percent of map unit: 5 percent
Hydric soil rating: No

Dickman

Percent of map unit: 5 percent
Hydric soil rating: No

411B—Waukegan silt loam, 2 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1t959
Elevation: 900 to 1,400 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Waukegan and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Waukegan

Setting

Landform: Outwash plains, outwash terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Glaciofluvial sediments over outwash

Typical profile

Ap - 0 to 10 inches: silt loam
Bw - 10 to 24 inches: silt loam
2BC,2C - 24 to 60 inches: coarse sand

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Moderate (about 6.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F090AY016WI - Loamy Upland
Forage suitability group: Sloping Upland, Acid (G090XN006MN)
Other vegetative classification: Sloping Upland, Acid (G090XN006MN)
Hydric soil rating: No

Minor Components

Chetek

Percent of map unit: 5 percent
Hydric soil rating: No

Dickman

Percent of map unit: 5 percent
Hydric soil rating: No

449—Crystal Lake silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2ypbg
Elevation: 820 to 1,430 feet
Mean annual precipitation: 27 to 36 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 80 to 150 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Crystal lake and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Crystal Lake

Setting

Landform: Kames on end moraines, terraces on end moraines, collapsed ice-walled lakebeds on end moraines, ground moraines, lake plains on end moraines
Landform position (three-dimensional): Tread, talf
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Silty lacustrine deposits

Typical profile

Ap - 0 to 8 inches: silt loam
E - 8 to 13 inches: silt loam
B/E - 13 to 20 inches: silt loam
Bt1 - 20 to 26 inches: silt loam

Bt2 - 26 to 33 inches: stratified silt loam to very fine sandy loam
C - 33 to 79 inches: stratified silt loam to very fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 24 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: F090AY016WI - Loamy Upland
Forage suitability group: High AWC, adequately drained (G090AY008WI)
Other vegetative classification: High AWC, adequately drained (G090AY008WI), Acer saccharum / Hydrophyllum virginianum , Sugar Maple / Virginia Waterleaf (AH)
Hydric soil rating: No

Minor Components

Comstock

Percent of map unit: 3 percent
Landform: Stream terraces on end moraines, collapsed ice-walled lakebeds on end moraines, depressions on end moraines, lake plains on end moraines
Landform position (three-dimensional): Riser, talf
Down-slope shape: Linear, concave
Across-slope shape: Concave, linear
Ecological site: F090AY011WI - Moist Loamy Lowland
Other vegetative classification: Acer rubrum - Abies balsamea / Cornus canadensis , Red Maple - Balsam Fir / Bunchberry (ArAbCo), Acer saccharum / Sanguinaria canadensis - Impatiens capensis , Sugar Maple / Bloodroot - Jewelweed (ASaI), Acer saccharum / Hydrophyllum virginianum - Impatiens capensis , Sugar Maple / Virginia Waterleaf - Jewelweed (AHI), High AWC, high water table (G090AY007WI)
Hydric soil rating: No

Barronett

Percent of map unit: 3 percent
Landform: Stream terraces on end moraines, depressions on lake plains on end moraines, drainageways on lake plains on end moraines
Landform position (three-dimensional): Riser, dip, talf
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Ecological site: F090AY006WI - Wet Loamy Lowland
Other vegetative classification: Fraxinus nigra-Acer rubrum/Impatience capensis , Black Ash-Red Maple/Spotted Touch-me-not (3FnArI), High AWC, high water table (G090AY007WI)
Hydric soil rating: Yes

Campia

Percent of map unit: 2 percent
Landform: Stream terraces, collapsed ice-walled lakebeds on end moraines, lake plains on end moraines
Landform position (three-dimensional): Tread, rise, talf
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F090AY016WI - Loamy Upland
Other vegetative classification: Acer saccharum / Hydrophyllum virginianum , Sugar Maple / Virginia Waterleaf (AH), Sloping Upland, Acid (G090XN006MN)
Hydric soil rating: No

Brill

Percent of map unit: 2 percent
Landform: Moraines, stream terraces on end moraines, outwash plains on end moraines, lake plains on end moraines
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, talf, rise
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: F090AY016WI - Loamy Upland
Other vegetative classification: Acer saccharum / Caulophyllum thalictroides - Circaea quadrisulcata , Sugar Maple / Blue Cohosh - Enchanter's Nightshade (ACaCi), High AWC, adequately drained (G090AY008WI)
Hydric soil rating: No

452—Comstock silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2ypbn
Elevation: 820 to 1,850 feet
Mean annual precipitation: 27 to 36 inches
Mean annual air temperature: 37 to 46 degrees F
Frost-free period: 80 to 150 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Comstock and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Comstock

Setting

Landform: Lake plains, stream terraces, collapsed ice-walled lakebeds, depressions
Landform position (three-dimensional): Riser, talf
Down-slope shape: Linear, concave
Across-slope shape: Concave

Parent material: Silty lacustrine deposits

Typical profile

Ap - 0 to 8 inches: silt loam
E - 8 to 15 inches: silt loam
B/E - 15 to 21 inches: silt loam
Bt - 21 to 34 inches: silt loam
BC - 34 to 44 inches: stratified silt loam to fine sand to very fine sand
C - 44 to 79 inches: stratified silt loam to very fine sand to silt

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 10 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B/D
Ecological site: F090AY011WI - Moist Loamy Lowland
Forage suitability group: High AWC, high water table (G090AY007WI)
Other vegetative classification: High AWC, high water table (G090AY007WI), Acer saccharum / Hydrophyllum virginianum - Impatiens capensis , Sugar Maple / Virginia Waterleaf - Jewelweed (AHI), Acer rubrum - Abies balsamea / Cornus canadensis , Red Maple - Balsam Fir / Bunchberry (ArAbCo), Acer saccharum / Sanguinaria canadensis - Impatiens capensis , Sugar Maple / Bloodroot - Jewelweed (ASaI)
Hydric soil rating: No

Minor Components

Barronett

Percent of map unit: 5 percent
Landform: Lake plains, stream terraces, depressions, drainageways, collapsed ice-walled lakebeds
Landform position (three-dimensional): Riser, dip
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Ecological site: F090AY006WI - Wet Loamy Lowland
Other vegetative classification: High AWC, high water table (G090AY007WI), Fraxinus nigra-Acer rubrum/Impatience capensis , Black Ash-Red Maple/ Spotted Touch-me-not (3FnArI)
Hydric soil rating: Yes

Crystal lake

Percent of map unit: 5 percent
Landform: Kames, lake plains
Landform position (three-dimensional): Talf
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Ecological site: F090AY016WI - Loamy Upland

Other vegetative classification: High AWC, adequately drained (G090AY008WI), Acer saccharum / Hydrophyllum virginianum , Sugar Maple / Virginia Waterleaf (AH)
Hydric soil rating: No

454B—Mahtomedi loamy sand, 0 to 6 percent slopes

Map Unit Setting

National map unit symbol: 1t95j
Elevation: 670 to 1,600 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Mahtomedi and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mahtomedi

Setting

Landform: Outwash plains
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Outwash

Typical profile

Ap - 0 to 8 inches: loamy sand
Bw - 8 to 30 inches: gravelly coarse sand
C - 30 to 60 inches: gravelly sand

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F090AY019WI - Dry Sandy Upland

Forage suitability group: Sandy (G090XN022MN)
Other vegetative classification: Sandy (G090XN022MN)
Hydric soil rating: No

Minor Components

Antigo
Percent of map unit: 3 percent
Hydric soil rating: No

Brill
Percent of map unit: 3 percent
Hydric soil rating: No

Kingsley
Percent of map unit: 2 percent
Hydric soil rating: No

Demontreville
Percent of map unit: 2 percent
Hydric soil rating: No

454C—Mahtomedi loamy sand, 6 to 12 percent slopes

Map Unit Setting
National map unit symbol: 1t95k
Elevation: 670 to 1,600 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition
Mahtomedi and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mahtomedi

Setting
Landform: Outwash plains
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Outwash

Typical profile
Ap - 0 to 8 inches: loamy sand
Bw - 8 to 30 inches: gravelly coarse sand
C - 30 to 60 inches: gravelly sand

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F090AY019WI - Dry Sandy Upland
Forage suitability group: Sandy (G090XN022MN)
Other vegetative classification: Sandy (G090XN022MN)
Hydric soil rating: No

Minor Components

Antigo

Percent of map unit: 3 percent
Hydric soil rating: No

Brill

Percent of map unit: 3 percent
Hydric soil rating: No

Kingsley

Percent of map unit: 2 percent
Hydric soil rating: No

Demontreville

Percent of map unit: 2 percent
Hydric soil rating: No

454D—Mahtomedi loamy sand, 12 to 25 percent slopes

Map Unit Setting

National map unit symbol: 1t95l
Elevation: 670 to 1,600 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Mahtomedi and similar soils: 90 percent

Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mahtomedi

Setting

Landform: Outwash plains
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Outwash

Typical profile

A - 0 to 5 inches: loamy sand
E - 5 to 8 inches: sand
Bw - 8 to 30 inches: gravelly coarse sand
C - 30 to 60 inches: gravelly sand

Properties and qualities

Slope: 12 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F090AY019WI - Dry Sandy Upland
Forage suitability group: Sandy (G090XN022MN)
Other vegetative classification: Sandy (G090XN022MN)
Hydric soil rating: No

Minor Components

Antigo

Percent of map unit: 4 percent
Hydric soil rating: No

Kingsley

Percent of map unit: 3 percent
Hydric soil rating: No

Demontreville

Percent of map unit: 3 percent
Hydric soil rating: No

454F—Mahtomedi loamy sand, 25 to 40 percent slopes

Map Unit Setting

National map unit symbol: 1t95m
Elevation: 670 to 1,600 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Mahtomedi and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mahtomedi

Setting

Landform: Outwash plains
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Outwash

Typical profile

A - 0 to 3 inches: loamy sand
Bw - 3 to 23 inches: gravelly coarse sand
C - 23 to 60 inches: gravelly sand

Properties and qualities

Slope: 25 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Low (about 4.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Ecological site: F090AY019WI - Dry Sandy Upland
Forage suitability group: Not Suited (G090XN024MN)
Other vegetative classification: Not Suited (G090XN024MN)
Hydric soil rating: No

Minor Components

Kingsley
Percent of map unit: 5 percent
Hydric soil rating: No

Demontreville
Percent of map unit: 5 percent
Hydric soil rating: No

488F—Brodale flaggy loam, 20 to 50 percent slopes

Map Unit Setting
National map unit symbol: 1t95x
Elevation: 900 to 1,400 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition
Brodale and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Brodale

Setting
Landform: Hills, terraces
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Colluvium over limestone bedrock

Typical profile
A - 0 to 7 inches: flaggy loam
Bw - 7 to 13 inches: flaggy very fine sandy loam
C - 13 to 50 inches: very flaggy very fine sandy loam
2R - 50 to 60 inches: unweathered bedrock

Properties and qualities
Slope: 20 to 50 percent
Depth to restrictive feature: 40 to 80 inches to lithic bedrock
Drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 60 percent
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F090AY020WI - Dry Loamy Bedrock Upland
Forage suitability group: Not Suited (G090XN024MN)
Other vegetative classification: Not Suited (G090XN024MN)
Hydric soil rating: No

507—Poskin silt loam

Map Unit Setting

National map unit symbol: 1t961
Elevation: 800 to 1,950 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Poskin and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Poskin

Setting

Landform: Drainageways on outwash plains
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium over outwash

Typical profile

Ap,A - 0 to 13 inches: silt loam
Bt - 13 to 28 inches: silt loam
BC - 28 to 33 inches: loam
2C - 33 to 60 inches: gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 18 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w

Hydrologic Soil Group: B/D
Ecological site: F090AY011WI - Moist Loamy Lowland
Forage suitability group: Level Swale, Acid (G090XN005MN)
Other vegetative classification: Level Swale, Acid (G090XN005MN)
Hydric soil rating: No

Minor Components

Barronett, sandy substratum
Percent of map unit: 3 percent
Landform: Depressions on outwash plains
Hydric soil rating: Yes

Antigo
Percent of map unit: 3 percent
Hydric soil rating: No

Brill
Percent of map unit: 2 percent
Hydric soil rating: No

Rosholt
Percent of map unit: 2 percent
Hydric soil rating: No

529B—Ripon silt loam, 2 to 6 percent slopes

Map Unit Setting
National map unit symbol: 1t963
Elevation: 700 to 1,950 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Ripon and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ripon

Setting
Landform: Hills, terraces
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess over limestone bedrock

Typical profile
A - 0 to 10 inches: silt loam
Bt - 10 to 28 inches: silt loam

2R - 28 to 32 inches: unweathered bedrock

Properties and qualities

Slope: 2 to 6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F090AY014WI - Loamy Bedrock Upland
Forage suitability group: Sloping Upland, Low AWC, Acid (G090XN008MN)
Other vegetative classification: Sloping Upland, Low AWC, Acid (G090XN008MN)
Hydric soil rating: No

Minor Components

Channahon

Percent of map unit: 4 percent
Hydric soil rating: No

Waukegan

Percent of map unit: 3 percent
Hydric soil rating: No

Whalan

Percent of map unit: 3 percent
Hydric soil rating: No

529C—Ripon silt loam, 6 to 12 percent slopes

Map Unit Setting

National map unit symbol: 1t964
Elevation: 700 to 1,950 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Ripon and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ripon

Setting

Landform: Hills, terraces
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess over limestone bedrock

Typical profile

A - 0 to 11 inches: silt loam
Bt - 11 to 24 inches: silt loam
2R - 24 to 28 inches: unweathered bedrock

Properties and qualities

Slope: 6 to 12 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F090AY014WI - Loamy Bedrock Upland
Forage suitability group: Sloping Upland, Low AWC, Acid (G090XN008MN)
Other vegetative classification: Sloping Upland, Low AWC, Acid (G090XN008MN)
Hydric soil rating: No

Minor Components

Channahon

Percent of map unit: 4 percent
Hydric soil rating: No

Whalan

Percent of map unit: 3 percent
Hydric soil rating: No

Waukegan

Percent of map unit: 3 percent
Hydric soil rating: No

541—Rifle muck

Map Unit Setting

National map unit symbol: 1t966
Elevation: 600 to 1,950 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Rifle and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rifle

Setting

Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Organic material

Typical profile

Oa - 0 to 9 inches: muck
Oe - 9 to 60 inches: mucky peat

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 30.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D
Ecological site: F090AY002WI - Mucky Swamp
Forage suitability group: Organic (G090XN014MN)
Other vegetative classification: Organic (G090XN014MN)
Hydric soil rating: Yes

Minor Components

Cathro

Percent of map unit: 8 percent
Landform: Depressions
Hydric soil rating: Yes

Markey

Percent of map unit: 7 percent
Landform: Depressions
Hydric soil rating: Yes

543—Markey muck

Map Unit Setting

National map unit symbol: 1t967
Elevation: 700 to 2,000 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Markey and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Markey

Setting

Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Organic material over outwash

Typical profile

Oa - 0 to 30 inches: muck
2A,2Cg - 30 to 60 inches: stratified sand to fine sand to loamy very fine sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 5.95 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum content: 5 percent
Available water supply, 0 to 60 inches: Very high (about 13.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: A/D
Ecological site: F090AY002WI - Mucky Swamp
Forage suitability group: Organic (G090XN014MN)
Other vegetative classification: Organic (G090XN014MN)
Hydric soil rating: Yes

Minor Components

Isanti

Percent of map unit: 5 percent
Landform: Depressions on outwash plains
Hydric soil rating: Yes

Seelyeville

Percent of map unit: 5 percent
Landform: Depressions on outwash plains
Hydric soil rating: Yes

Lino

Percent of map unit: 5 percent
Hydric soil rating: No

857C—Urban land-Waukegan complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 1t96d
Elevation: 900 to 1,400 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 65 percent
Waukegan and similar soils: 35 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Outwash plains, outwash terraces
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex

Interpretive groups

Land capability classification (irrigated): None specified
Forage suitability group: Not Suited (G090XN024MN)

Other vegetative classification: Not Suited (G090XN024MN)
Hydric soil rating: No

Description of Waukegan

Setting
Landform: Outwash plains, outwash terraces
Landform position (two-dimensional): Shoulder
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Glaciofluvial sediments over outwash

Typical profile
Ap - 0 to 10 inches: silt loam
Bw - 10 to 24 inches: silt loam
2BC,2C - 24 to 60 inches: coarse sand

Properties and qualities
Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water supply, 0 to 60 inches: Moderate (about 6.3 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F090AY016WI - Loamy Upland
Forage suitability group: Sloping Upland, Acid (G090XN006MN)
Other vegetative classification: Sloping Upland, Acid (G090XN006MN)
Hydric soil rating: No

1013—Pits,quarry

Map Unit Setting
National map unit symbol: 1t96t
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition
Pits, quarry: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Pits, Quarry

Setting

Landform: Moraines
Down-slope shape: Linear
Across-slope shape: Linear

Interpretive groups

Land capability classification (irrigated): None specified
Forage suitability group: Not Suited (G090XN024MN)
Other vegetative classification: Not Suited (G090XN024MN)

1040—Udorthents

Map Unit Setting

National map unit symbol: 1t96z
Elevation: 670 to 1,070 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Landform: Moraines
Down-slope shape: Linear
Across-slope shape: Linear

Properties and qualities

Slope: 0 to 6 percent
Depth to restrictive feature: More than 80 inches
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified
Ecological site: F090AY016WI - Loamy Upland
Forage suitability group: Sloping Upland, Calcareous (G090XN010MN)
Other vegetative classification: Sloping Upland, Calcareous (G090XN010MN)
Hydric soil rating: No

Minor Components

Udorthents, wet substratum

Percent of map unit: 10 percent

Landform: Moraines
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F090AY016WI - Loamy Upland
Other vegetative classification: Sloping Upland, Calcareous (G090XN010MN)
Hydric soil rating: No

1847—Barronett silt loam, sandy substratum

Map Unit Setting

National map unit symbol: 1t977
Elevation: 800 to 1,950 feet
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Barronett, sandy substratum, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Barronett, Sandy Substratum

Setting

Landform: Drainageways on outwash plains
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Alluvium over outwash

Typical profile

A - 0 to 17 inches: silt loam
Bt - 17 to 42 inches: silt loam
2BC - 42 to 50 inches: loamy sand
2C - 50 to 60 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 6 inches
Frequency of flooding: None
Frequency of ponding: Occasional
Available water supply, 0 to 60 inches: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D

Ecological site: F090AY006WI - Wet Loamy Lowland
Forage suitability group: Ponded If Not Drained (G090XN013MN)
Other vegetative classification: Ponded If Not Drained (G090XN013MN)
Hydric soil rating: Yes

Minor Components

Markey
Percent of map unit: 5 percent
Landform: Depressions on outwash plains
Hydric soil rating: Yes

Poskin
Percent of map unit: 5 percent
Hydric soil rating: No

Brill
Percent of map unit: 5 percent
Hydric soil rating: No

W—Water

Map Unit Setting
National map unit symbol: 1t979
Mean annual precipitation: 28 to 36 inches
Mean annual air temperature: 39 to 48 degrees F
Frost-free period: 120 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition
Water: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

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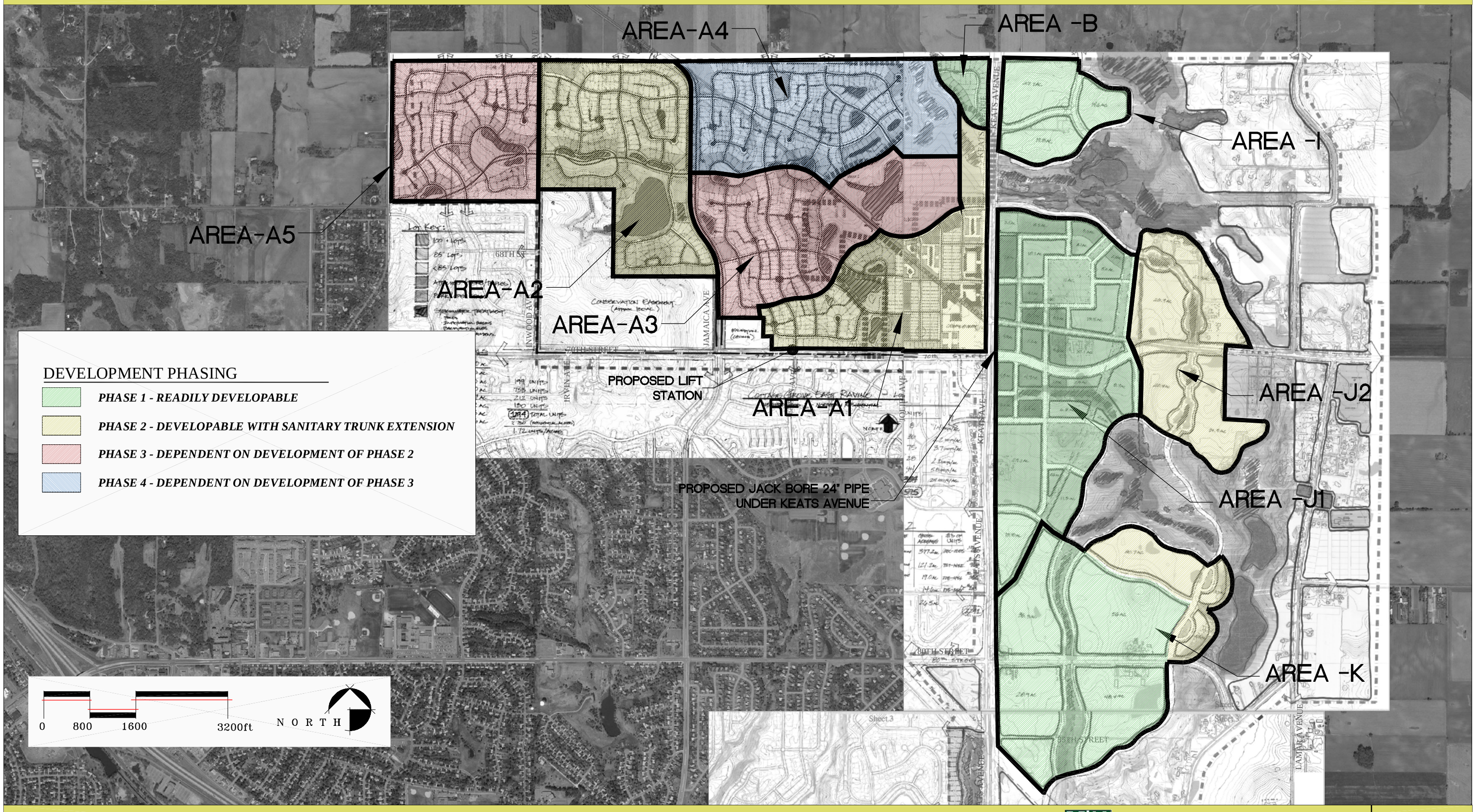
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SANITARY SEWER IMPACTS AND IMPROVEMENT PLANS



CITY OF COTTAGE GROVE

January 24, 2005 3:00:54 p.m.
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Howard R. Green Company
IBI Group
McComb Group, Ltd.

EXHIBIT

1

SANITARY SEWER IMPACTS AND IMPROVEMENT PLANS

AREA-C

AREA-D

AREA-E

AREA-F

AREA-G

AREA-H

AREA -L

PROPOSED JACK BORE 8" PIPE UNDER KEATS AVENUE

JOINT FACILITIES CAMPUS

85TH STREET

90TH ST

KEATS AVENUE

KOMERO AVENUE

LAMPERT AVENUE

TH 61

Sheet 3

Sheet 4

DEVELOPMENT PHASING

PHASE 1 - READILY DEVELOPABLE

PHASE 2 - DEVELOPABLE WITH SANITARY TRUNK EXTENSION

0 800 1600 3200ft

NORTH

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EXHIBIT

2

SANITARY SEWER IMPACTS AND IMPROVEMENT PLANS

LEGEND
- 8" SANITARY
- 10" SANITARY
- 12" SANITARY
- 15" SANITARY
- 18" SANITARY
- 24" SANITARY
- 30" SANITARY

PROPOSED LIFT STATION

PROPOSED JACK BORE 24" PIPE UNDER KEATS AVENUE

0 800 1600 3200ft

NORTH

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CITY OF COTTAGE GROVE

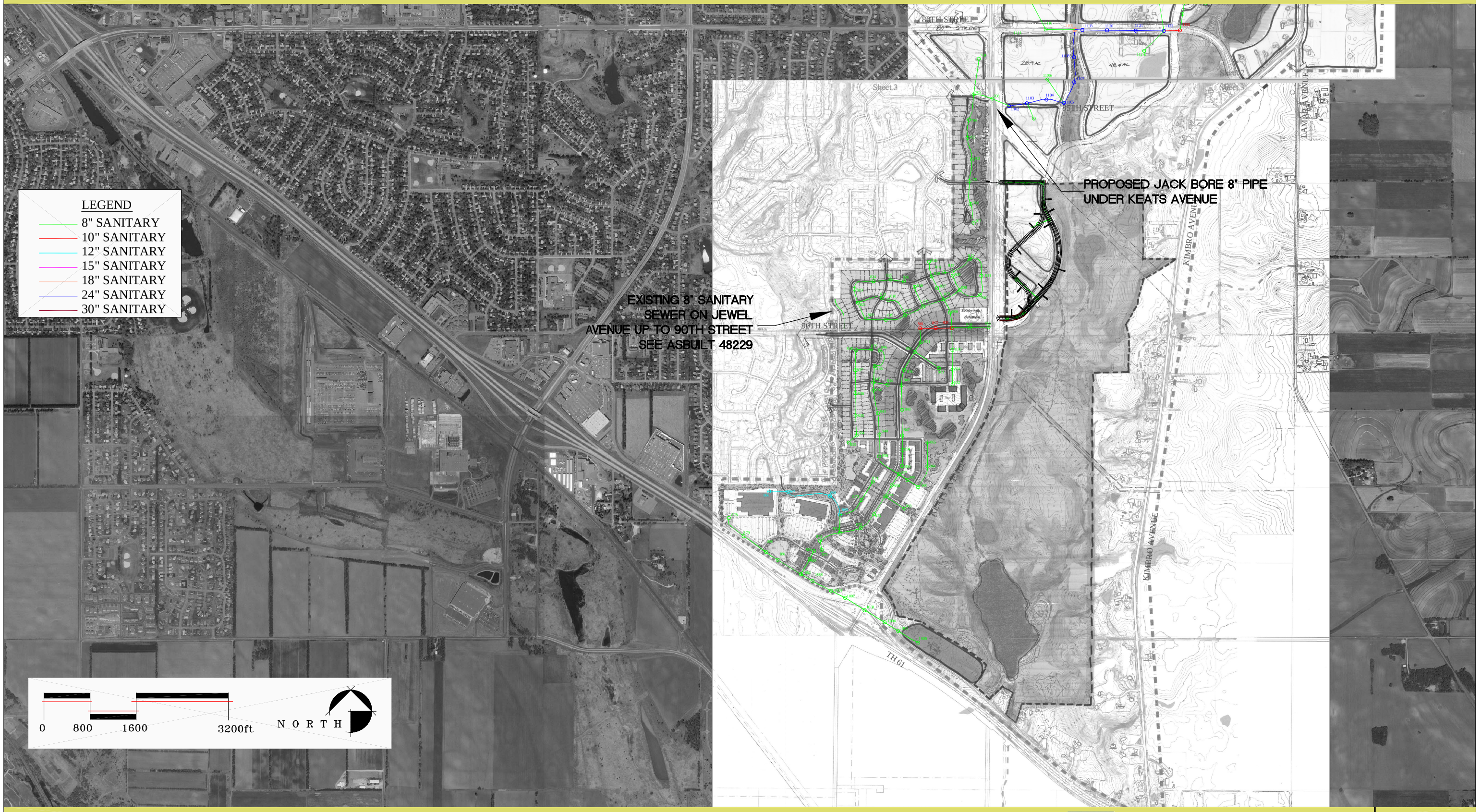
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EXHIBIT

4

SANITARY SEWER IMPACTS AND IMPROVEMENT PLANS



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IBI Group
McComb Group, Ltd.

EXHIBIT

5

Howard R. Green Company

MEMO

To:	Brian Johnson
From:	Greg Robinson
Subject:	Cottage Grove East Ravine Planning Study – Sanitary Sewer
Date:	February 7, 2005

TECHNICAL MEMORANDUM

The purpose of this memo is to outline the methodology and assumptions used in the sanitary sewer and improvement plans for the Cottage Grove East Ravine Study, and present key features of the preliminary design.

Methodology

- This preliminary sanitary sewer design was accomplished in accordance with Metropolitan Council Environmental Service (MCES) and Ten State Standards guidelines.
- Sanitary sewer system design and Impacts were based on the Detailed Master Plan for Neighborhood One and the General Plan for Neighborhood Two.
- Construction plans for South Washington County Gravity Interceptor Phase 1 and South Washington County Gravity Interceptor Phase 2 were used to determine the existing location of the trunk interceptor running along Keats Avenue (CSAH 19).
- Existing Sanitary stubs as indicated on the interceptor plans were utilized where possible. However, In order to provide an efficient design some new connections to the interceptor are included in this preliminary plan.
- The study area is primarily divided into two sections, Neighborhood One is located west of Keats Avenue and Neighborhood Two is located east of Keats Avenue. Design characteristics for each neighborhood are presented below.

Assumptions

- Design must maximize the area served per available trunk interceptor connection.
- In Neighborhood Two the assumed sewer requirement is 150 lineal feet per acre for all land uses.

Design Flow Parameters

Neighborhood One

- Residential design flow units were based on
    - 100 gallons per day per capita.
    - 4 people per Unit
    - Peak Factor of 4

- Low and Medium Density parcels were assigned one unit per property as shown in Detailed Master Plan for Neighborhood One.

- Attached Housing parcels were assigned 6 units per acre as shown in the Detailed Master plan for Neighborhood One.

- High Density parcels were assigned 24 units per acre as shown in the Detailed Master plan for Neighborhood One.

- Mixed Use parcels were assigned 24 units per acre as shown in the Detailed Master Plan for Neighborhood One.

- Commercial Units were based on 5,000 Gallons Per Day Per Acre.

- A minimum 10-foot depth of pipe is required.

- Pipe must be within the right-of-way as indicated on the Detailed Master Plan for Neighborhood One.

Neighborhood Two

- Residential design flow units were based on
    - 100 gallons per day per capita.
    - 4 people per Unit
    - Peak Factor of 4

- Low Density parcels were assigned 5 units per acre as shown in the General Plan for Neighborhood Two.

- Medium Density parcels were assigned 12 units per acre as shown in the General Plan for Neighborhood Two.

- High Density parcels were assigned 24 units per acre as shown in the General Plan for Neighborhood Two.

- Mixed Use parcels were assigned 24 units per acre as shown in the General Plan for Neighborhood Two.
- Commercial Units were based on 5,000 Gallons Per Day per Acre.

- A minimum 10-foot depth of pipe is required.

- Pipe must be within the right-of-way as indicated on the General Plan for Neighborhood Two.

Design Characteristics

Neighborhood One

Neighborhood One was divided into eight sub areas each connecting to the existing sanitary system at different locations. The areas are designated as Areas A and B on Exhibit 1 and Areas C through H on Exhibit 2. Specific design characteristics of each area are presented below.

AREA-A:
This area represents approximately 100,000 feet (19 Miles) of new sanitary sewer with a design flow rate of 3 Million Gallons per Day (MGD). Connection to the Interceptor would be done via a 24" jack-boring under Keats Avenue near 70th Street. The existing 18" stub at the interceptor is not adequate to serve this Area, and would need to be replaced with a 24" pipe.

During the design process we discovered that portions of the pipe along 70th street would have less than three feet of cover if the existing surface elevations were maintained. At that time we believed that the areas in question would need to be graded to provide adequate cover. Since then the issue has been further complicated by the necessity of a box culvert in this same location that would directly conflict with the proposed 24-inch diameter sanitary sewer.

This initial design calls for the removal of the existing 18" stub at the interceptor and replacing it with a 24" pipe at a lower elevation, thus providing adequate size and alleviating the conflict with the proposed box culvert. This upsizing would be required for all three alternatives mentioned below.

The Critical segment in Area-A is the 24" pipe on &70th Street between the interceptor and Jensen Avenue. Once this segment is constructed areas north of 70th Street can then be developed.

Part of Area-A, may be difficult to serve with gravity sewer without significant grading, or the installation of a lift station. This area is shown shaded red on Exhibit 3C. This study examined three design alternatives for this area:

Alternative One (Preferred)

This design alternative is depicted on Exhibit 3-A, and calls for the installation of oversized sewer pipes along the Military Road right-of-way and North from Jensen Avenue. Most areas meet a minimum 10-foot depth of pipe, and the pipe would be installed within the right-of-way as depicted on the Detailed Plan for Neighborhood One.

Installation of an oversized pipe would allow the sewer to be installed at a flatter grade. This would help provide adequate pipe cover. The down side to installing a larger pipe is that it would require more maintenance in the form of regular flushing with water to prevent the build up of hydrogen sulfide and solids.

Areas near the 900-foot contour may require filling in order to assure adequate pipe cover and service to lots. The extent of the required grading will depend on the final plat design.

Alternative Two
This design alternative is depicted on Exhibit 3-B, and calls for installing oversized sewer pipes to allow for flatter pipe grade and greater pipe depth. Like alternative one these pipes would require regular flushing to prevent the build up of hydrogen sulfide and solids in the pipe.

This alternative connects to the trunk on 70th street in three locations. Utility easements would be required in two of the locations, and the third would be within the Jensen Avenue right-of-way.

Areas near the 900-foot contour may require filling to assure adequate pipe cover and service to lots. Basement depths may need to be restricted in some areas in order assure service. The extent of the required grading, and restrictions would depend on the final plat design.

Alternative Three
This design alternative is depicted on Exhibit 3-C, and calls for the installation of a lift station at 70th Street and Jensen Avenue.

This is design alternative assures that adequate pipe cover so that lots can be serviced without restricting basement depths. The system would be installed within the right-of-way as depicted on the Detailed Plan for Neighborhood One.

The total estimated construction cost for Area-A, Alternative Three is $ 4,390,000. This includes an estimated $200,000 for a lift station and does not consider regular maintenance costs. The estimated construction cost for Area-A, Alternative One or Alternative Two would be similar to Alternative Three less the lift station cost.

AREA-B:
This area has a design flow of approximately 0.05 MGD, and would require approximately 3,000-feet (0.6 miles) of sanitary sewer pipe. Connection to the interceptor would be made at an existing 18-inch diameter stub. This preliminary design and the cost estimate below consider 8-inch diameter sanitary sewer main throughout this area. If sanitary sewer service is to be extended to the City of Woodbury through this area, the sewer main could be increased in size up to an 18-inch diameter pipe. This would of course increase the estimated construction cost. See serving the City of Woodbury below for more details.

The total estimated construction cost for Area-B is $ 310,000

AREA-C:
This area would consist of approximately 4,800-feet (0.9 Miles) of 8-inch diameter sanitary sewer, and has a design flow rate of approximately 0.20 MGD. The study looked at connecting this area to existing sanitary sewer on 82nd Street and 85th Street, however the inverts of the existing structures were higher than required. The design alternatives were either install a lift station on 85th Street or jack-bore under Keats Avenue and connect with the interceptor on the

East side of Keats Avenue. The later was chosen as the preferred alternative being it would eliminate the need to construct and maintain a lift station.

The total estimated construction cost for Area-C is $ 280,000.

AREA-D:
This Area has a design flow rate of approximately 0.75 MGD, and would consist of approximately 13,000-feet (2.5 miles) of sanitary sewer pipe.

There is a design conflict between the detailed master plan for Neighborhood One and the South Washington County Gravity Interceptor plan, on 90th Street. This preliminary sewer plan follows the interceptor construction plan. The pipe layout may need to be changed if the interceptor plan set does not reflect what was constructed.

The total estimated construction cost for Area-D is $ 670,000.

AREA-E:
This area consists of six lots on Jewel Avenue South. According to the as-built drawing for Jewel Ave. Sanitary sewer has already been extended to 90th Street. These lots therefore should be able to connect to this existing sewer line.

AREA-F:
This area would consist of approximately 2,000 feet (0.4 miles) of sanitary sewer with a design flow rate of approximately 0.10 MGD. Connection to the interceptor would be made at an existing 12-inch diameter stub.

The total estimated construction cost for Area-F is $ 100,000.

AREA-G:
This area would consist of approximately 8,500 feet (1.6 miles) of sanitary sewer pipe and has an approximate design flow rate of 1.00 MGD. Connection to the interceptor would be made at an existing 12-inch diameter stub.

The total estimated construction cost for Area-G is $ 500,000.

AREA-H:
This area would consist of approximately 2,000 feet (0.4 miles) of sanitary sewer pipe and has an approximate design flow of 0.20 MGD. Connection to the interceptor would be made at an existing 30-inch diameter stub.

The total estimated construction cost for Area-H is $ 90,000.

Neighborhood Two

The east side of Keats Avenue is divided into four more general sub areas, each connecting to the interceptor in different locations. These areas are designated I through K on Exhibit 1 and Area L on Exhibit 2. Specific design characteristics of each area, and the feasibility of connecting Old Cottage Grove to the interceptor are discussed below.

Area-I:
This area would have approximately 11,000 feet (2 miles) of sanitary sewer with an approximate design flow rate of 0.5 MGD. A new 10-inch diameter connection would be required at the interceptor.

The total estimated construction cost for Area-I is $ 340,000.

Area-J:
There are two interceptor stubs in this area. However, one of them would need to be replaced with a larger stub and both of their locations made for an inefficient design. This preliminary design therefore disregards the two existing stubs and extends a new trunk line along 70th Street starting at Keats Avenue. Lateral lines then feed into the 70th Street trunk from the north and south. This trunk line could also be resized and extended to the East to serve Old Cottage Grove. This will be presented in more detail below. Area-J would have approximately 57,000 feet (10.8 miles) of sanitary sewer pipe and have an approximate design flow rate of 4.5 MGD.

The total estimated construction cost for Area-J is $ 2,635,000.

Area-K:
The connection at the interceptor for this area is an existing 30-inch diameter stub. This is the same connection utilized by Area-C in Neighborhood One. A trunk line would be extended north on the new parkway to 80th Street, and then East along 80th Street. Lateral lines would then connect to this trunk. This trunk line could be resized to accommodate service to Old Cottage Grove. See Serving Old Cottage Grove, Below. This area would have approximately 38,000-feet (7.2 miles) of sanitary sewer pipe and a design flow of approximately 1.7 MGD

The total estimated construction cost for Area-K is $ 1,550,000.

Area-L:
This area would have approximately 4,000-feet (0.75 miles) of sanitary sewer, and a design flow of approximately 0.13 MGD. Connection to the interceptor would be made through Area-H in Neighborhood-One

The total estimated construction cost for Area-L is $ 160,000.

Serving Old Cottage Grove:
We looked at two scenarios to serve Old Cottage Grove:

1. Extend the trunk that serves Area-J, approximately 2,2000-feet, along 70th Street to Lamar Avenue and then South along Lamar Avenue to 80th Street.

2. Extend the trunk that serves Area-K approximately 1,800-feet, along 80th Street to Lamar Avenue and then North on Lamar Avenue to 70th Street. This scenario would require crossing a ravine on 80th Street. For this to be accomplished with gravity sewer would require part of the road to be raised approximately 25-feet. An alternative to raising the road would be to install a lift station on 80th Street on the West side of the ravine.

This area would consist of approximately 26,000-feet (5 miles) of sanitary sewer pipe and would have a design flow rate of approximately 1.26 MGD.

Serving the City of Woodbury

The Woodbury neighborhood abutting Area B to the north could be served through Area B. If the existing 18" sanitary sewer line were extended to the city of Woodbury we estimate that there would be enough available capacity to serve approximately 1,300 residential units.

Summary

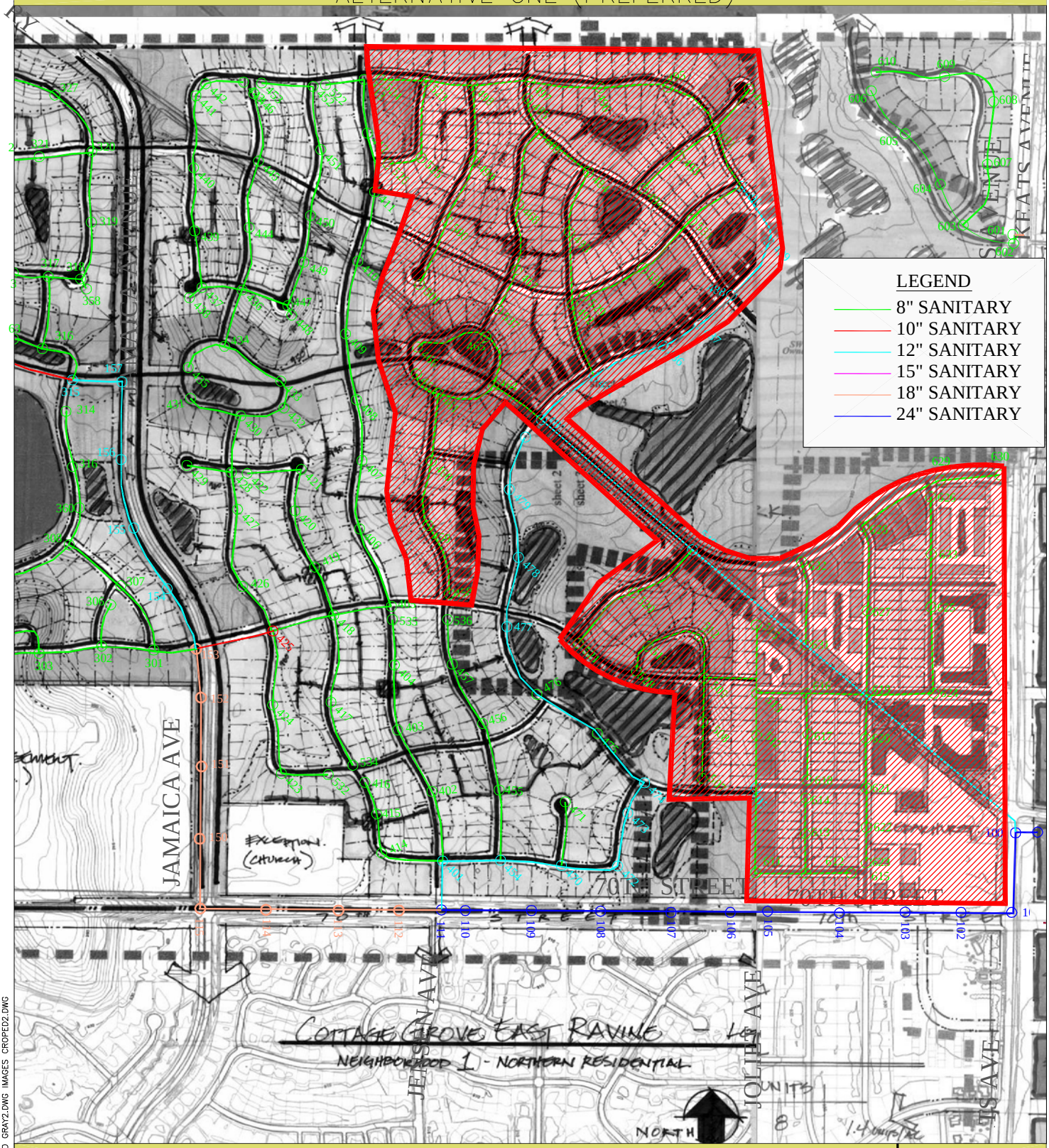
This preliminary plan consists of approximately 242,000 feet (46 miles) of sanitary sewer pipe with a total estimated design flow of approximately 13 MGD.

Estimated Construction Costs include the cost of installing the sanitary sewer pipe only. The total estimated construction cost for Neighborhood One is $6,340,000. The total estimated construction cost for Neighborhood Two is $ 4,700,000. The estimated Construction Cost for each area as depicted in Exhibits 1 and 2 are outlined in Table 1 below.

Table1 Estimated Construction Costs

Area	Estimated Cost / Sub Area	Estimated Cost / Area	Totals
Trunk Extension to Area A-1	$ 390,000		
Lift Station	$ 200,000		
A-1	$ 650,000		
A-2	$ 900,000		
A-3	$ 700,000		
A-4	$ 700,000		
A-5	$ 850,000		
Total Area A		$ 4,390,000	
B		$ 310,000	
C		$ 280,000	
D		$ 670,000	
F		$ 100,000	
G		$ 500,000	
H		$ 90,000	
Total Neighborhood 1			$ 6,340,000
I		$ 340,000	
J-1	$2,100,000		
J-2	$ 550,000		
Total Area J		$ 2,650,000	
K		$ 1,550,000	
L		$ 160,000	
Total Neighborhood 2			$ 4,700,000

SANITARY SERVICE IMPACTS AND IMPROVEMENTS
ALTERNATIVE ONE (PREFERRED)



CITY OF
COTTAGE GROVE

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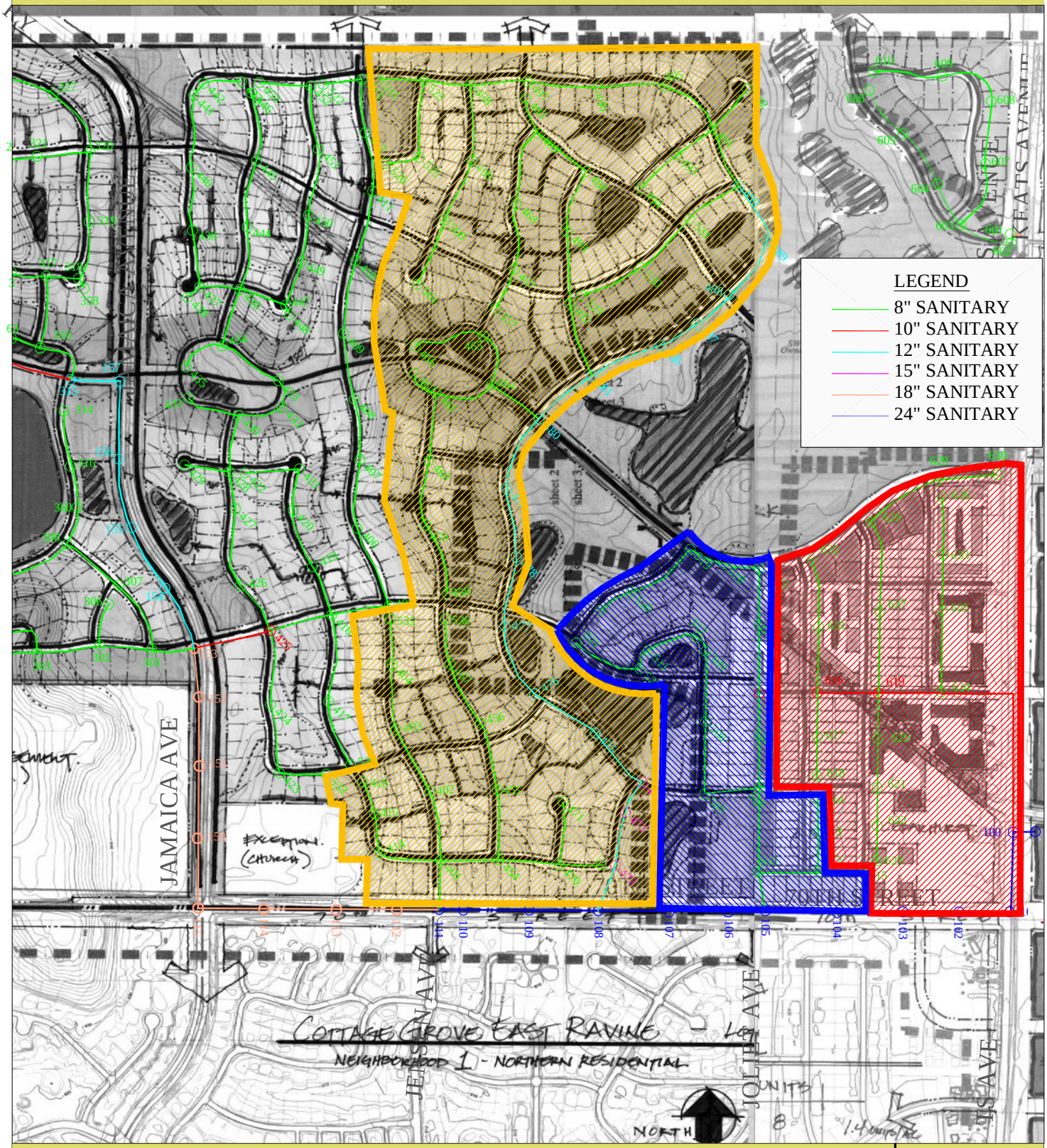
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SANITARY SERVICE IMPACTS AND IMPROVEMENTS
ALTERNATIVE TWO



CITY OF
COTTAGE GROVE

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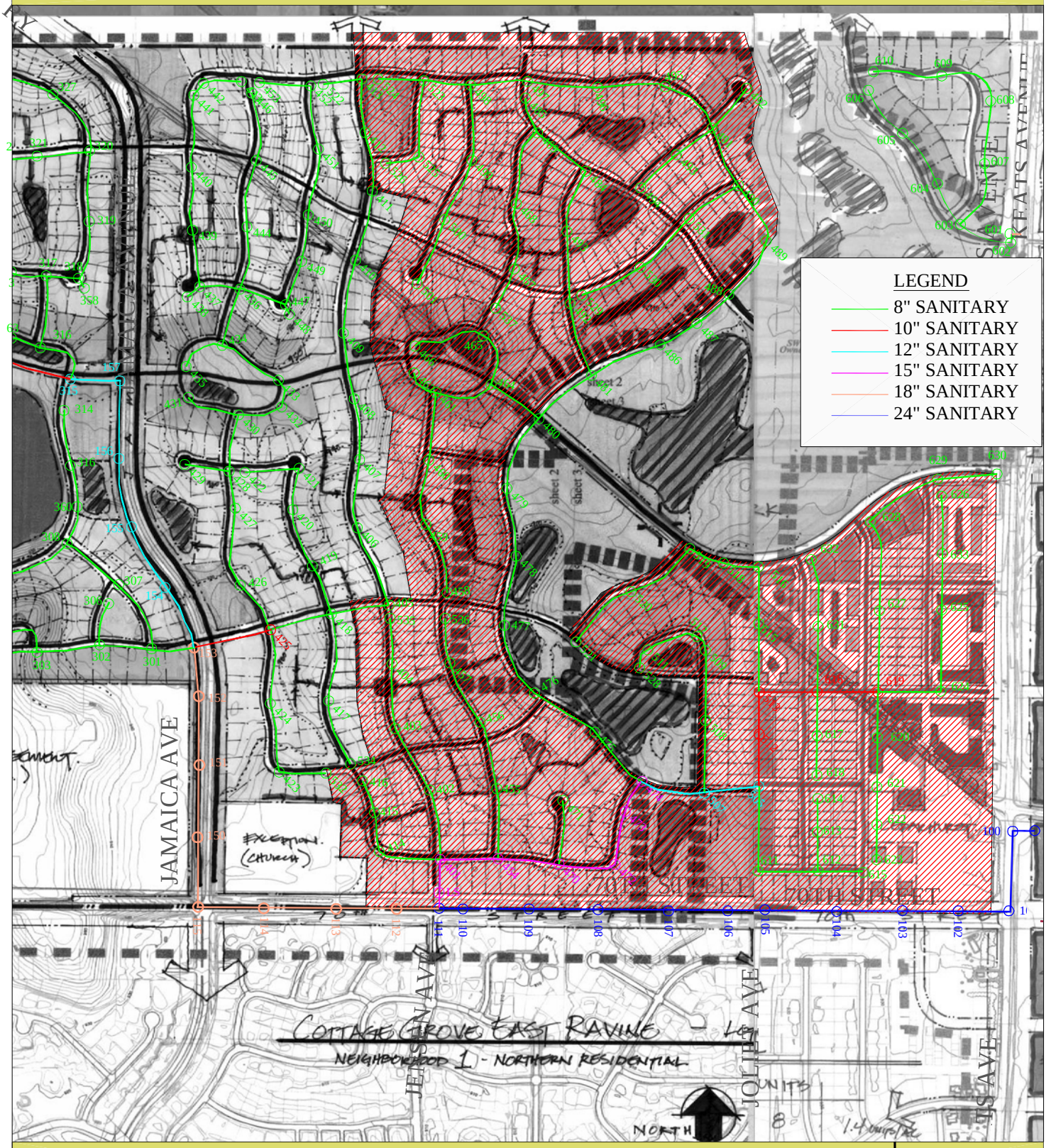
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3B

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SANITARY SERVICE IMPACTS AND IMPROVEMENTS
LIFT STATION SERVICE AREA



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COTTAGE GROVE

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EXHIBIT

3C

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Appendix 2B

While evaluating the sanitary sewer flows for the City of Cottage Grove and the East Ravine area, subsequent updates were performed to the 2040 Sanitary Sewer Comprehensive Plan model. These changes included updated land uses, sewer districts and units. The updated Table 7-6 shows the connection points to MCES #1 and #4 and does not include MCES #3. This connection to MCES #3 is discussed in the AUAR specifically for the East Ravine area due to sewer district changes.

From Node	To Node	Add Subdistricts	Average Flow (MGD)	Total Ave Flow (MGD)	Peak Flow	Design Flow (MGD)
To MCES Connection Point #1						
48	49	CGR-1	0.11	0.11	4	0.45
49	50	CGR-2	0.12	0.23	3.8	0.88
50	MDS #1	CGR-3	0.10	0.33	3.6	1.18
To MCES Connection Point #4						
1	2	WD-1	0.04	0.04	4	0.17
3	4	WD-3	0.04	0.04	4	0.14
4	2	WD-2	0.05	0.09	4	0.36
2	7	WD-9	0.00	0.13	3.9	0.52
8	7	WD-4	0.04	0.04	4	0.14
5	6	WD-5	0.05	0.05	4	0.22
6	7	WD-6	0.07	0.12	3.9	0.49
7	9		0.00	0.29	3.7	1.09
9	10	WD-7	0.06	0.35	3.6	1.26
10	11	WD-8	0.09	0.44	3.5	1.54
11	15		0.00	0.44	3.5	1.54
12	13	WD-10	0.05	0.05	4	0.18
14	13	WD-11	0.13	0.13	3.9	0.52
13	15		0.00	0.18	3.9	0.70
15	16	WD-12	0.10	0.72	3.3	2.38
16	17	WD-13	0.13	0.85	3.2	2.71
17	18	WD-14	0.18	1.03	3.1	3.19
19	20	C-1	0.05	0.05	4	0.18
20	21	C-2	0.10	0.15	3.9	0.59
21	22	C-3	0.15	0.30	3.7	1.10
22	23	C-4	0.06	0.35	3.6	1.28
24	23	C-5	0.06	0.06	4	0.26
23	25		0.00	0.42	3.5	1.47
25	26	C-6	0.06	0.48	3.5	1.67
26	27	C-7	0.05	0.53	3.4	1.81
28	29	ED-1	0.12	0.12	4	0.47
29	30	ED-2	0.12	0.24	3.8	0.89
30	31	ED-3	0.07	0.30	3.6	1.08
31	32	ED-4	0.15	0.45	3.5	1.58
33	32	ED-5	0.13	0.13	3.9	0.52
32	27		0.00	0.59	3.4	1.99
27	18		0.00	1.12	3.1	3.47
18	34		0.00	2.15	2.8	6.01
35	34	ED-6	0.09	0.09	4	0.37
34	36	L-1	0.17	2.41	2.7	6.51
37	38	TG-1	0.09	0.09	4	0.34
38	39	TG-2	0.13	0.22	3.8	0.83
39	40	TG-3	0.16	0.37	3.6	1.35
40	41	TG-4	0.17	0.54	3.4	1.83
42	43	TG-5	0.07	0.07	4	0.30
43	44		0.00	0.07	4	0.30
44	41	TG-6	0.06	0.14	3.9	0.54
41	45	TG-7	0.06	0.74	3.3	2.44
45	46	TG-8	0.22	0.96	3.2	3.07
46	36	TG-9	0.44	1.58	2.9	4.58
47	46	TG-10	0.18	0.18	3.9	0.71
36	MDS #4	L-2	0.09	4.08	2.5	10.19

WASTEWATER MANAGEMENT

According to the Metropolitan Land Planning Act, a Local Comprehensive Plan is required to include a sanitary sewer element covering the collection and disposal of wastewater generated by the community. Similarly, the Metropolitan Sewer Act requires local governments to submit a Comprehensive Sewer Plan (CSP) which describes the current and future service needs required from Metropolitan Council Environmental Services (MCES). The Comprehensive Sewer Plan is attached to the 2018 Comprehensive Plan as an appendix.

GOALS AND POLICIES

Goal 1: Effective and efficient operation and maintenance of the city's sanitary sewer system.

- POLICY 7.1 Cottage Grove will construct its system to facilitate operation and maintenance and prevent inflow and infiltration.
- POLICY 7.2 Cottage Grove will maintain a detailed inventory of its sanitary sewer system including an up-to-date electronic map including location and specifications of all pipes, structures, and lift stations.
- POLICY 7.3 Cottage Grove will clean a portion of its sanitary sewer system every year.
- POLICY 7.4 Cottage Grove will regularly televise and clean its sanitary sewer system to determine whether it is performing adequately.
- POLICY 7.5 During major street reconstruction projects, Cottage Grove will assess the system within the project area and makes improvements as needed.
- POLICY 7.6 Cottage Grove is committed to training those responsible for managing its sanitary sewer system and ensures that staff has the equipment necessary to properly maintain the system.
- POLICY 7.7 Cottage Grove will maintain an organizational chart of its sewer maintenance department and ensure that each staff member has a job description.
- POLICY 7.8 Cottage Grove will rehabilitate sewers before their deterioration negatively affects residents, businesses, or the Metropolitan Disposal System.
- POLICY 7.9 Cottage Grove will maintain a general emergency response plan that pertains to sanitary sewer overflows.
- POLICY 7.10 The City will coordinate sanitary sewer utility services and development with surrounding communities, Washington County, the Minnesota Pollution Control Agency, and the Metropolitan Council.

Goal 2: To provide sanitary sewer service that is adequate to meet current and future development needs.

- POLICY 7.11 The extension of sanitary sewers shall be programmed so as to achieve maximum benefit from the existing utilities.
- POLICY 7.12 The sanitary sewer system shall be constructed to accommodate the proposed land use densities and uses identified in the future land use plan.
- POLICY 7.13 Cottage Grove will provide a system reserve capacity in all trunk designs so that local occurrences of higher sewage generating uses or higher densities can be accommodated.
- POLICY 7.14 When in-fill development or redevelopment occurs, Cottage Grove will evaluate existing sanitary sewer systems as to their capacity.
- POLICY 7.15 Cottage Grove develops and regularly updates its sanitary sewer system Capital Improvement Plan (CIP).
- POLICY 7.16 The City will encourage development densities that maximize the use of the existing sanitary system. Where existing facilities do not have capacities to accommodate the maximum allowable densities, the City reserves the right to restrict development to average density.

- POLICY 7.17 For properties in the rural service area, subsurface sewage treatment systems (SSTS) shall be allowed provided such systems conform to all local, state and federal requirements.
- POLICY 7.18 When feasible, maintain sanitary sewer depth to provide maximum flexibility related to future development.
- POLICY 7.19 When installing new sanitary sewer adjacent to properties on private well and septic, sanitary sewer services will be installed to allow for cost effective connection it the future.

Goal 3: Cottage Grove provides a cost effective sanitary sewer system that is equitably financed.

- POLICY 7.20 Cottage Grove finances new sanitary sewer trunks for new development through area and connection charges.
- POLICY 7.21 Cottage Grove finances its existing system operation and maintenance through utility billings.
- POLICY 7.22 Cottage Grove prepares for replacement of its sanitary sewer system by incorporating replacement costs into its utility billing rates.
- POLICY 7.23 The extension of sanitary sewers shall be programmed so as to achieve maximum benefit from the existing utilities. This staging program will result in the most efficient expenditure of public funds while maintaining the City's growth pattern.

COTTAGE GROVE COMPREHENSIVE SANITARY SEWER PLAN

Introduction

According to the Metropolitan Land Planning Act, a Local Comprehensive Plan is required to include a sanitary sewer element covering the collection and disposal of wastewater generated by the community. Similarly, the Metropolitan Sewer Act requires local governments to submit a Comprehensive Sewer Plan (CSP) which describes the current and future service needs required from Metropolitan Council Environmental Services (MCES). This sanitary sewer section will serve as both the sanitary sewer element of the City's Comprehensive Plan and the City's CSPP document.

In May 2015 the Metropolitan Council adopted the 2040 Water Resources Management Policy Plan (WRMPP). The 2040 WRMPP includes the metropolitan wastewater system plan with which local comprehensive plans must conform. Cottage Grove will prepare this sewer element chapter of its Comprehensive Plan to demonstrate its conformance to the regional plan. This chapter will update previous sewer planning efforts and describe in detail the expansion of the City's sanitary sewer system to serve urban development. This sanitary sewer section provides the specific information needed to meet the 2040 WRMPP requirements.

Cottage Grove's 2030 Comprehensive Plan included a wastewater section describing the expansion of the City's trunk system through 2030 and the demands this expansion would place on the Metropolitan Disposal System (MDS) operated by MCES. The wastewater section in the 2040 Comprehensive Plan will describe these demands out to 2040. MCES also uses this section to determine whether capacity upgrades will be needed at the Eagles Point Wastewater Treatment Plant (WWTP), which services all of Cottage Grove.

Cottage Grove's sanitary sewer system is designed to carry wastewater from homes to the MDS, which is owned and operated by MCES. The MDS consists of interceptors and wastewater treatment plants and appurtenances to these including lift stations, siphons, valves and tunnels. Cottage Grove's sanitary sewer system consists of lateral sewer pipes that serve neighborhoods and businesses, trunk sewer pipes (larger than 10-inch diameter) that collect wastewater from laterals, and lift stations that pump wastewater from lower areas of the City.

Municipal sanitary sewer service was initially provided within Cottage Grove in 1961 as a replacement for the individual septic tank systems that were serving the Thompson Grove plats. The first stage of the Cottage Grove WWTP was constructed in 1962 in conjunction with this original municipal sewer installation. This

plant continued to serve the wastewater treatment needs of Cottage Grove until it was replaced by the Eagles Point WWTP in 2002. The new treatment plant has a wastewater capacity of 10 Million Gallons per Day (MGD) to serve Cottage Grove and portions of Woodbury via the South Washington County Interceptor (SWCI) through approximately 2020, at which time it could be expanded to 20 MGD for added service capacity. Ultimately, the Eagles Point WWTP discharges effluent to the Mississippi River.

Sanitary Sewer System

The Sanitary Sewer System Map (Figure 7-2) identifies the ultimate service area, represented by sewer district delineations, delivering wastewater to the Eagles Point WWTP via the SWCI. The Sanitary Sewer System Map provides a detailed inventory of the City's existing trunk facilities, including: trunk sanitary sewer pipe, lift stations, forcemains, and MCES Interceptors. The location of lateral sanitary sewer pipe is also identified. All five existing and future connection points to the MDS (i.e. connections to the SWCI) are identified and numbered one through five. The Sanitary Sewer System Map also identifies the intercommunity wastewater flow connection points.

The only existing private treatment facility in Cottage Grove is located at the 3M Cottage Grove Center industrial complex. Because 3M is a high-volume facility, it is inspected annually by either the Environmental Protection Agency or the MPCA to determine compliance with their National Pollution Discharge Elimination System permit. The City of Cottage Grove oversees proper operation of the 3M facility by maintaining contact with the MPCA representative responsible for this plant and reviewing the annual inspection report. The location of the 3M treatment facility is identified on Figure 7-X.

Forecasts

The Metropolitan Council requires municipalities to include adopted forecasts for population, households, and employment in ten-year increments to 2040 in their comprehensive plans. Table 7-3 includes the forecast figures directly from the Metropolitan Local Planning Handbook for the City of Cottage Grove. These forecast numbers are confirmed in the WRPP revised forecasts adopted in May of 2015. The City of Cottage Grove has reviewed and concurs with these projections.

Table 7-3: Cottage Grove Population, Household, and Employment Forecasts

Year	Population	Households	Employment
2010	34,589	11,719	6,484
2020	38,400	13,300	7,700
2030	42,200	15,200	8,400
2040	47,000	17,300	9,000

Source: Metropolitan Council

In addition to the forecasts in Table 7-X, the Metropolitan Council also requires cities to provide projected average wastewater flows in 10-year increments through 2040. The Metropolitan Council uses these forecasts to plan all future interceptors and wastewater treatment work needed to provide adequate service. Table 7-3 presents projected average flow data from two sources:

Flows identified in the Metropolitan Council Water Resources Policy Plan dated May of 2015 and amended in May of 2018.
City flow projections are calculated by a spreadsheet sewer models (existing and ultimate). Projected flows were determined by multiplying the ratio of increase in flow from 2020 to 2040 to roughly match the projected growth forecasts for the City.

Table 7-4: Wastewater Flow Projections

Year	MCES Projected Average Flow (MGD)	City Projected Average Flow (MGD)
2010	2.03	2.76
2020	2.28	3.86
2030	2.49	4.49
2040	2.70	5.20

The City-wide average flows presented in Table 7-4 are further divided into the projected average wastewater flow to each MDS connection point in 10-year increments through 2040. Figure 7-2 identifies the five connection points to the MDS from Cottage Grove and the area tributary to each of these five connection points. This information is provided in Table 7-5.

Table 7-5: Projected Wastewater Flows by Connection Point to the MDS

Stage Year	#1 (MGD)	#2 (MGD)	#3 (MGD)	#4 (MGD)	#5 (MGD)	Total
2010	0.00	0.00	0.00	2.72	0.00	2.72
2020	0.12	0.03	0.03	3.68	0.00	3.86
2030	0.24	0.03	0.29	3.90	0.03	4.49
2040	0.28	0.04	0.32	4.36	0.20	5.20
Ultimate	1.07	0.28	1.33	4.51	2.57	9.76

Table 7-6 presents the capacity and design flows of the existing trunk sanitary sewer pipes. The trunk system is summarized from node to node, as identified on Figure 7-2. For the purposes of this narrative, a node is identified within trunk sewer system at the following locations:

- Upstream end of a trunk (generally considered 10” pipe and larger) sewer pipe
- Where new flows from the sewershed are introduced into the system
- Trunk sewer junction points
- Trunk sewer pipe size changes

The design flows presented in Table 7-6 on the next page are calculated from the summation of the average flow values of the sewer districts tributary to a trunk pipe segment, multiplied by the appropriate peak flow factor.

Table 7-6: Design Flows (MDG) for the Ultimate System

From Point	To Point	Area Added	Average Flow Added (MGD)	Total Average Flow (MGD)	Peak Flow Factor (PFF)	Design Flow (MGD)
To MCES Connection Point #1						
48	49	CGR-1	0.105	0.105	4	0.419
49	50	CGR-2	0.166	0.271	3.7	1.001
50	#1	CGR-3	0.146	0.417	3.5	1.458
To MCES Connection Point #3						
51	#3	CGR-15	0.287	0.287	3.7	1.062
To MCES Connection Point #4						
1	2	WD-1	0.119	0.119	4	0.478
3	4	WD-3	0.044	0.164	3.9	0.638
4	2	WD-2	0.057	0.221	3.8	0.839
2	7			0.221	3.8	0.839
5	6	WD-5	0.090	0.090	4	0.360
6	7	WD-6	0.128	0.218	3.8	0.830
8	7	WD-4	0.093	0.093	4	0.371
7	9			0.532	3.4	1.809
9	10	WD-7	0.064	0.596	3.4	2.028
10	11	WD-8	0.117	0.713	3.3	2.353
11	15	WD-9	0.016	0.729	3.3	2.405
12	13	WD-10	0.046	0.046	4	0.184
14	13	WD-11	0.151	0.151	3.9	0.588
13	15			0.197	3.8	0.748
15	16	WD-12	0.122	1.047	3.1	3.246
16	17	WD-13	0.107	1.154	3.1	3.579
17	18	WD-14	0.218	1.372	3	4.116
19	20	C-1	0.055	0.055	4	0.219
20	21	C-2	0.108	0.163	3.9	0.634
21	22	C-3	0.133	0.296	3.7	1.095
22	23	C-4	0.072	0.367	3.6	1.323
24	23	C-5	0.069	0.069	4	0.275
23	25			0.436	3.5	1.527
25	26	C-6	0.063	0.499	3.5	1.748
26	27	C-7	0.052	0.552	3.4	1.876
28	29	ED-1	0.131	0.131	3.9	0.512
29	30	ED-2	0.167	0.299	3.7	1.105
30	31	ED-3	0.065	0.364	3.6	1.310
31	32	ED-4	0.153	0.517	3.4	1.758
33	32	ED-5	0.135	0.135	3.9	0.528
32	27			0.652	3.3	2.153
27	18	C-8	0.066	1.270	3	3.810
18	34			2.642	2.7	7.134
35	34	ED-6	0.086	0.086	4	0.343
34	36	L-1	0.231	2.959	2.6	7.693
37	38	TG-1	0.110	0.110	4	0.442
38	39	TG-2	0.134	0.245	3.7	0.906
39	40	TG-3	0.165	0.410	3.5	1.435
40	41	TG-4	0.146	0.556	3.4	1.889
42	43	TG-5	0.086	0.086	4	0.345
43	44			0.086	4	0.345
44	41	TG-6	0.061	0.148	3.9	0.576
41	45	TG-7	0.062	0.765	3.3	2.525
45	46	TG-8	0.176	0.941	3.2	3.012
47	46	TG-10	0.146	0.146	3.9	0.571
46	36	TG-9	0.353	1.441	3	4.322
36	#4	L-2	0.108	4.508	2.4	10.819

Infiltration and Inflow

The Metropolitan Council has continued its Inflow/Infiltration (I/I) Surcharge Program. The fundamental policy statement summarizing this program is that the Metropolitan Council "will not provide additional capacity within its interceptor system to serve excessive inflow and infiltration." The Council establishes inflow and infiltration thresholds for each of the communities that use its system. Communities that exceed this threshold are required to eliminate this excess flow within a reasonable timeframe. The Metropolitan Council has not identified Cottage Grove as a community with observed excess I/I. Cottage Grove's sanitary sewer system is relatively new and I/I has not been a significant issue to date. Comparing the MCES flow meter (M600A) data and daily rainfall data over the past few years, no consistent correlation is observed between rainfall events and higher average flow values, indicating I/I problems. The City has identified the Thompson Grove trunk sanitary sewer through subdistricts TG-1 and TG-3 as a potential I/I contributor and is diligent in inspecting this trunk sanitary sewer frequently to identify cracks or joint separations and performing crack grouting or joint repair as necessary.

An outline of the City's proactive implementation program directed at identifying and correcting I/I, is as follows:

- City Ordinance 8-1-13A prohibits roof and foundation drains to be connected to the sanitary sewer system. The ordinance states that "No owner, occupant or user of any premises shall direct into or allow any storm water or surface water to drain into the sanitary system of the City."
- Cottage Grove conducts sewer line televising for a portion of the system annually in conjunction with the sewer cleaning schedule, making repairs where potential I/I problems are indicated. All new City facilities are also televised before being placed in service. Additionally, after major street reconstruction projects, sanitary sewer pipe in the project area are televised to ensure that no damage occurred.
- Continue regular monitoring and maintenance activities on trunk sanitary sewer lines suspected of contributing to I/I.
- Communication with the MCES regarding above average flow readings at meter number M600 indicating a potential I/I problem.

Table 7-7 presents a summary of budgeted implementation costs to address I/I in the City's system.

Table 7-7: Estimated I/I Implementation Costs

I/I Implementation Activity	Cost
Televise and inspect sewer facilities for leaks	$20,000 per year
Inspect sewer facilities in response to backups and in coordination with street reconstruction program	$50,000 per year
Perform repairs or rehabilitation of sewers	$150,000 per year
Disconnect prohibited/unused connections to sewer	$5,000 per year

Subsurface Sewage Treatment Systems (SSTS)

According to the current Washington County SSTS database, there are approximately 808 SSTS in operation within the City of Cottage Grove. In August 1999, Cottage Grove turned administrative responsibility for SSTS over to Washington County. The transfer of authority was conducted under the premise that Washington County can more easily keep up-to-date on evolving regulation regarding these systems. Section 17.2 of the Washington County Individual Sewage Treatment System Regulations (Ordinance 128) states:

> *"The owner of an individual sewage treatment system or the owner's agent shall regularly, but in no case less frequently than every three years, have the tank or tanks pumped. As an alternative, the owner may inspect and measure the accumulations of scum, which includes grease and other floating materials at the top of each septic tank and compartment along with the sludge, which includes the solids denser than water."*

The following is a comparison of Washington County regulations versus those contained in Minnesota Rules 7080:

- The Washington County regulations establish a 30-day time frame to correct failing systems which pose an imminent threat to the public health, safety and welfare, whereas Chapter 7080 establishes a 10 month time frame.
- The Washington County ordinance establishes a 90 day time frame for correcting failing systems that do not pose an imminent threat to public health, safety and welfare, whereas there is no time frame listed in Chapter 7080.
- The Washington County regulations require percolation tests and four soil borings for proposed sites, while Minnesota Rules 7080 has no such requirements.
- Under the Washington County regulations, a minimum of 12 inches of rock layer is required, while Minnesota Rules 7080 requires 6 inches.
- The Washington County regulations require that homeowners have tanks pumped every three years or be inspected, while Chapter 7080 requires a homeowner inspection every three years.

Figure 7-3 shows the locations of SSTS within Cottage Grove.

Figure 7-2: City of Cottage Grove, MN Sanitary Sewer Map

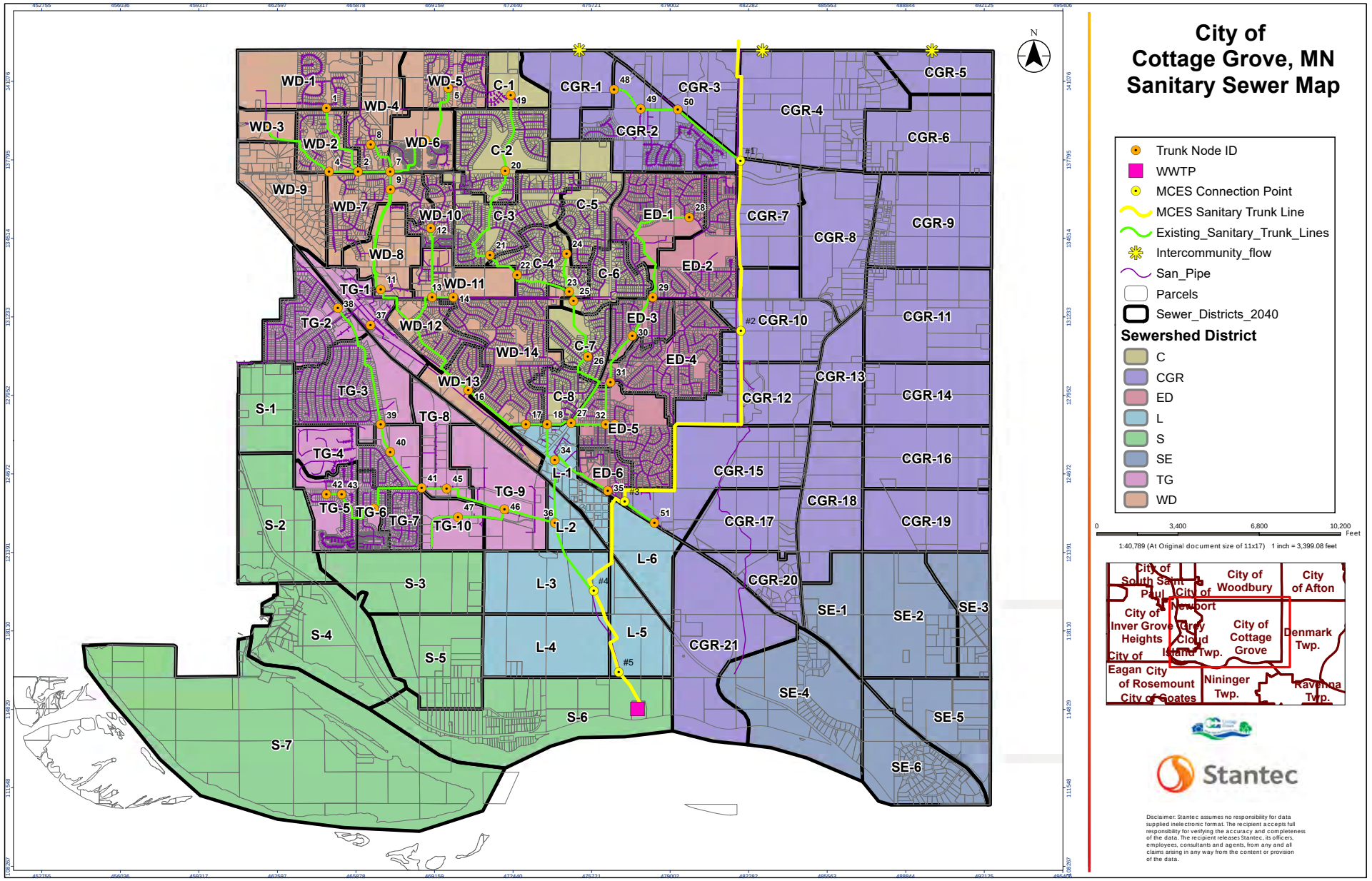
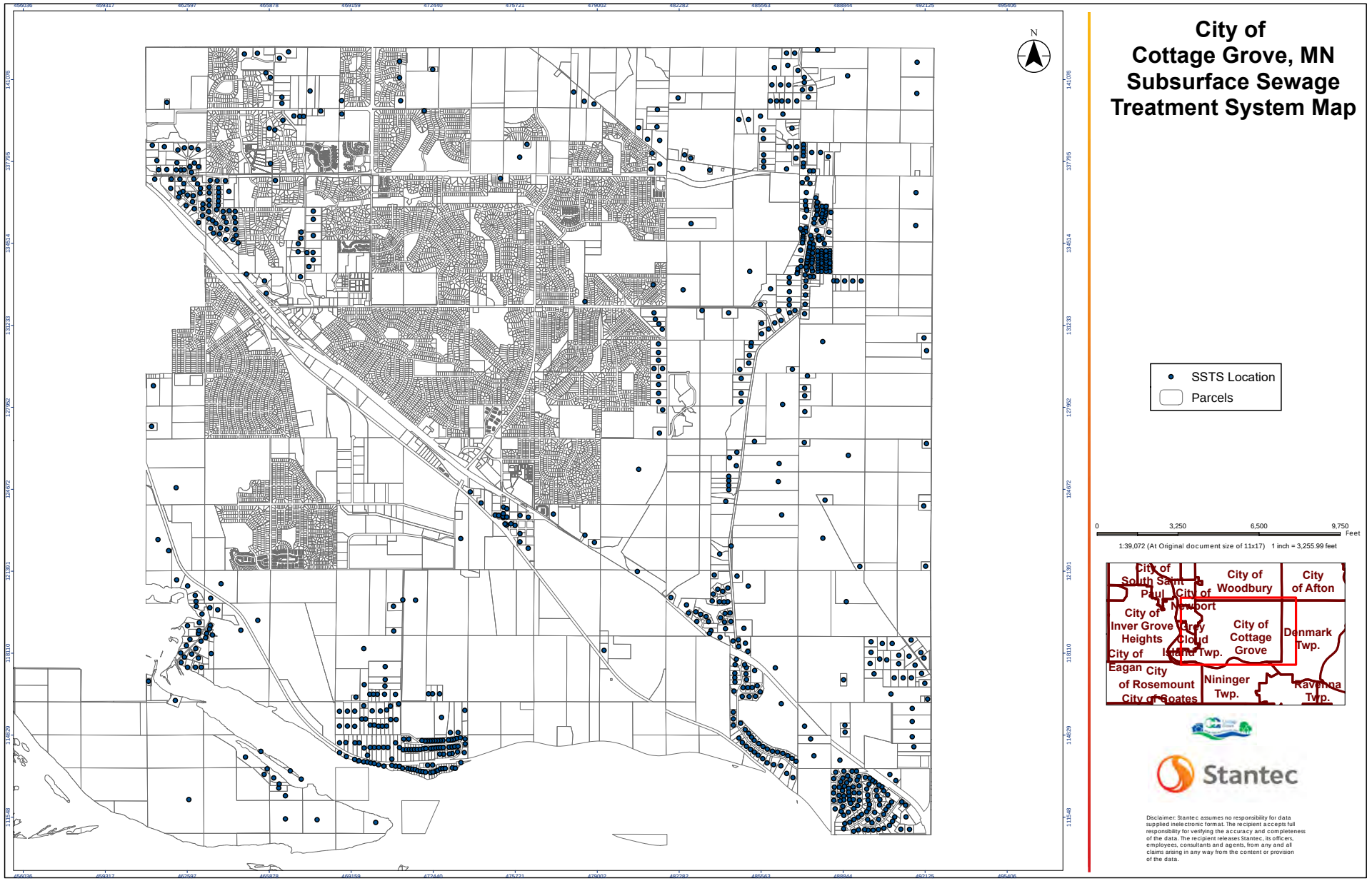


Figure 7-3: City of Cottage Grove, MN Subsurface Sewage Treatment System Map



Howard R. Green Company

MEMO

To:	Brian Johnson
From:	Brent Thompson
Subject:	Cottage Grove East Ravine Planning Study - Watermain
Date:	February 7, 2005

TECHNICAL MEMORANDUM

The purpose of this memo is to outline the methodologies and assumptions used in the Public Water Supply and Impact Improvement Plans for the Cottage Grove East Ravine Study, and present key features of the preliminary layouts.

Methodology

- The Water Supply Distribution Plan Dated December 1995, by Bonestroo Rosene Anderlik and Associates (BRAA) was used as a guideline in:
  - Locating existing trunk lines
  - Locating existing towers
  - Determining proposed trunk pipe sizes and locations
  - Locating and sizing proposed water towers
- Water supply system design and impacts were based on the detailed master plan for Neighborhood One and the general plan for Neighborhood Two provided by Hoisington Koegler Group, Inc. (HKgi).
- The study area is divided into two sections. Neighborhood One is located west of Keats Avenue and is further subdivided into an area north of 70th Street and an area along Keats Ave. south of 80th Street. Neighborhood Two is located east of Keats Avenue. Design characteristics for each neighborhood are presented below.
- The project was also broken out into phases. Phasing of the overall project is largely dependent upon the sanitary sewer infrastructure. Watermain construction will follow along with the sanitary sewer construction.

Design Characteristics

Neighborhood One

Neighborhood One is located west of Keats Avenue. Trunk watermain locations were laid out based on the City's ultimate water distribution plan. This plan shows general trunk watermain locations in the unserved areas located at ½ mile spacing. Since the East Ravine plan provided by HKgi was more detailed, indicating street and lot details, the watermain routing was laid out to follow the proposed streets. Connections to the existing watermain system would be made where appropriate. The watermain layout for Neighborhood One is shown on **Exhibits 6 & 7**.

Neighborhood One was divided into two sub areas. The North Area is located north of 70th Street. The South Area is located south of 80th Street.

North Area:
24-inch and 16-inch trunk watermain would be extended north along Inwood Avenue from the existing water tower at Inwood Avenue and 68th Street to provide a connection to the City of Woodbury's water system. This connection would be used only in the case of an emergency.

The design of the water supply system was laid out to minimize the impact to Jamaica Avenue, which is assumed to continue to serve as a higher volume roadway.

With the exception of the trunk watermain shown on the exhibits, all other watermain in the North Area is 8-inch diameter. It was laid out to follow the proposed streets and looped through cul-de-sacs where possible.

This area would have approximately 131,000 linear feet of watermain pipe to serve an estimated 1889 units.

South Area:
12-inch through 24-inch trunk watermain is proposed in the South Area of Neighborhood One. 12-inch watermain is recommended for the commercial areas in order to provide adequate fire flow to the buildings. In addition to the trunk watermains, 8-inch lateral watermain is laid out to follow the remaining proposed streets.

This area would have approximately 52,000 linear feet of watermain pipe to serve an estimated 1272 units. The estimated cost of improvements for Neighborhood One is $8,600,000.

Neighborhood Two

Neighborhood Two is located east of Keats Avenue. The East Ravine plan indicated a more general layout of land uses, with less street and "plat level" detail than Neighborhood One. Again, watermain was designed with trunk location and sizing according using the BRAA plan as a guide. An attempt was made to minimize the impact to Keats Avenue, however, some disruption may occur when connections area made to existing watermain along and on the west side of Keats Avenue. We recommend the use of trenchless technologies to minimize traffic impacts on major county roads such as Keats (CSAH 19). One water tower is proposed within the Neighborhood Two area, located at the intersection of Keats Avenue and 70th Street (CSAH 20), with a storage capacity of 2.0 MG. The exact location of the tower is not determined and can be adjusted based on land development priorities and demands. General proximity to 70th Street is desirable. The watermain design for Neighborhood Two is shown on **Exhibit 6**.

This area would have approximately 86,000 linear feet of watermain pipe to serve an estimated 2241 units. Including the water tower, the estimated cost of improvements for Neighborhood Two is $8,030,000.

Old Cottage Grove

To serve Old Cottage Grove, trunk watermain would be extended east along 70th and 80th Streets as well as along Lamar Avenue from 80th Street to the northern City limits. A 1.0 MG water tower is proposed at the intersection of 70th Street and Lamar Avenue. The proposed watermain extensions to serve this area would contain approximately 20,000 linear feet of pipe. The estimated cost of improvements for the Old Cottage Grove area, including the water tower, is $2,630,000.

Project Phasing

As mentioned above, the project has been broken out into phases to identify those areas that are readily developable, and other areas that are dependent upon preceding development construction. See **Exhibits 1 & 2** for phasing areas.

Approximate costs per development area for watermain improvements:

Neighborhood One

A1	$1,310,000
A2	$1,090,000
A3	$ 960,000
A4	$1,070,000
A5	$1,200,000
B	$ 180,000
C	$ 520,000
D	$1,310,000
E	$ 0 – existing infrastructure would allow immediate service connections
F	$ 130,000
G	$ 440,000
H	$ 390,000
Total	**$8,600,000**

Neighborhood Two

I	$ 400,000
J1	$4,890,000
J2	$1,170,000
K	$1,420,000
L	$ 150,000
Total	**$8,030,000**

Old Cottage Grove **$ 2,630,000**

Note: The above costs do not include additional wells or treatment plant costs, should they be required in the future.

Recommendations

The City currently has many lateral watermains that are 6-inch diameter pipe. Our recommendation is to use 8-inch diameter for the minimum pipe size (except for hydrant leads

which could be 6-inch). Our recommendation is based on providing adequate fire flow while still maintaining residential service.

Portions of Area A-5 are above an elevation of 978' and may require special consideration for low pressure. The majority of Areas G, H and L are below an elevation of 863' and may require pressure reducing valves on the services.

Existing Water Treatment Capacity and impact of additional demand

Based on information obtained from BRAA, the existing water supply and treatment for the East Ravine area will be provided off site. In addition, the existing well field is felt to be adequate for the needs of the East Ravine area.

The proposed East Ravine plan would increase the water demand by approximately 13.0 MGD.

Summary

The preliminary plan for the Public Water Supply and Impact Improvements in the East Ravine area consists of approximately 290,000 linear feet (55 miles) of watermain pipe and 3.0 MG of storage to serve an estimated 5400 units. The total estimated cost of these improvements is $19,260,000.

A more detailed modeling of the water system would need to be conducted to address the number of wells that would be needed, exact location of new towers, threshold demand levels for the addition of new towers, high & low pressure areas, and overall system performance.

WATERMAIN IMPACTS AND IMPROVEMENT PLANS

LEGEND
- 8" WATERMAIN
- 12" WATERMAIN
- 16" WATERMAIN
- 20" WATERMAIN
- 24" WATERMAIN
- 30" WATERMAIN

NEIGHBORHOOD 1-NORTH AREA

NEIGHBORHOOD 2

0 800 1600 3200ft

NORTH

CONNECTION TO CITY OF WOODBURY

CONNECT TO EXISTING 24"

CONNECT TO EXISTING 24"

EXISTING 1.5 MG WATER TOWER

CONSERVATION EASEMENT (APPROX 18AC.)

CONNECT TO EXISTING 12"/18"

CONNECT TO EXISTING 12"

CONNECT TO EXISTING 24"

CONNECT TO EXISTING 8"

CONNECT TO EXISTING 8"

FUTURE 2.0 MG WATER TOWER

FUTURE 1.0 MG WATER TOWER

FUTURE TRUNK EXTENSION

FUTURE TRUNK EXTENSION

FUTURE TRUNK EXTENSION

68TH ST

70TH STREET

80TH STREET

INWOOD AVE

JAMAICA AVE

IRVINA AVE

JOLIET AVE

KEATS AVENUE

LAMAR AVENUE

Sheet3

CITY OF COTTAGE GROVE

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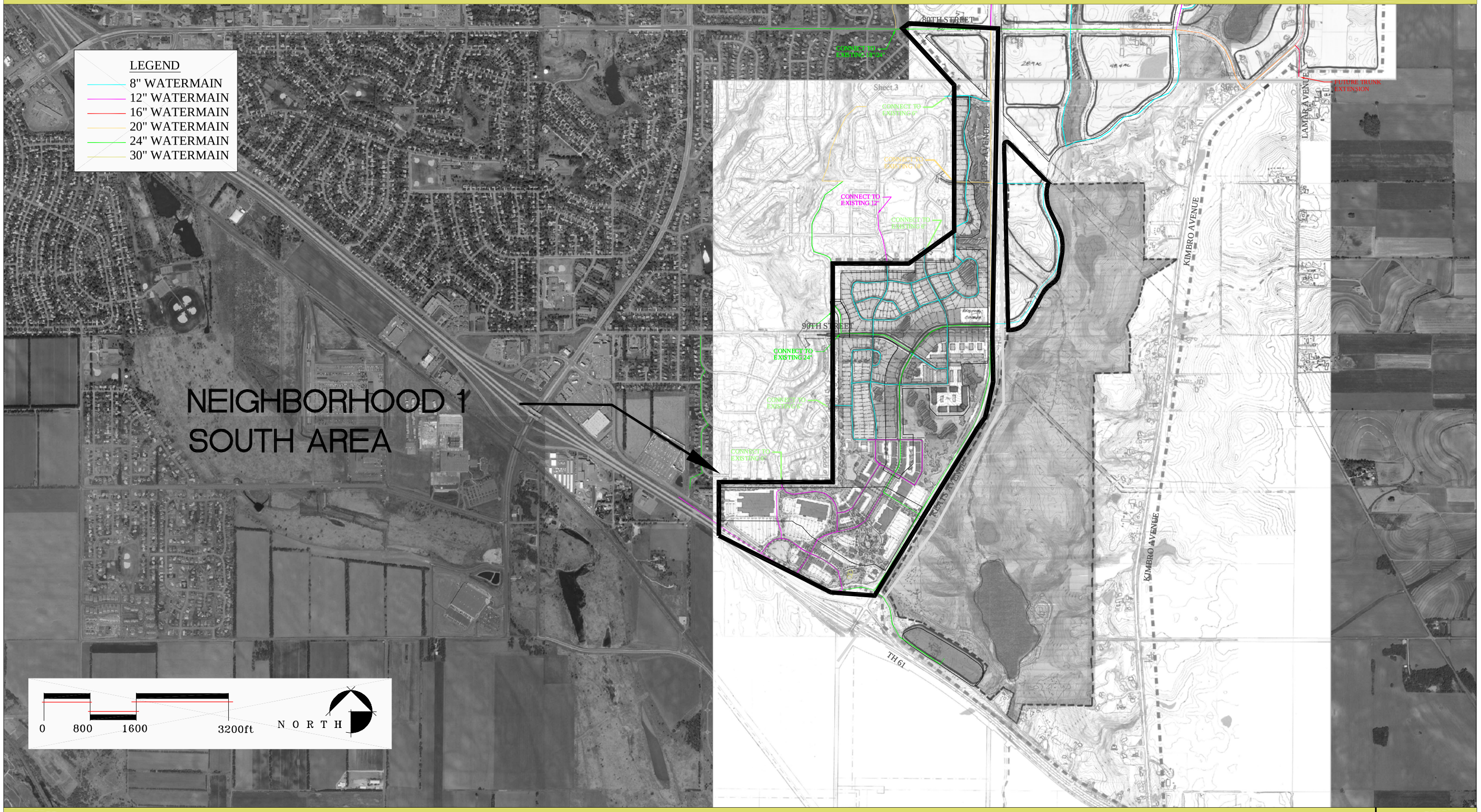
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Hoisington Koegler Group inc.
Earth Tech
Emmons & Oliver Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

EXHIBIT

6

WATERMAIN IMPACTS AND IMPROVEMENT PLANS



CITY OF COTTAGE GROVE

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Hoisington Koegler Group inc.
Earth Tech
Emmons & Oliver Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

EXHIBIT

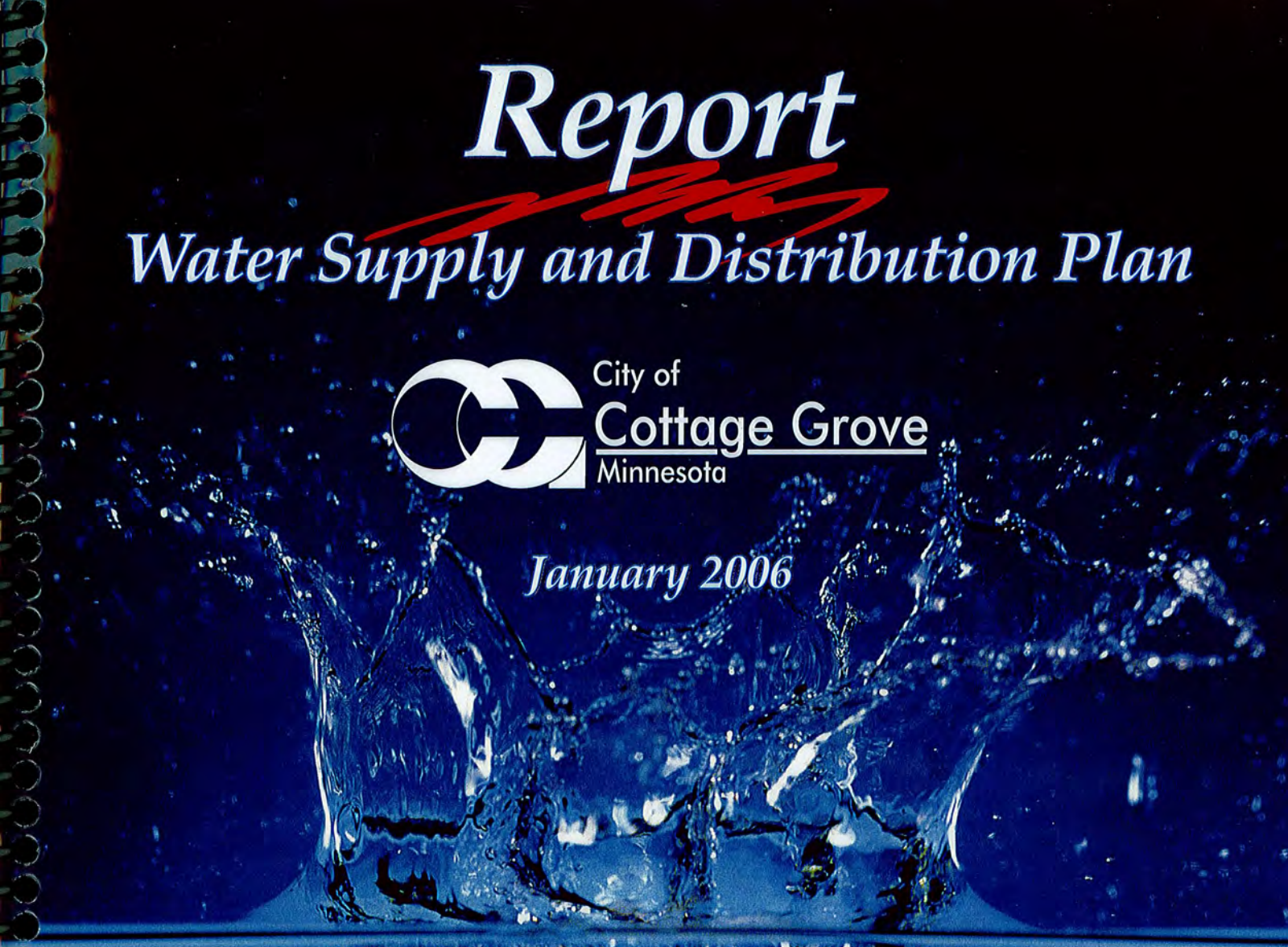
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Report

Water Supply and Distribution Plan

City of
Cottage Grove
Minnesota

January 2006



Bonestroo
Rosene
Anderlik &
Associates
Engineers & Architects

Bonestroo
Rosene
Anderlik &
Associates
Engineers & Architects

2335 West Highway 36 • St Paul, MN 55113
Office: 651-636-4600 • Fax: 651-636-1311
www.bonestroo.com

January 23, 2006

Honorable Mayor and City Council
City of Cottage Grove
7516 80th Street South
Cottage Grove, MN 55016

Re: Water Supply & Distribution Plan
Our File No. 000048-05213-0

Dear Mayor and Council:

Transmitted herewith is the Water Supply and Distribution Plan for the City of Cottage Grove. The plan is intended to serve as a guide for the expansion of the City's trunk water system. The information presented in this report is based on costs and data that were available in late 2005.

This report updates and expands upon previous water distribution system reports. A layout of the ultimate trunk water supply and distribution system is presented on Figure 1 at the back of the report. Preliminary cost estimates for water mains, wells, and storage facilities have been prepared to serve as a basis for area and connection charges.

We would be pleased to discuss the contents of this report and the findings of our study with the City Council and Staff or other interested parties at any mutually convenient time.

Respectfully submitted,

BONESTROO, ROSENE, ANDERLIK & ASSOCIATES, INC.

Mark D. Wallis, P.E.

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Mark D. Wallis, P.E.

Date: January 23, 2006 Reg. No. 19145

Table of Contents

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EXISTING FACILITIES I
2030 CAPITAL IMPROVEMENTS II
ULTIMATE WATER SYSTEM II
ECONOMIC ANALYSIS III
RECOMMENDATIONS III

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Executive Summary

Introduction

This report presents a Comprehensive Water Supply and Distribution Plan of a water system that will meet both the near-term and ultimate needs of the City of Cottage Grove. The most recent Comprehensive Water Plan was completed in 1995.

Growth and Water Demand

Cottage Grove has experienced steady growth over the last 10 years. From 1990 to 2000, its population increased by 33%, going from a population of 22,935 to 30,582. The 2004 estimated population was 34,800. Water needs will continue to increase as the City builds to an estimated 2030 served population of approximately 68,400. The water system is designed with enough flexibility to serve full build-out of the City Limits – an ultimate saturation population of over 100,000.

Water use has increased steadily as population has grown. The City of Cottage Grove currently pumps approximately 1,295 million gallons of water into the system each year. This corresponds to an average daily use of 3.5 million gallons per day. Maximum day water use was on July 10, 2001 with 13.1 million gallons being pumped in one day (MGD). The projected water demand for 2030 is a daily average of 7.3 MGD with an estimated daily maximum of 24.1 MGD. The projected ultimate average day demand is 15.4 MGD and the ultimate maximum day demand is 45.1 MGD. Projected water demands were based on the City's land use designations for the 2030 Future Land Use Plan.

Existing Facilities

The existing water supply and distribution system has served Cottage Grove's needs quite well. The existing distribution system operates under three pressure zones, due to the variation in the City's topography. The high water level for each pressure zone is as follows:

High Zone	1093
Intermediate Zone	990
Low Zone	935

The City presently obtains its raw water supply from 3 wells in the Low Zone, 7 wells in the Intermediate Zone, and 1 well in the High Zone. A booster station pumps water from the Intermediate Zone to the High Zone.

Six storage facilities stabilize pressures in all zones during peak water demands, and also serve as a source of water during fires or power outages. There is a total existing useful storage volume of 4.65 million gallons.

Water from the supply wells is chlorinated, fluoridated, and pumped into the system. Raw water from the Jordan aquifer is considered to be hard and has occasional high concentrations of iron and manganese, but does not require treatment at this time. The need for treatment in the future will be evaluated in light of customer desires and mandates of the Safe Drinking Water Act.

2030 Capital Improvements

The recommended improvements necessary to meet Cottage Grove's estimated 2030 trunk water supply and distribution needs will cost about $26,100,000. Improvements include:

- 1 new well to replace 2 existing smaller capacity wells that are nearing the end of their expected life.
- 7 new wells.
- 2 new storage reservoirs.
- trunk distribution system improvements.

Ultimate Water System

The improvement program for Cottage Grove's ultimate trunk water supply and distribution system is estimated to cost an additional $43,900,000. The ultimate system shown on the map in the back of this report consists of the near-term improvements plus the following:

- 12 new wells to serve the growth of the City.
- 1 new standby well for redundancy.
- an additional 4 water storage towers, for a total of 12 storage reservoirs.
- over 70 miles of additional trunk water distribution mains.
- creation of an additional pressure zone.
- 2 proposed sites for water treatment plants, in case of future raw water quality problems.

The proposed ultimate system differs from the 1995 Plan in the following ways:

- The South Water Treatment Plant has been moved from the TH 61 / Keats location to the Industrial Park.
- No water supply wells are considered east of Keats Avenue.

Economic Analysis

This report recommends that the City maintain the current system of using area charges and connection charges to finance the proposed Capital Improvement Plan. Area charges of $2,590 per acre developed are proposed to pay for 100% of distribution system costs and 10% of supply and storage costs. Connection charges of $770 per residential equivalent connection are proposed to pay for 90% of supply and storage costs.

The City should review the Capital Improvement Program annually and modify the program to better serve community development needs. The entire water supply and distribution plan should be revised every 5 to 10 years.

Recommendations

Based upon the results and analysis of this study, it is recommended that Cottage Grove City Council:

1. Adopt this study and the Capital Improvement Program as a guide to the orderly expansion of the City's water system.
2. Adopt the proposed emergency preparedness and conservation plans included in this study and submit them to the Metropolitan Council and Department of Natural Resources for their approval.
3. Authorize a Feasibility Study for Well 12.
4. Authorize a Feasibility Study for the Industrial Park Water Tower.
5. Annually review the Capital Improvements Program and water system service charges to better serve community development needs.
6. Expedite acquisition of sites for wells, storage facilities, potential water treatment sites, and any easements required to connect these sites to the water system.
7. Monitor water quality and consumer complaints to screen out problems with high iron and manganese concentrations and insure compliance with drinking water quality standards. The need for water treatment should be evaluated if raw water quality problems arise in the future.
8. Annually review the effectiveness of the Water Conservation Plan.

1 Introduction

1.1 Purpose and Objectives

The purpose of this water supply and distribution plan is to provide a comprehensive improvement program to meet the near-term and ultimate water supply needs for the City of Cottage Grove. The most recent Water Supply and Distribution Plan was completed in 1995. The primary objective of this report is to revise and update the existing Water Supply and Distribution Plan and provide a comprehensive water system plan for the entire City, based on Cottage Grove's anticipated land use plan. Specific objectives are as follows:

- **Determine the potential ultimate water demands** expected within the City and the production capacity, treatment capacity, and storage required to meet these demands.

- **Revise the existing and proposed trunk water main system,** as presented in the 1995 Water Supply and Distribution Plan, in accordance with present planning.

- **Determine near-term supply, treatment, and storage needs** in order to allow sufficient lead time for the addition of facilities to the system.

- **Hydraulically analyze the existing and ultimate system** to identify weak water main connections and propose solutions to ensure adequate residual pressures.

- **Optimize supply, treatment, storage, and distribution combinations** to develop an economical and efficient ultimate water system.

- **Develop preliminary cost estimates** for supply, treatment, storage, and distribution facilities to form a basis for a satisfactory financing program.

- **Provide capacities and locations** of proposed new water storage facilities.

- **Update the 1995 Water Conservation Plan** in order to reduce the overall demand for water and encourage wise use of a limited resource.

1.2 Background

Cottage Grove has experienced steady growth over the last 15 years, going from a 1990 population of 22,935 to a 2000 population of 30,582. The population at the end of 2004 was estimated at 34,800. Water needs will continue to increase as the City builds to an estimated 2030 service population of 68,400. This report also evaluates the water system requirements to serve a potential ultimate build-out population of 125,000.

Water usage within the City has remained relatively constant during the last 10 years. The City of Cottage Grove pumped approximately 1.295 billion gallons of water into the system in 2004. This corresponds to an average day demand of 3.5 MGD. Maximum day water demand was 13.1 MGD, recorded on July 10, 2001. The maximum day water demand prorated for the 2004 population is 13.4 MGD. The projected increase in population will correlate with an increase in water demand, making the provision of a well planned water supply and distribution system a necessity.

The development of a water system capable of supplying and distributing potable water of high quality to all points of demand at acceptable residual pressures requires advance planning. Such a system is dependent upon a strong network of trunk water mains complemented by properly sized and strategically located supply and storage facilities. A comprehensive plan based on the most reliable information presently available is necessary to ensure that adequate facilities are provided during a significant growth period and to allow flexibility for future adjustments.

Without proper planning, haphazard and piece-meal construction can result in either undersized or oversized facilities. Either condition is very costly to a community since a water main that is too large is not fully utilized, while a main that is too small will eventually have to be paralleled or replaced. The purpose of this study is to provide the City of Cottage Grove with a comprehensive Water Supply and Distribution Plan that will minimize these problems and will establish continuity in the development of a future water system (at full build-out of the East Ravine, 2030, and Ultimate study areas) by serving as a guide for future expansions and additions.

A municipal water system can be divided into three main categories: 1) supply and treatment facilities, 2) storage facilities, and 3) the distribution system.

- **Supply and Treatment Facilities** include all equipment necessary to supply, pump and treat the amounts of water demanded by the system. For Cottage Grove, it is proposed to consider only groundwater supply sources. The supply facilities thus include the wells, pumps, pumphouses, controls, raw water transmission mains, water treatment facilities, and all related facilities.

- The **Storage Facilities** are the reservoirs used throughout the system to store water for usage during emergency and peak conditions. Water from storage is fed into the system either by gravity or by pumping through a booster station. Two types of reservoirs feed water directly into the system by gravity: (1) a ground reservoir with the floor resting on the ground and (2) an elevated reservoir with columns supporting the tank. A ground reservoir may also be constructed at an elevation which requires a booster station to pump the water into the system at the proper pressure.

- The **Distribution System** is made up of the trunk water mains (primarily 12 inches or larger in diameter), lateral water mains (6 to 8 inches in diameter), service pipes, valves, hydrants, and all appurtenances necessary to convey water from the supply sources and reservoirs to the points of demand. Since the lateral water mains are normally routed along residential streets within a development, it is impossible to predict with any degree of accuracy where future laterals will be placed in undeveloped areas. These lines are excluded from consideration in analyzing the distribution system hydraulics.

The phased construction of the Cottage Grove water distribution system has primarily been dependent on development within the City. Where development occurs, water mains are constructed to serve those specific developments. However, development within a City is not always contiguous and gaps in the distribution system may result. As development continues to grow further away from the supply wells and reservoirs, these gaps can cause problems with insufficient supply and pressures since they prevent "looping" of the distribution system.

Looping of the distribution system provides system reliability in the event of a water main break, but more importantly it provides the large flows required for fighting fires. One of the purposes of this report is to evaluate potential water pressure and supply problems and determine the most feasible solutions.

2 Water Demands

2.1 General

Capacity requirements for the three water system components of supply and treatment, storage, and distribution are dictated by the demands placed upon them for production and distribution. The design of the water supply and distribution system for Cottage Grove was based on estimates of the future water demands (at build-out of the East Ravine, 2030, and Ultimate study areas). Phasing of the system improvements was based on estimates of near-term needs.

Water demand (both peak and average) is affected by many factors including population, population distribution, commercial and industrial activity, water quality, water rates, climate, soil conditions, economic level of the community, sewer availability, water pressures and the condition of the water system. The most important factor is land usage, which encompasses residential and non-residential development. A summary of the land use within the Study Area is shown on Table 1. The water demand rates used in this plan are shown in Table 2.

Projections of land usage and population within the East Ravine, 2030, and Ultimate study areas for Cottage Grove were correlated with past and present water demands to develop estimates of water demands for each of these study areas. Historical well pumping records along with the zoning map were compared to generally accepted design parameters, which were used as the basis for the new water demand computation contained in this report.

2.2 Relationship to Land Use Plan and Population Forecasts

The Water Supply and Distribution Plan was prepared based on the City's 2030 Comprehensive Plan. The household and population forecasts are based on the projected land uses within the study areas. For the purposes of this report, City staff chose to evaluate the feasibility of providing water service to Grey Cloud Island and portions of Woodbury and Denmark Township. Future land uses for Grey Cloud Island were based on Aggregate Industries 2005 Mining Permit Application. Full build-out of the East Ravine study area is expected to occur around 2020. Full build-out of the Ultimate study area is not expected to occur until well after the year 2030. The resulting conceptual land use plan is shown on Future Land Use map as seen in Appendix G.

Population projections and water use forecasts were developed for the City at build-out of the 2030 and Ultimate study areas by taking the net developable acres for each future land use (as shown in Table 1) and multiplying by the appropriate factors in Table 2. Net developable acres are exclusive of areas such as right-of-way (ROW), National Wetlands Inventory (NWI), environmentally sensitive areas, and steep slopes. This plan provides for serving water to portions of southern Woodbury. The southwest Woodbury area has already developed to a large extent (as rural residential). In this area, lots were physically counted instead of calculating units per acre. For the purposes of this report, it is assumed that eventually the agricultural areas may develop as Low Density Residential.

Table 1. Developable Land Use Summary

Land Use Type	2030*	Ultimate**	Total
Agricultural	21	2,656	2,677
Rural Residential	1,649	3,220	4,869
Low Density Residential	3,234	1,091	4,325
Medium Density Residential	93	38	131
Mixed Use	0	47	47
Total Residential	***4,997***	***7,052***	***12,049***
Commercial	141	70	211
Industrial	427	1,730	2,157
Golf Course	0	333	333
Total Non-Residential	***568***	***2,133***	***2,701***
Total	**5,565**	**9,185**	**14,750**
% Residential	89.8%	76.8%	81.7%
% Non-Residential	10.2%	23.2%	18.3%

* Includes East Ravine acres and a portion of southwestern Woodbury.

** Includes Grey Cloud Island and a portion of southeastern Woodbury.

Table 2. Future Water Demand Rates

				Demand Rate (GPM/Acre)		
Land Use Type	**Persons/ Dwelling**	**Gallons/ Capita/ Day**	**Units/ Acre**	**Average Day**	**Maximum Day**	**Peak Hour**
Agricultural	2.65	90	3	0.5	1.49	2.98
Rural Residential	2.65	90	1-3	0.17-0.5	0.5-1.49	0.99-2.98
Low Density Res	2.65	90	3	0.5	1.49	2.98
Med Density Res	2.65	80	9	1.33	3.98	7.95
Mixed Use	2.65	85	3.5	0.55	1.64	3.28
Commercial	-	1500 gpd/acre	-	1.04	2.08	4.17
Industrial	-	1500 gpd/acre	-	1.04	2.08	4.17
Golf	-	500 gpd/acre	-	0.35	0.69	1.39

The facilities described in this plan are designed to serve an ultimate population of 125,000 at full build-out of the Ultimate study area. Actual growth rates will affect only the timing of construction and not the actual design of the system. Table 3 summarizes the service population projections used for this study.

Table 3. Service Population Projections

Year	**Estimated Served Population**
2005	35,500
2010	39,167
2015	46,900
2020 (Build-Out of East Ravine Study Area)	54,600
2030	68,400
Full Build-Out of Ultimate Study Area	125,000

2.3 Variations in Water Usage

The rate of water consumption will vary over a wide range during different periods of the year and during different hours of the day. Several characteristic demand periods are recognized as being critical factors in the design and operation of a water system. The demand rates are expressed in million gallons per day (MGD), which in the case of a daily demand indicates the total amount of water pumped in a 24 hour period. Hourly rates are also expressed in million gallons per day. In the case of an hourly rate, the rate in MGD is determined by assuming that the demand would continue at the indicated rate for 24 hours.

The **average day demand** is equal to the total annual pumpage divided by the number of days in the year. The principal significance of the average day demand is as an aid in estimating maximum day and maximum hour demands. The average day demand is also used in estimating future revenues and operating costs such as power and chemical requirements, since these items are determined primarily by the total annual water requirements rather than by daily or hourly rates of usage.

The **maximum day demand** is the critical factor in the design of certain elements of the waterworks system. The principal items affected by the maximum day demand are:

- raw water supply facilities,
- treatment plant capacity, and
- treated water storage requirements.

The raw water supply facilities must be adequate to supply water near the maximum day demand rate and the water treatment plant must be capable of processing a majority of the water supplied. Sufficient treated water storage should be provided to meet hourly demands in excess of the water supply capacity. The installed capacities should also include reserves for growth, industrial development and fire protection.

The maximum demands upon the water system are encountered during short periods of time, usually on days of maximum consumption. These short period demands are referred to as hourly demands, and they seldom extend over a period of more than three or four hours, generally during hot summer evenings when the sprinkling load is the highest. The existing maximum day occurred on July 10, 2001, at 13.1 MGD. Prorated to the 2004 population, the maximum day demand would be 13.4 MGD.

The **maximum hour** consumption rates impose critical demands on the distribution system, and major elements of the waterworks facilities must be designed to meet these demands and provide satisfactory service at all times.

Maximum hour demands in Cottage Grove are supplied through a combination of water from the well pumps and water drawn from storage reservoirs on the distribution system. Although the rate of consumption is high during periods of maximum hourly demands, the duration of the extreme rate is relatively short. Therefore, a moderate quantity of water withdrawn from storage reservoirs strategically located on the system assures satisfactory service, minimizes the total maximum hour pumping and transmission main capacity required, and permits more uniform and economical operation of the wells and booster pump facilities. Storage on the system is also an important factor in insuring reliability of service during emergencies resulting from power failure, from temporary outages of water supply facilities, and from sudden and unusual demands brought about by fires or line breaks.

In Cottage Grove another critical situation should be evaluated in designing the system. The storage tanks are refilled during the night and early morning hours when demand on the system is low. A strong network of piping is needed between the supply sources and the reservoirs to insure that a sufficient amount of water can reach the storage tanks during the refilling period to provide the required supply for the following day.

2.4 Water Demand by Customer Category

Analysis of past water usage by customer category provides additional insight into how water is being used in Cottage Grove, and where potential for conserving water may be found. Data from 2004 indicates that City water use is 80% Residential, 14% Commercial, and 6% Other.

2.5 Projected Water Usage

Estimated future water usage is based on population, land use, and water use trends. Peak demands vary with land use. High peak usage rates are experienced in low density areas during hot, dry periods due to extensive lawn sprinkling, while usage in high density areas depends on human consumption to a greater extent. Average daily usage for commercial and industrial areas is very high, but is much more stable than residential usage. Therefore, although commercial and industrial areas have high average usage, the peak usage (maximum day and maximum hour demands) is comparable to those in residential areas.

Each of the land use categories was examined with consideration given to population density, area of lawns to be sprinkled and other activities likely to occur compatible with the projected land usage. Demand rates were then developed for each land use type.

Total water usage at designated discrete points of demand on the water system was determined for the purpose of hydraulic analysis and system design. This was accomplished by dividing the City into subareas whose total demand was assumed to be located at a designated point in each subarea. The subareas were then further subdivided into the various land use categories, based on the Future Land Use Map. By applying the unit demand, the total demand for each subarea was developed.

Projected maximum day water demands are presented in Table 4. The maximum day water demands are used for the sizing of supply facilities. A record of actual maximum and average day demands should be charted to aid in the sizing and phasing of future facilities. The maximum day demands at build-out of the 2030 and Ultimate study areas are estimated to be 24.1 MGD and 45.1 MGD, respectively. The per-capita demands in the ultimate system increase due to the large Industrial area.

This plan incorporates the following built-in assumptions.

- **Conservation Plan:** Assumes successful implementation of an up-to-date conservation plan. Exceeding the goals outlined in the conservation plan will result in additional water use reduction for the City.

- **Commercial/Industrial Water Use:** The water use for any property can vary widely depending on their specific process, employment base, ability to recycle water, etc. Therefore, this report assumes an average water use of 1,500 gallons per day per acre for Industrial and Commercial land use.

Table 4. Projected Water Demands

Year Ending	Served Population	Per Capita Demand (gpcd)	Average Day Demand (MGD)	Maximum Day Demand (MGD)	Max Day Per Capita Demand (gpcd)
2005	35,500	102	3.6	13.4	377
2010	39,200	103	4.0	14.5	370
2015	46,900	103	4.8	17.4	370
2020 (East Ravine Build-Out)	54,600	104	5.7	19.6	360
2030	68,400	107	7.3	24.1	352
Ultimate Study Area Build-Out	125,000	123	15.4	45.1	360

2.6 Fire Demand

Water usage for fire demand is also a vital consideration in the design of a water supply and distribution system. Fire demand varies greatly from normal usage in that an extremely large quantity of water is required from a single demand point in a very short time. The quantity of water used for fires is almost negligible when compared to other usage categories, but because of the extreme rate of usage during an emergency situation, fire demands frequently govern design.

The Insurance Services Office (ISO) recommends that a system the size of Cottage Grove's be capable of delivering a fire demand of 1,000 gpm to 3,500 gpm for varying durations depending on the rate of demand. Commercial and industrial properties that implement fire suppression sprinkling systems require less fire flow, and 2,000 gpm is generally considered sufficient for these properties. Table 5 shows the recommended fire flows used in the design of the Cottage Grove water system.

Table 5. Recommended Fire Flows

Land Use	Required Fire Flow	Duration
	(gpm)	(hrs)
Commercial/Industrial	3,500	3
Institutional/Public	3,500	3
Multi-Family Residential	1,500	2
Single Family Residential	1,000	2

The most recent ISO survey for the City of Cottage Grove was performed in 1989. Surveys are typically repeated every ten years or so, which suggests that Cottage Grove may be surveyed again in the near future. Based on the 1989 survey the city received a percentage credit of 60.84%, which is the low end for a Class 4 rating. The City's water system received 38.13 out of a possible 40 points. In addition, the fire system received 6.03 out of 10 points for receiving and handling fire alarms, and 25.55 out of 50 points for the fire department. The City also lost 8.87 points for divergence, which is calculated based on the following equation:

$$\text{Divergence} = \frac{[(\text{Fire Department}) \times 0.8 - (\text{Water Supply})]}{2}$$

Without the divergence calculation, it would be numerically possible for a City without a fire department to get 40 points (Class 6) without any fire-fighting capability. Similarly, a City without a water system but having an excellent fire system could get 60 points (Class 4) and still have no fire-fighting capability.

The water system for Cottage Grove lost only 1.87 percentage points. Even if these points were gained, the City's overall score would only increase by 0.94 points because half of the gains would be lost to a greater divergence score. Gaining 0.94 points would not improve the City's fire class rating, since a percentage credit of at least 70% is required to achieve Class 3. If the City desires a lower fire class, it should focus on the fire department and fire alarm system. A copy of the 1989 ISO rating report for Cottage Grove is located in Appendix F.

2.7 Phasing of the System

For the purpose of phasing additions to the system, water demands for each year are determined by multiplying the demand rates by the appropriate acres of each land type expected to develop by that year. Based on these assumptions, the average day demand at build-out of the East Ravine study area is expected to be about 5.7 MGD with a corresponding maximum day demand of about 19.6 MGD. The 2030 average day demand is projected to be 7.3 MGD with a maximum day demand of 24.1 MGD. The average day demand for the City at build-out of the Ultimate study area is expected to be 15.4 MGD with a corresponding maximum day demand of 45.1 MGD.

3 Existing Facilities

3.1 Water Supply

General

The Twin Cities Metropolitan Area is underlain by geological formations that are capable of yielding large volumes of water. These formations were deposited in a trough that resulted in a unique dish-shaped geological structure centered below the Seven County Metropolitan Area.

The Twin City Artesian Basin contains a total of six aquifers. Four of these aquifers, the Ironton-Galesville, the Franconia, the St. Peter, and the Platteville-Decorah, are minor aquifers. The major aquifers are the Prairie du Chien-Jordan and the Mt. Simon-Hinckley. The area also includes numerous smaller glacial drift aquifers. The Prairie du Chien-Jordan is the major aquifer in the Seven County Metropolitan Area, supplying approximately 75 percent of the area's groundwater. The majority of the remaining groundwater is supplied by the Mt. Simon-Hinckley aquifer.

Where the Prairie du Chien-Jordan aquifer is overlaid by the St. Peter formation and the full thickness of the aquifer can be developed, well capacities can reach 2,500 gallons per minute (gpm). Where only the Jordan formation can be developed, the well capacities will usually fall into the range of 1,000 to 1,500 gpm. Hinckley wells can generally be developed to an 800-1,000 gpm capacity. The drawdown experienced with Hinckley wells causes higher pumping costs. Also, because the Hinckley formation lies beneath the Jordan and Franconia-Ironton-Galesville aquifers, Hinckley wells are more expensive to construct and operate than Jordan wells. In addition, State Legislation restricts the ability to withdraw water from the Mt. Simon-Hinckley aquifer.

The City of Cottage Grove presently obtains its water supply from deep wells in the Jordan aquifer. The water is pumped directly into the distribution system following chlorination and fluoridation.

There are eleven existing wells that currently serve Cottage Grove with well capacities ranging from 600 gpm to 1,800 gpm. The well capacities depend on the size of the well and the structure of the geologic formation at each well. Cottage Grove's wells are described in Appendix B.

South Well Field

Wells 1, 2, and 10 pump to the Low Zone. The total well capacity in the Low Zone with all wells operating is 3,000 gpm or 4.3 MGD. Firm capacity is defined as the capacity available with the largest well out of service. Existing Low Pressure Zone firm capacity is 1,200 gpm (1.7 MGD).

North Well Field

Wells 3, 4, 5, 6, 7, 8, and 9 pump directly to the Intermediate Zone, and provide service to the High Zone via the 81st Street Booster Station. Total existing well capacity to the Intermediate/High Zone is 7,700 gpm (11.1 MGD). Existing firm capacity is 6,200 gpm (8.9 MGD).

The booster station has four pumps that transfer water from the Intermediate Zone to the High Zone. The booster station has 2 – 3,000 gpm pumps and 2 – 1,300 gpm pumps. The firm capacity of the booster station (with one large pump and one small pump on) is approximately 4,000 gpm (5.8 MGD).

Well 11 pumps directly to the distribution system in the High Zone. The pumping capacity of Well 11 is 1,500 gpm (1.0 MGD).

The total supply capacity to the High Zone is 5,500 gpm (7.9 MGD). The firm capacity (with Well 11 out of service) is 4,000 gpm (5.8 MGD).

Well Water Quality/Treatment

The U.S. Environmental Protection Agency (EPA) has established national drinking water standards. These standards contain federally enforceable maximum contaminant level (MCL) standards for substances known to be hazardous to public health.

Water quality parameters are defined and regulated by two sets of standards – Primary and Secondary. Primary Standards are set for those substances known to be a hazard to public health. Secondary Standards are set for those substances that, although not hazardous to public health, frequently cause drinking water to have objectionable aesthetic qualities, such as taste and odor. A complete discussion of the drinking water standards can be found in Appendix E.

Water quality test results on Cottage Grove's raw water may be found in Appendix B. The test results indicate that the raw water is moderately high in iron and manganese. Results from six of the existing wells exceed the secondary standard for iron. Since secondary standards are indicative of the aesthetic quality of the water, this does not necessarily constitute a health hazard. However, the City could opt to treat for iron and manganese if consumer complaints about water color and clarity reach unacceptable levels.

The raw water is treated with fluoride and chlorine prior to entering the distribution system. No other treatment is provided. The water quality at the wells and in the distribution system is tested regularly to ensure that water quality is within the Primary and Secondary standards. Appendix E should be updated as new water quality requirements are promulgated.

3.2 Storage

Maximum hour demands are supplied through a combination of water from the wells and water drawn from the storage reservoir on the water distribution system. Although the rate of consumption is high during periods of maximum hourly demand, the duration of the extreme rate is relatively short. Therefore, a moderate quantity of water withdrawn from storage reservoirs strategically located on the system assures satisfactory service, minimizes the total maximum hour pumping and transmission main capacity required, and permits more uniform and economical operation of the system and pumping facilities.

Storage on the system is also an important factor in insuring reliability of service during emergencies resulting from loss of power, temporary outages of water supply facilities, and from sudden and unusual demands brought about by fire. The storage tends to stabilize the peaks in water demand and allows the system to produce water at a lower, more uniform rate.

The City of Cottage Grove currently has four elevated storage facilities and two ground reservoirs with a total capacity of 7.15 MG. Effective storage is defined as the storage available while still maintaining a sufficient residual pressure (generally within 30 ft. to 40 feet of the high water level). 4.65 MG of Cottage Grove's storage can be considered effective. A summary of the existing facility is presented in Table 6. Both existing and proposed water storage locations are shown on the Ultimate Trunk Water System Map (Figure 1) at the back of this report.

Table 6. Existing Storage Facilities

Storage Location	Type of Storage	HWL	Pressure Zone	Effective Storage (MG)	Year Constructed
Highland	Elevated	1093	High	1.5	1971
West Draw	Elevated	1093	High	1.0	2002
81st Street (2 tanks)	Ground	990	Intermed.	1.5	1980
Grange	Elevated	935	Low	0.15	1958
Pinehill	Elevated	935	Low	0.5	1985

3.3 Distribution System

The existing distribution system consists of lines that vary in size from 6 inches to 36 inches in diameter. Water mains are primarily ductile iron pipe (DIP), although several older areas of the City are served with cast iron pipe (CIP).

The distribution system currently receives water from two well fields. One well field is located south of Highway 61. The second well field stretches from near Foothill Park north to Highlands Park. Both well fields draw from the Jordan aquifer. A network of large distribution mains extend from the well fields to other points in the system and to the storage reservoirs located throughout the City. The existing system can be seen on Figure 1 in the back of the report.

The existing water system operates under three pressure zones. The low pressure zone is served by Wells 1, 2, and 10; and by the 150,000-gallon and 500,000-gallon elevated water towers. Wells 1, 2, and 10 are controlled to maintain a water elevation near 935 in the two storage tanks.

The intermediate pressure zone is served by Wells 3, 4, 5, 6, 7, 8, and 9; and by the 1.0 MG and 3.0 MG ground storage reservoirs. The well pumps in the intermediate zone maintain a water elevation of 990 in the ground storage reservoirs.

The high pressure zone is served by a booster pump station and Well 11. Storage in this zone is provided by the 1.5 MG and 1.0 MG elevated water towers. Normal operation has Well 11 pumping to maintain a water elevation of about 1093 in the water towers. Well 11 is augmented by the booster pumps which withdraw water from the intermediate pressure zone.

Pressure reducing valves provide emergency connections between adjacent pressure zones. In an emergency, the pressure reducing valves would open to allow water to flow from the higher pressure zone to the lower pressure zone.

The existing system operates under three pressure zones. The respective static high water elevations for the High Zone, Intermediate Zone, and Low Zone are 1093 feet, 990 feet, and 935 feet above sea level. Static pressure readings within these zones generally range from about 40 pounds per square inch (psi) to 100 psi throughout the system. Static water pressures based on the high water level in each zone can be found on the Static Water Pressure Map in Appendix G.

3.4 Hydraulic Analysis

A hydraulic analysis of Cottage Grove's entire water supply and distribution system was conducted using computer modeling software. The results of this model are discussed in more detail in the next section. The first step in the process is to create a computer model of the existing supply and distribution system. The purpose of this model is to find any problems with the existing system and to serve as a foundation for a model of the entire system.

Cottage Grove's system was flow tested in various locations in 2003 and 2005. The computer model was then run with the same conditions in an attempt to match the results. After several trials in which model characteristics are adjusted, it was possible to reasonably match the computed model results with the field test results.

3.5 Adequacy of Existing Facilities

The existing water supply and distribution system for the City of Cottage Grove meets the various current water demands placed on it. Phased improvements in the supply, storage, and distribution facilities have proven to be cost-effective and timely. The existing wells have met current supply needs.

Generally, the existing storage facilities provide satisfactory static and residual pressures to most areas. The existing distribution system consists generally of properly sized mains that are capable of conveying water and fire flows to the needed areas. Modifications proposed to strengthen and expand the existing system are discussed in the following section. The analysis identified the following problem areas.

- **Water Supply.** The Minnesota Department of Health recommends that cities provide a firm well capacity at least equal to their maximum day demand. By this measure, Cottage Grove needs another well.

- **Water Storage.** Cottage Grove currently has adequate storage capacity in the High and Intermediate Zones, but will soon need additional storage in the Low Zone. It is generally preferable to construct storage facilities prior to development in order to minimize complaints. Because of this, Cottage Grove should begin planning for storage sites in the East Ravine and Industrial Park areas.

- **Low Pressures.** Several areas of the City have low static water pressures (less than 40 psi). This is primarily due to high ground elevations. The Static Pressure Map in Appendix G shows the static pressures for all locations in the City.

  During peak demands, several areas of the City experience residual pressures less than 40 psi. These areas include the south and west portions of the Grange neighborhood, a portion of the Intermediate Zone near 80th Street and Hemingway, and part of the Intermediate Zone near 80th Street and Jamaica.

- **High Pressures.** Some areas have high pressures (greater than 90 psi.). Again, these are primarily the result of low ground elevations. These areas are shown on the Static Water Pressure Map in Appendix G.

  During the low demand period (tank filling), there are a number of nodes on the high side of the pressure zone boundary between the High Zone and the Intermediate Zone that experience residual pressures in excess of 100 psi.

- **High Headloss.** The maximum headloss in the distribution system is 13.3 ft/1000 ft in the 8-inch line along Hillside Trail west of Isle Avenue, which is experienced during peak demands.

- **Low Fire Flows.** With a couple of exceptions, the entire City is able to meet the recommended fire flows. The Existing Fire Flow Map in Appendix G shows the fire flow projected by the model.

4 Proposed Facilities

4.1 Supply-Storage Considerations

Supply capacity, storage volume, and distribution system capacity are interrelated. Tanks act as additional supply sources during peak periods when the primary supply source is incapable of meeting the demand. Thus, the storage tends to stabilize the peaks in water demand and allows the system to produce water at a lower, more uniform rate. Ideally, the distribution system should be capable of carrying the flows from both the supply sources and the tanks without allowing pressures to drop below approximately 40 psi or rise above 100 psi. Static pressure should be within a range of 50 psi to 90 psi, if possible. Static pressure is defined as the pressure available at the street when all the tanks are full and no one is using water. During fires or other emergencies, the pressure must not drop below 20 psi. The system must also be capable of conveying water from the supply source to the tanks for storage without allowing the development of high pumping heads and therefore high pressures in the system during low usage periods.

There are an infinite number of combinations of supply and storage that can be used to meet peak water demands. An economical system can be obtained through an analysis of supply and storage costs.

For the vast majority of communities, the ideal combination of supply and storage is found when the supply equals 100% of the maximum day demand. This is consistent with the recommendations in both Recommended Standards for Water Works by Great Lakes Upper Mississippi River Board, and American Water Works Manual of Practice M32 - Distribution Network Analysis for Water Utilities. The City of Cottage Grove system capacity is established at 45.1 MGD which is 100% of the maximum day demand for the ultimate population of 125,000 persons (at full build-out of the Ultimate study area).

The amount of storage required for Cottage Grove's water system is determined from the maximum day demand variation curve. This curve was developed by evaluating the well and storage operation during maximum demand days for a typical Minnesota community, and is presented in Figure 2. This curve should be checked with future peak days.

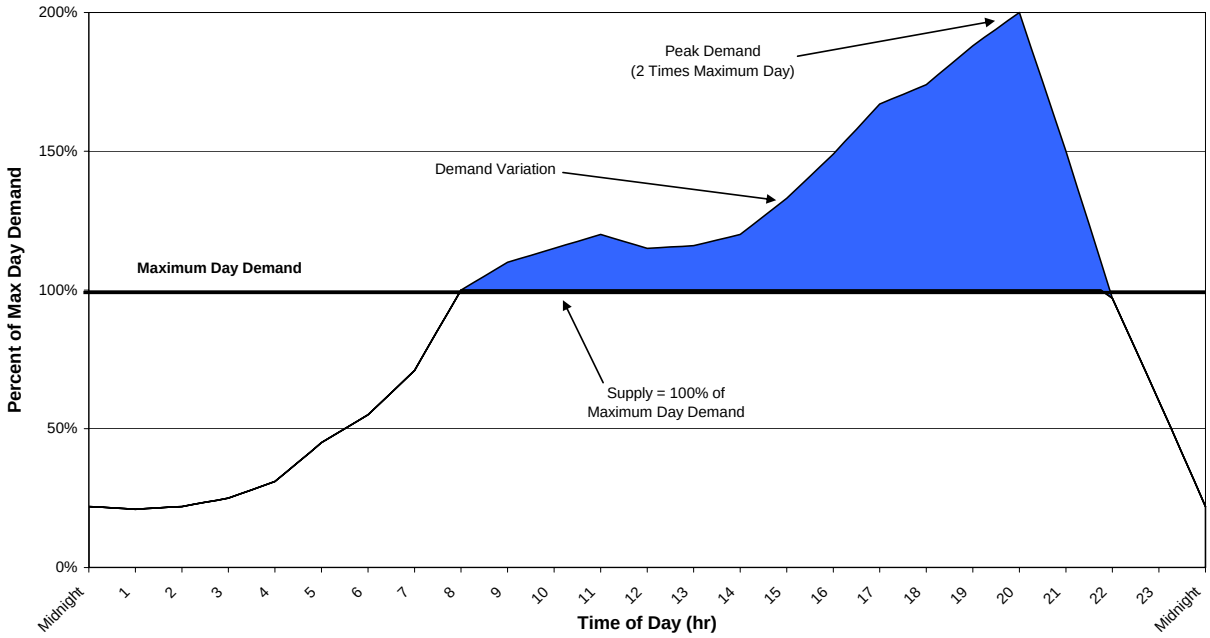


Figure 2. Maximum Day Demand Curve

The shadowed area above the maximum day demand line in Figure 2 represents about 20% of the maximum total day demand. This volume of water takes into account hourly fluctuations and is provided by storage facilities. In addition, a safety factor is required to account for fire flows, unusual demands on the system and operational concerns. This safety factor is estimated to be approximately 10% of the maximum day total demand, and is based on a 3,500 gpm fire flow sustained for 3 hours and on actual operating levels in the reservoirs being 2 or 3 feet lower than the high water level. 16.25 MG of effective storage is planned for the ultimate system (at build-out of the Ultimate study area). Effective storage is considered to be water available for use at an adequate residual pressure (not lower than 40 feet below the system high water level).

For maximum system reliability and efficiency, supply and storage should be considered separately in each pressure zone. It is inefficient to pump water to a high elevation (such as the High Zone) and then let the water flow down to lower pressure zones through pressure reducing valves. Also, pressure reducing valves are a high maintenance item and subject to occasional failure. Therefore, it is generally not desirable to rely on a pressure reducing valve as a single supply source for an area. For these reasons, we have analyzed supply and storage requirements for each zone independently.

The exception to this is the combined analysis of the Low Zone and River Zone, due to the relatively small demand in the River Zone and the inadvisability of building a separate water treatment plant for the River Zone. The resulting supply and minimum storage requirements for the ultimate system are shown in Table 7.

Table 7. Ultimate System Supply and Storage Requirements

Pressure Zone	Max. Day Demand, MGD	Minimum Required Storage, MG	Required Well Capacity, gpm
High	24.0	7.2	16,700
Intermediate	9.0	2.7	6,200
Low/River	12.1	3.7	8,400
Totals	**45.1**	**13.6**	**31,300**

Water storage tanks are typically constructed in standard sizes to avoid increased costs associated with custom tank sizes. As a result, minimum storage requirements within each pressure zone are typically exceeded.

4.2 Hydraulic Analysis

The Cottage Grove water system was analyzed in detail using a hydraulic computer model, WaterCAD. The model describes the entire system, including wells, pumps, tanks, and distribution mains. The model incorporates the Hazen-Williams energy loss formula and the Hardy Cross procedure. The Hardy Cross procedure balances both flows and energy losses throughout the entire system.

Input for the computer model includes pipe sizes and lengths, point supplies and demands, storage tank characteristics, pump performance curves, and ground elevations all entered in a CAD drawing. The model then computes data for various times of the day based on the demand curve. These data include pipe flows and velocities, energy losses, pressures at each demand point, pumping rates, and storage tank levels.

Analysis of this data facilitates the design of an economical and adequate water system. Results of this analysis and recommendations for improvements are presented later in the report.

4.3 Raw Water Supply

Wells Required

A total firm production capacity of 45.1 MGD (31,300 gpm) is required to meet the demand conditions in Cottage Grove at build-out of the Ultimate study area. This represents 100% of the ultimate system's maximum day demand. For reliability, firm capacity is calculated by considering one out of every ten wells to be a back-up well. Providing a firm capacity equal to the maximum day demand will result in improved system reliability by enhancing performance during the tank-filling periods, and particularly in the event of an emergency such as a fire. Peak demands will be supplied by storage on the system.

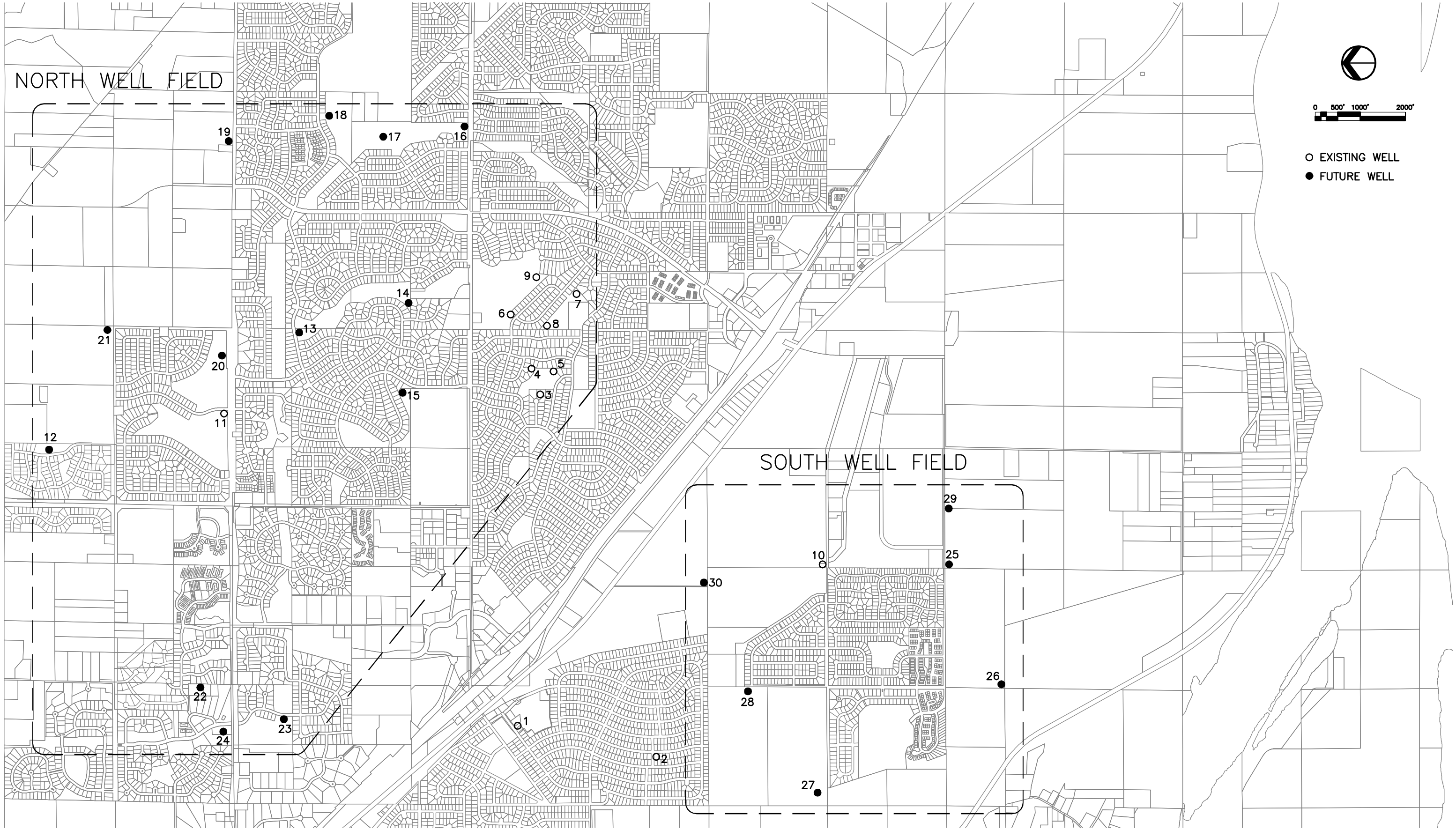
Two well fields are planned for the Ultimate service area, and these are shown in Figure 3. The North Well Field consists of the existing and proposed wells north of Highway 61. The existing and proposed wells south of Highway 61 comprise the South Well Field. As described in the Cottage Grove Well Siting Study (see Appendix C), the locations of future well sites in both the North and South Well Fields have been influenced by data presented in the Cottage Grove Nitrates Study conducted by Washington County. In addition, vulnerability concerns associated with the South Well Field have been mitigated by the completion of the City's Wellhead Protection Plan. Continued vigilance in implementing the Wellhead Protection Plan will be necessary to minimize the likelihood of aquifer contamination within the South Well Field.

Wells in the Jordan aquifer are expected to yield between 1,000 gpm and 1,500 gpm. Of the last five wells installed in Cottage Grove, four have a pumping capacity of 1,500 gpm. For this study, it was assumed that new wells will yield 1,200 gpm. It was also assumed that the two oldest wells—Wells 1 and 2—will eventually be replaced. These two wells were both constructed in 1958; they yield 600 gpm each, and are located on sites distant from the proposed future South Water Treatment Plant site.

It was assumed that eleven of the future wells will be constructed on City property. Sites will need to be purchased for the remaining future wells. Cost estimates found in Appendix D contain projections for well site acquisition costs.

North Well Field

The North Well Field serves the Intermediate Zone and the High Zone. At saturation development, the total required firm capacity is 6,200 gpm (9.0 MGD) to the Intermediate Zone and 16,700 gpm (24.0 MGD) to the High Zone. Through the use of pressure reducing valves, the North Well Field can also provide emergency water service the Low and River Zones.



PROPOSED WELL FIELDS

COTTAGE GROVE, MINNESOTA

WATER SUPPLY & DISTRIBUTION PLAN

FIGURE 3

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Engineers & Architects

North Well Field

Required Firm Capacity	22,900 gpm
Existing Firm Capacity	7,700 gpm
Required Additional Capacity	15,200 gpm
At 1,200 gpm =	13 wells + 1 standby well

The Well Siting Study identifies thirteen future well sites in the North Well Field, these are shown in Figure 3. Due to lower contamination vulnerability of the North Well Field sites, it is anticipated that the North Well Field will be fully developed prior to developing the South Well Field.

South Well Field

The proposed South Well Field will serve the Low Zone and the River Zone. At saturation development, the total required firm capacity is 7,000 gpm (10.1 MGD) to the Low Zone and 1,400 gpm (2.0 MGD) to the River Zone.

South Well Field

Required Firm Capacity	8,400 gpm
Existing Firm Capacity	1,200 gpm
Required Additional Capacity	7,200 gpm
At 1,200 gpm =	6 wells + 1 replacement well

Figure 3 shows the six future well sites for the South Well Field that were identified in the Well Siting Study. These wells are expected to be constructed after full build-out of the North Well Field.

Water Supply Strategies

To address future water supply needs, the City will take the following actions:

- Plan to eventually replace Wells 1 and 2. Both wells have relatively small pumping capacities and are nearing the end of their useful life. One 1,200 gpm well will be required to replace both of these wells.
- Acquire well sites either prior to or in conjunction with development of adjacent areas.
- Construct new wells according to the phasing detailed later in this report.

4.4 Water Treatment

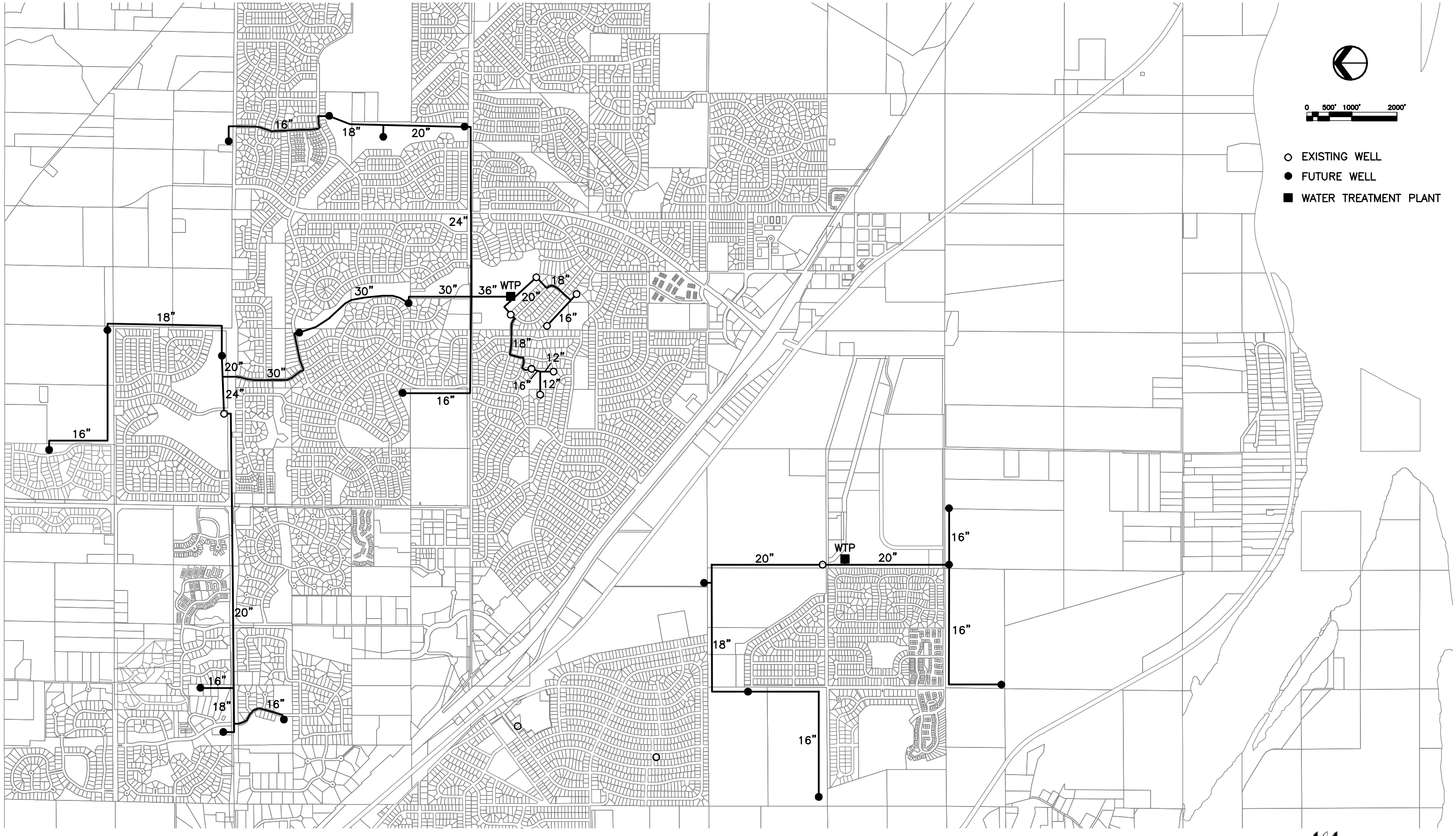
The City of Cottage Grove presently obtains its raw water supply from deep wells into the Jordan Sandstone aquifer. Water obtained from the wells in Cottage Grove is generally considered to be safe from pathogenic or disease-causing organisms.

The iron concentration in the City's wells ranges from 0.01 mg/L to 3.2 mg/L. The manganese concentration in the City's wells ranges from <0.02 mg/L to 0.11 mg/L. Iron and manganese precipitates from the water and accumulates in the distribution system, particularly in areas of low demands. When demand increases or when the system is interrupted for some reason, red water problems occur which cause staining of washed clothing and plumbing fixtures. Customer complaints can be minimized by frequent flushing and cleaning of lines in problem areas.

Because of public complaints and/or high maintenance costs, iron and manganese treatment may become necessary. Although a detailed analysis of the treatment alternatives is beyond the scope of this report, the following paragraphs describe some factors to consider as they relate to the planning of the overall distribution system.

Iron and manganese may be removed at a water treatment plant. Removal could be accomplished at two water treatment plants—one at each well field, or at three water treatment plants of roughly the same capacity. Two treatment facilities would generally be less expensive to build and operate than three facilities. However, the three plants of similar sizes, could each be designed to serve a major pressure zones. Also, three plants would minimize the number and size of raw water lines, although the cost savings is not anticipated to offset the cost of building a third treatment plant.

For this report, we are assuming that two separate treatment plants would be constructed if necessary. It was assumed that all future wells in the North Well Field will pump to a future water treatment plant located near the existing booster station. The water treatment plant could then pump water to both the Intermediate and High Zones. It was also assumed that all wells in the South Well Field will ultimately pump to a South Water Treatment Plant. Pumps in the water treatment plant would supply water to both the Low and River Zones. Figure 4 shows the proposed locations for the water treatment plants.



WATER TREATMENT PLANT LOCATIONS

COTTAGE GROVE, MINNESOTA

WATER SUPPLY & DISTRIBUTION PLAN

FIGURE 4

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Engineers & Architects

It is difficult to predict if any additional contaminants would need to be removed by future water treatment plants. The following are possible future treatment scenarios: 1) a currently regulated contaminant could be detected at a level which would require treatment, 2) regulatory agencies could lower the maximum contaminant level of a currently regulated contaminant to the point where treatment would be necessary, 3) an existing water constituent could be reclassified as a regulated contaminant at a level which would require treatment, 4) the utility may elect to provide treatment in response to customer complaints or for maintenance cost reasons, and 5) no treatment may be necessary.

Depending on the contaminant, the treatment plants could be sized to treat approximately 80% of the maximum day demand. Storage in the distribution system and blending raw and treated water at the water treatment facility would allow the facility to provide 100% treated water during all but the largest peak demand periods. This level of treatment allows for a significant cost savings due to the smaller plant size requirements. Since the duration of extreme peak demands are relatively short and the plant would supply a large percentage of the water required, the mixture of treated and non-treated water in the system would maintain iron and manganese concentrations at acceptable levels.

An alternative method for controlling iron and manganese is to add polyphosphates to the water in the distribution system. Polyphosphates are added to the water at the well pumphouse with injection equipment. Polyphosphates keep the iron in suspension so that it does not settle out in the system. Unfortunately, polyphosphates are substantially less effective in keeping manganese in suspension in the distribution system. Also, the polyphosphates remain in the water through the wastewater treatment process and eventually become a source of nutrients in the Mississippi River.

Cottage Grove's water is also considered hard, with an average hardness of 232 mg/L. Although softening can be accomplished at the water treatment plant, it is generally most cost effective to treat with in-home softeners.

Installation of an iron and manganese removal plant will not reduce the level of hardness in Cottage Grove's water. However, existing softeners owned by the residents and businesses of Cottage Grove will operate more efficiently since iron and manganese commonly foul softener media, causing short softening cycles.

Water Treatment Strategy

To address future water treatment needs, the City will reserve sites in both the North and South Well Fields for potential water treatment plants. Future water treatment plant sites should be a minimum of five acres in size for iron and manganese treatment. More area may be required if the City wishes to reserve space for expansion to provide softening or treatment for possible future contaminants. For the purposes of this report, it was assumed that City land would be used for the North Water Treatment Plant and that land would need to be purchased for the South Water Treatment Plant.

4.5 Storage

The existing and proposed storage sites for the Cottage Grove water distribution system are shown on the Ultimate Trunk Water System Map (Figure 1) at the back of this report. A total of 16.25 million gallons (MG) of effective storage at 11 sites is planned as seen on Table 8. The amount of storage required may be increased or reduced depending on population, water usage patterns, and conservation measures.

The most important considerations in the selection of the type of storage facilities are safety, reliability and ease of operation. A gravity-fed type of storage facility, either elevated or ground, provides a safe and reliable source of water, is easy to operate, and allows for smooth operation of pump controls. It is recommended that all of Cottage Grove's future storage be gravity-fed reservoirs.

A total effective storage volume of 8.0 million gallons is proposed at the 7 sites inside the 2030 study area. These sites are described in Table 8 and shown on Figure 1. Development should be reviewed periodically to ensure that adequate storage is constructed prior to development. Phasing of tower construction is discussed in more detail later in this report.

Table 8. Storage Facilities in the Ultimate System

Storage Location	Type of Storage	HWL	Effective Storage (MG)	Pressure Zone
Highland	Existing Elevated	1093	1.5	High
West Draw	Existing Elevated	1093	1.0	High
81st Street (2 tanks)	Existing Ground	990	1.5	Intermed.
Pinehill	Existing Elevated	935	0.5	Low
East Ravine*	**Proposed Elevated**	**1093**	**2.0**	**High**
Northeast	**Proposed Elevated**	**1093**	**1.5**	**High**
East	**Proposed Elevated**	**1093**	**2.0**	**High**
105th Street	**Proposed Elevated**	**990**	**2.0**	**Intermed.**
Railroad*	**Proposed Elevated**	**935**	**1.5**	**Low**
South	**Proposed Elevated**	**935**	**2.0**	**Low**
River 1.5MG	**Proposed Standpipe**	**875**	**0.75**	**River**
Total Ultimate Storage = 16.25 MG				
* Anticipated Storage Sites for 2030 System				

The future tanks have been located to take advantage of high ground, thus minimizing construction costs. They are also located at points within the distribution system which complement the primary supply points and thereby maintain more constant water pressure during peak demand periods. Depending on the phasing and location of controls, the towers may need altitude valves to prevent over-filling.

Each of the three zones in which storage is provided exceeds the minimum storage requirements set forth earlier in this report. A storage increase of nearly one million gallons is due to the use of standard tank sizes in each of the three zones. The remaining increase in storage is due to upsizing of tanks in the Intermediate and High Zones to allow the ultimate system to function with fewer, albeit larger, tanks.

Fewer tanks lead to reduced maintenance costs, and this strategy also takes advantage of economies of scale associated with construction costs for larger tanks. When considering a potential water reservoir site, a clear space of 400 feet by 400 feet (or larger) should be identified to allow adequate room for construction staging and paint containment. Once the reservoir has been constructed, a lot

250 feet by 250 feet (62,500 square feet) is generally considered acceptable for future maintenance activities such as repainting and rehabilitation. Reservoir site costs (see Appendix D) were estimated based on a 62,500 sq-ft lot. It was assumed that construction easements could be obtained for the remaining area needed for tank construction.

The 0.15 MG Grange Tower will need rehabilitation in the near future. Removing the tower from service is also an option, since the Grange area could be served from the Railroad Tower. The Railroad Tower and the proposed water main to the Grange area will need to be installed prior to removing the Grange Tower from service. A decision on whether to rehabilitate the Grange Tower or remove it from service should be made before additional maintenance is necessary.

4.6 Distribution System

General

The proposed distribution system for the City of Cottage Grove is presented on the Ultimate Trunk Water System Map (Figure 1) at the back of this report. The system covers the entire City and reflects changes to previous reports and layouts.

The distribution system analysis was performed under the assumption that there will ultimately be two well fields and potentially two water treatment plants for the City of Cottage Grove. The sites of the water treatment plants have not yet been finalized, but preliminary sites are shown on the map in Figure 4. A strong network of trunk water mains is planned to extend in every direction from these sites. Major water mains connect the storage tanks and are looped throughout the system in order to provide reliable service.

Because the City's topography ranges considerably, it is recommended that four pressure zones be maintained. It is desirable to provide a static pressure range of 30 psi to 100 psi (pounds per square inch) throughout the maximum demand day. Static pressure is defined as the pressure available at street level when all the tanks are full and no one is using water. Homes with a static pressure of greater than 90 psi may want to install individual pressure reducing valves. Homes with a static water pressure less than 40 psi may desire in-home booster stations. A minimum static pressure of 40 psi is necessary for the operation of automatic sprinkler systems without a booster pump. Under emergency conditions, pressures must be maintained above 20 psi.

The high water levels for the four pressure zones are as follows:

High Zone	1,093
Intermediate Zone	990
Low Zone	935
River Zone	875

Pressure reducing valves (PRVs) will be needed between the pressure zones for redundancy and to provide supplementary fire flows to the lower zones. All PRVs, except the small PRVs in the northwest area of the Intermediate Zone, should be set so they do not open under normal pressure fluctuations.

A 16-inch line is shown to the Cottage Grove/Woodbury border at Inwood Avenue. This line could be used to serve an additional portion of southern Woodbury with water or be used to share water in the event of an emergency. The additional demand this would place on the Cottage Grove water system has not been addressed in this study. The water system elevations are such that a booster pumping station would be necessary to serve Woodbury, and pressure reducing valves would be required for Woodbury to serve Cottage Grove.

The possibility exists for part of Denmark Township to be served by Cottage Grove's water system. This study did not address the additional demand that this would incur, but the portion of Denmark Township adjacent to Cottage Grove (with ground elevations of 980 or less) has the potential to be served by Cottage Grove's High Zone. See the Unserviceable Areas of Denmark Township map in Appendix G for a graphical depiction of the areas that cannot be served by Cottage Grove's High Zone without a pressure booster station. Providing water service to Denmark Township will require additional supply and storage facilities.

Hydraulic Analysis

Hydraulic analysis of the distribution system was performed by a computer program. The program computed flows and residual pressures which were then analyzed to locate problem areas. Water main sizes, storage tank characteristics, and pump controls were then revised and the program was run again until the problem was corrected. Analyses of both the 2030 and ultimate study areas were conducted.

The time simulation computer analysis was used to design and analyze the performance of the ultimate water system during the maximum demand day. The types of alternatives that were evaluated during multiple computer runs can be grouped into three categories:

1. Changes in size and location of the projected elevated tanks.
2. Changes in diameter of the proposed water mains.
3. Addition of new water mains.

After evaluating the different alternatives, the selected best option was a trade-off between the following parameters:

1. Tank Operation: Includes minimum level, ending level, and total operation time for each tank.
2. High Pressure Nodes: Identify high pressure nodes during low demand (tank-filling) periods.
3. Low Pressure Nodes: Identify low pressure nodes during high demand periods.
4. High Headloss Lines: Find pipes with unusually high headloss per thousand feet that need to be replaced, paralleled, or redesigned.
5. Fire Flows: Make sure that all nodes in the distribution system are able to get sufficient fire flows while maintaining a minimum residual pressure of 20 psi.

For the ultimate system shown on the Ultimate Trunk Water System Map (Figure 1) at the back of the report, the lowest pressures never drop below 23 psi (immediately after peak hour demand) and the highest pressures do not rise above 114 psi (overnight during tank filling conditions). The maximum headloss is 13 ft/1000 ft. These results are discussed in more detail in the following sections.

With few exceptions, all areas are able to meet or exceed the following fire flow recommendations while maintaining adequate residual pressures.

Area	Fire Flow (gpm)
Residential	1000
Commercial/Industrial	3500

- **Low Pressure Areas:** Several areas in the City have low pressures simply because they are at high ground elevations. Areas that will have low static pressures (less than 40 psi when the towers are full) are outlined below. For a graphical representation of these areas, see the Static Water Pressure Map in Appendix G.

High Zone - Ground elevations higher than 1001
Intermediate Zone - Ground elevations higher than 898
Low Zone - Ground elevations higher than 843
River Zone - Ground elevations higher than 773

Low residual pressures (less than 40 psi) as determined by the computer model time simulation include were primarily limited to nodes in the Grange area.

- **High Pressure Areas:** Several areas in the City have high pressure due to being at low elevations. Areas with high static pressures (greater than 100 psi) are detailed below. These areas may require individual home pressure reducing valves. Refer to the Static Water Pressure Map in Appendix G for a graphical depiction of high pressure areas.

  High Zone - Ground elevation lower than 862
  Intermediate Zone - Ground elevation lower than 759
  Low Zone - Ground elevation lower than 704
  River Zone - Ground elevation lower than 634

  High residual pressures (greater than 100 psi) as determined by the computer model time simulation were limited to the areas along the pressure zone boundary on the high side of the High/Intermediate Zone boundary.

- **Fire Flows:** The Insurance Services Office (ISO) recommended fire flows are shown in Table 5 (see Section 2). All areas outside the existing service area are designed for 3,500 gpm (gallons per minute) since it is not possible to determine the exact location of single family residential at this time. All areas, except as noted on the Ultimate Trunk Water System Map (Figure 1) at the back of the report, are able to meet or exceed the recommended fire flows while maintaining 20 psi residual pressure.

4.7 Water System Phasing

The projected served population for the Cottage Grove water system at build-out of the 2030 and Ultimate study areas is 68,400 and 125,000 respectively. Based on the projected population growth, the timing of additions to the supply and storage facilities were estimated and these estimates are presented in Table 9. These additions will keep pace with the increasing needs of the community and at the same time maintain a desirable balance between storage and supply for economy and

reliability. If growth rates deviate from the City's forecasts, if a major water consumer is added to the system, or conservation measures produce a result different than anticipated, the phasing schedule of Table 9 should be revised in accordance with the latest available data.

The data presented in Table 9 is based on the assumption that new wells will provide an average capacity of 1,200 gpm. Three standby wells will ultimately be provided above and beyond the required raw water supply. Tanks are designed to provide at least 30 percent of maximum day volume to protect against emergency demands and fires.

Table 9. Supply/Storage Phasing

Year Ending	Served Population	Maximum Day Demand		Water Supply Wells		Effective Storage		Phasing Schedule
		(gpm)	(MGD)	Required[1] (gpm)	Existing[2] (gpm)	Required[3] (MG)	Existing (MG)	
2005	35,500	9,300	13.4	9,300	8,900	4.1	4.65	
2006	36,240	9,400	13.6	9,400	10,100	4.1	4.65	Install Well 12
2007	36,980	9,600	13.8	9,600	10,100	4.2	6.0	Install Railroad Tower
2008	37,720	9,700	14.0	9,700	10,100	4.2	6.0	
2009	38,460	9,900	14.2	9,900	10,100	4.3	6.0	
2010	39,167	10,100	14.5	10,100	11,300	4.4	8.0	Install 1 new well; install East Ravine Tower
2015	46,900	12,100	17.4	12,100	12,500	5.3	8.0	Install 1 new well
2020	54,600	13,600	19.6	13,600	13,700	5.9	8.0	Install 1 new well
2030	68,400	16,700	24.1	16,700	17,300	7.3	8.0	Install 3 new wells + 1 replacement well
Ultimate	125,000	31,300	45.1	31,300	31,400	13.6	16.3	Install up to 12 new wells + 1 standby well Install Northeast, East, Intermediate, South Towers; Install River Tank

Notes:

[1] 100% of Maximum Day Demand

[2] Firm Capacity (1 of every 10 wells out of service)

[3] Minimum Effective Storage - approximately 30% of Maximum Day Demand

5 Economic Analysis

5.1 Cost Estimates

One of the basic objectives of this report was to determine the cost of completing Cottage Grove's water supply and distribution system. The cost estimates presented in this report were based on current construction costs and can be related to the value of the ENR (Engineering News Record) Index for Construction Costs of approximately 7647 (December 2005). Future changes in this index are expected to reflect cost changes in the proposed facilities. During interim periods, between full evaluation of projected costs, capital recovery procedures can be related to this index.

A summary of the estimated total construction costs of future water supply, treatment, storage, and trunk distribution facilities is presented in Table 10. The costs in Table 10 also include replacement costs for some existing wells. Treatment costs will need to be split equitably between existing and future water customers. Excluded from Table 10 is the cost of approximately 22,500 lineal feet of 12-inch main to serve Woodbury. Appendix D contains a more detailed cost estimate.

Table 10. Trunk Water System Cost Summary

System Component	Replacement Cost	Development Cost	Total Cost
Supply	$ 833,000	$ 16,300,000	$ 17,100,000
Treatment	-	-	$ 70,100,000
Storage	-	$ 24,300,000	$ 24,300,000
Distribution	-	$ 29,400,000	$ 29,400,000
Total Ultimate System Cost	$ 833,000	$ 67,000,000	$ 135,900,000

5.2 Recommended Trunk Water System Improvements

The installation of Cottage Grove's trunk water system has proceeded steadily during past years, and a significant portion of the City is presently served with water. It is anticipated that growth of the water system will continue at a steady rate.

A capital improvement program for the City of Cottage Grove's water supply and storage system is presented in Table 11. The table includes an estimate of the storage and supply facilities that will be added, the construction cost, and the total expenditure for the time period.

Table 11. Capital Improvement Plan

Year	Improvement	Estimated Cost	Total Cost
2006	Install Well 12	$ 800,000	$ 800,000
2007	Install Railroad Tower	$ 3,300,000	$ 3,300,000
2010	Install 1 new well	$ 833,000	$ 4,770,000
	Install East Ravine Tower	$ 3,940,000	
2010-2015	Install 1 new well	$ 833,000	$ 833,000
2015-2020	Install 1 new well	$ 833,000	$ 833,000
2020-2030	Install 3 new wells + 1 replacement well	$ 3,230,000	$ 3,230,000
Ultimate	Install 12 new wells + 1 standby well	$ 10,530,000	$ 27,540,000
	Install Northeast Tower	$ 3,300,000	
	Install East Tower	$ 3,940,000	
	Install Intermediate Tower	$ 3,940,000	
	Install South Tower	$ 3,940,000	
	Install River Tank	$ 1,890,000	

5.3 Existing Water System Charges

The current policy of the City of Cottage Grove is to finance trunk water supply, storage, and distribution costs with connection charges and area charges. The current charges are shown in Table 12.

Table 12. Current Area and Connection Charges

2005	Residential	Commercial/Industrial
Water – Connection	$ 773 per unit	$ 1,961 per acre
Water – Area	$ 1,901 per acre	$ 2,403 per acre

It is common practice in the Metro Area to establish a policy of paying for the capital improvements with a combination of area charges and connection charges as the City currently does. This method allows the City to assess developable property for a portion of the trunk facilities costs at the time the facilities are constructed. The "area charge" is based on gross benefited area. Connection charges are then assessed at the time of hook-up and are used to finance the remaining capital cost. We recommend that the City revise the existing area and connection charge systems according to the cost estimates provided in this report. These charges should be reviewed and adjusted annually, according to the ENR construction cost index.

5.4 Lateral Benefit

Lateral benefit is the portion of the cost of a trunk water main that would normally be paid for by the developer. Under the City's existing policy, any development in Cottage Grove would be expected to pay for an 8 inch water main to serve residential development and an 8 inch main to serve commercial or industrial development. We recommend that commercial / industrial properties be required to install a minimum 10 inch line to provide adequate fire flows.

Approximately 156,000 lineal feet of trunk water main is required to build the system out the 2030 service boundary. Assuming half of that length is assessable as an 8-inch main, an estimate of the revenue the City would receive through lateral benefit is $1,600,000.

5.5 Area Charges

There are no set rules for the percentage of the capital costs to be paid for with area charges and the percentage to be paid for with connection charges. For the purposes of this report, the remaining portion of the 2030 distribution system costs (those not covered by lateral benefit), and 10% of all 2030 system supply and storage costs are simply divided by the number of developable acres to calculate an area charge. The method presented in this report also assumes that the City will break even at build-out of the 2030 study area, at 100% of the planned densities. An analysis could also be calculated based on breaking even at Ultimate build-out, and with varying development densities.

The estimated total developable area in the study area is 4,950 acres (after build-out of 2030 Study Area). Table 13 shows the required area charges based on the built-out system. Based on the criteria and assumptions described above, the area charges are as follows:

Table 13. Area Charge Requirements

Water System (at Build-Out of 2030 Study Area)	
Total Distribution Costs	$13,100,000
- Lateral Benefit	$ 1,600,000
+ 10% of Supply / Storage Costs	$ 1,300,000
Total Area Charge Costs	$12,800,000
Total Developable Area (acres)	4,950
Area Charge (per acre)	**$2,590**

5.6 Connection Charges

Water supply and storage facilities required in the provision of an overall water system can be directly related to the amount and type of development experienced by a community. It is a common practice to recover the majority of the costs for these facilities on a connected unit basis. As described above, this report assumes 90 percent of the supply and storage facility costs will be collected through connection charges. Table 14 presents estimated connections for Cottage Grove based on future land use and anticipated revenue.

Table 14. Estimated Number of Connections

Land Use Type	Area (Acres)	Residential Equiv. Units/Ac	Residential Equiv. Total Units
Agricultural	21	3	63
Rural Residential	1032	1-3	1846
Low Density Residential	3234	3	9702
Medium Density Residential	93	8	744
Commercial	141	5	705
Industrial	427	5	2135
Total Res. Equivalent Units			15,195

The connection charge for commercial/industrial properties can be further broken down by water meter size. However, to fully recover capital costs, the average connection charge should be maintained. The calculation of the average connection charge is shown below.

90% of Supply Cost	$5,100,000
90% of Storage Cost	$6,600,000
Total Connection Charge Costs	$11,700,000
Number of REUs	15,195
Connection Charge	$ 770 per REU

The connection charge for each land use designation is based on the amount of water it is expected to use in comparison to residential land use. The residential equivalent unit (REU) is used to compare relative water use between land use types.

5.7 Implementation

This section presents one example of how the charges for the ultimate water system could be split between lateral benefit, connection charge, and area charge. The City should review the system of lateral benefit, area charges, and connection charges presented in this chapter, and revise them annually to account for changes in the ENR index of construction costs. With respect to lateral benefit, consideration should be given to revising the City's policy to require10 inch mains instead of 8 inch mains for commercial and industrial developments. The entire analysis should be reviewed every 5 years to account for changes in development patterns, water use, and construction costs, and to check the balances in the trunk water fund.

The charges established in this chapter are primarily based on land use – and assumed water use based on land usage. Actual water use can vary significantly for specific properties. The charges in this report should be viewed as the minimum charges required to provide water service and fire flows to properties. These charges should be increased to account for the proposed water use (including irrigation uses) for the property. Connection charges can easily be increased based on residential equivalents.

It is important to note that this combination of lateral benefit, area charges, and connection charges is intended to cover the costs for the ultimate system supply, storage, and distribution. Treatment costs for the ultimate system will need to be met using an alternative method. It is suggested that an equitable method for covering the costs of treatment would be one that splits these costs between developed areas and user rates.

Appendix A

Emergency and Conservation Plan

DEPARTMENT OF NATURAL RESOURCES - DIVISION OF WATERS and METROPOLITAN COUNCIL
WATER EMERGENCY AND CONSERVATION PLANS

These guidelines are divided into four parts. The first three parts, Water Supply System Description and Evaluation, Emergency Response Procedures and Water Conservation Planning apply statewide. Part IV, relates to comprehensive plan requirements that apply only to communities in the Seven-County Twin Cities Metropolitan Area. If you have questions regarding water emergency and conservation plans, please call (651) 259-5703 or (651) 259-5647 or e-mail your question to wateruse@dnr.state.mn.us. Metro Communities can also direct questions to the Metropolitan Council at watersupply@metc.state.mn.us or (651) 602-1066.

DNR Water Appropriation Permit Number(s)	776349
Name of Water Supplier	City of Cottage Grove
Address	8635 West Point Douglas Road South Cottage Grove, MN 55016-3318
Contact Person	Rick Alt
Title	Utilities Foreman
Phone Number	651-458-2808
E-Mail Address	ralt@cottage-grove.org

PART I. WATER SUPPLY SYSTEM DESCRIPTION AND EVALUATION

The first step in any water supply analysis is to assess the current status of demand and supplies. Information in Part I, can be used in the development of Emergency Response Procedures and Conservation Plans.

A. ANALYSIS OF WATER DEMAND.

Fill in Table 1 for the past 10 years water demand. If your customer categories are different than the ones listed in Table 1, please note the changes below.
---N/A---

TABLE 1 Historic Water Demand

Year	Total Population	Population Served	Total Connections	Residential Water Sold (MG)	C/I/I Water Sold (MG)	Other Water Sold (MG)	Total Water Sold (MG)	Total Water Pumped (MG)	Percent Unmetered/ Unaccounted	Average Demand (MGD)	Maximum Demand (MGD)	Residential gallons/ capita/day	Total gallons/ capita/day
2004	34,800	34,800	9,528	956	171	70	1,197	1,295	7.6	3.55	9.97	75	102
2003		34,800	9,231	1,047	170	-	1,217	1,428	14.8	3.9	12.6	82.4	112
2002		34,500	9,075	856	153	70	1,079	1,197	9.9	3.3	10.8	68.0	95
2001		34,113	8,904	930	156	69	1,155	1,498	22.9	4.1	13.1	74.7	120
2000	30,582	30,423	8,859	958	151	28	1,137	1,339	15.1	3.7	8.3	86.0	121
1999		32,633	8,645	835	129	25	989	1,167	15.3	3.2	10.3	70.1	98
1998		32,200	8,577	887	138	9.5	1,034.5	1,212	14.6	3.3	11.1	75.5	103
1997		31,211	8,281	801	148	-	949	1,088	12.8	3.0	10.6	70.3	96
1996		28,000	8,117	860	137	-	997	1,141	12.6	3.1	10.3	83.9	112
1995	29,146	26,982	7,841	756	138	3.5	897.5	920	2.4	2.5	8.5	76.8	93

MG – Million Gallons **MGD** – Million Gallons per Day **C/I/I**- Commercial, Industrial, Institutional

Residential. Water used for normal household purposes, such as drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, and watering lawns and gardens.

Institutional. Hospitals, nursing homes, day care centers, and other facilities that use water for essential domestic requirements. This includes public facilities and public metered uses. You may want to maintain separate institutional water use records for emergency planning and allocation purposes.

Commercial. Water used by motels, hotels, restaurants, office buildings, commercial facilities, both civilian and military.

Industrial. Water used for thermoelectric power (electric utility generation) and other industrial uses such as steel, chemical and allied products, food processing, paper and allied products, mining, and petroleum refining.

Wholesale Deliveries. Bulk water sales to other public water suppliers.

Unaccounted. Unaccounted for water is the volume of water withdrawn from all sources minus the volume sold.

Residential Gallons per Capita per Day = total residential sales in gallons/population served/365 days **Total Gallons per Capita per Day** = total water withdrawals/population served/365 days

NOTE: Non-essential water uses defined by Minnesota Statutes 103G.291, include lawn sprinkling, vehicle washing, golf course and park irrigation and other non-essential uses. Some of the above categories also include non-essential uses of water.

Water Use Trends. Discuss factors that influence trends in water demand (i.e. growth, weather, industry, conservation). If appropriate, include a discussion of other factors that affect daily water use, such as use by non-resident commuter employees or large water consuming industry.
Preliminary calculations show the total annual withdrawals for 2005 (1.313 billion gallons) to be lower than total withdrawals in two previous years. This was thought to be a result of annual weather patterns. In 2005, Cottage Grove also experienced its maximum day demand (13.4 million gallons) on July 16. This may be attributed to a combination of growth and seasonal weather conditions.

TABLE 2 Large Volume Users - List the top 10 largest users.

Customer	Gallons per year	% of total annual use
Up North Plastics	16,079,000	1.22%
Park Senior High School	5,305,000	0.40%
Cottage Grove Jr. High School	5,291,000	0.40%
Trade Home Shoes	3,887,000	0.30%
River Valley Clinic	2,546,000	0.19%
Mister Car Wash	2,310,000	0.18%
Advance Corp.	1,982,000	0.15%
Grey Cloud Elementary	1,794,000	0.14%
Crestview Elementary	1,398,000	0.11%
Hillside Elementary	1,340,000	0.10%

B. TREATMENT AND STORAGE CAPACITY.

TABLE 3(A) Water Treatment

Water Treatment Plant Capacity	13.5 Million Gallons per day
Describe the treatment process used (ie, softening, chlorination, fluoridation, Fe/Mn removal, reverse osmosis, coagulation, sedimentation, filtration, others). Also, describe the annual amount and method of disposal of treatment residuals, if any.	
Chlorination and fluoridation.	

TABLE 3(B) Storage Capacity - List all storage structures and capacities.

Total Storage Capacity	**Average Day Demand** (average of last 5 years)	
7.15 MG (4.65 MG Useful Storage)	3.7	Million Gallons per day
Type of Structure	Number of Structures	Gallons
Elevated Storage	4	3,150,000
Ground Storage	2	4,000,000
Other:		

C. **WATER SOURCES.** List all groundwater, surface water and interconnections that supply water to the system. Add or delete lines to the tables as needed.

TABLE 4(A) Total Water Source Capacity for System (excluding emergency connections)

Total Capacity of Sources	12,200	Gallons per minute
Firm Capacity (largest pump out of service)	8,900	Gallons per minute

TABLE 4(B) Groundwater Sources - Copies of water well records and well maintenance information should be included with the public water supplier's copy of the plan in Attachment 1. If there are more wells than space provided or multiple well fields, please use the List of Wells template (see Resources) and include as Attachment 2.

Well # or name	Unique Well Number	Year Installed	Well & Casing Depth (ft)	Well Diameter (in)	Capacity (GPM)	Geologic Unit	Status

Status: Active use, Emergency, Standby, Seasonal, Peak use, etc GPM – Gallons per Minute
Geologic Unit: Name of formation(s), which supplies water to the well

TABLE 4(C) Surface Water Sources

Intake ID	Resource name	Capacity (GPM/MGD)
	---N/A---	

GPM – Gallons per Minute MGD – Million Gallons per Day

TABLE 4(D) Wholesale or Retail Interconnections - List interconnections with neighboring suppliers that are used to supply water on a **regular basis** either wholesale or retail.

Water Supply System	Capacity (GPM/MGD)	Wholesale or retail
---N/A---		

GPM – Gallons per Minute MGD – Million Gallons per Day

TABLE 4(E) Emergency Interconnections - List interconnections with neighboring suppliers or private sources that can be used to supply water on an emergency or occasional basis. Suppliers that serve less than 3,300 people can leave this section blank, but must provide this information in Section II C.

Water Supply System	Capacity (GPM/MGD)	Note any limitations on use
City of St Paul Park	Minimal. No physical pipe-to-pie connection. Connection involves hose connection between hydrants.	Emergency use only

GPM – Gallons per Minute MGD – Million Gallons per Day

D. DEMAND PROJECTIONS.

TABLE 5 Ten Year Demand Projections

Year	Population Served	Average Day Demand (MGD)	Maximum Day Demand (MGD)	Projected Demand (MGY)
2005	35,500	3.6	13.4	1,322
2006	36,300	3.7	13.6	1,351
2007	37,000	3.8	13.8	1,378
2008	37,700	3.9	14.0	1,417
2009	38,500	4.0	14.2	1,447
2010	39,200	4.0	14.5	1,474
2011	40,700	4.2	15.0	1,530
2012	42,300	4.4	15.5	1,590
2013	43,800	4.5	16.0	1,647
2014	45,400	4.7	16.6	1,707

MGD – Million Gallons per Day MGY – Million Gallons per Year

Projection Method. Describe how projections were made, (assumptions for per capita, per household, per acre or other methods used).

Demand projections were based on land use and population projections from the City's 2030 Comprehensive Plan. Future water demands were estimated by multiplying the developable acres of each land use type by appropriate factors (gallons per acre per day). Future demands were also checked by comparing the existing total per capita demand to the future per capita demand. From 2005 to 2014 the design total average day per capita demand is expected to increase from 102 gpcd to 103 gpcd based on the expectation that commercial and industrial development will outpace residential development in the future. The maximum day total per capita demand is expected to reduce from a 2005 demand rate of 378 gpcd to 365 gpcd in 2014 based on the projected efficacy of conservation measures.

E. RESOURCE SUSTAINABILITY

Sustainable water use: use of water to provide for the needs of society, now and in the future, without unacceptable social, economic, or environmental consequences.

Monitoring. Records of water levels should be maintained for all production wells and source water reservoirs/basins. Water level readings should be taken monthly for a production well or observation well that is representative of the wells completed in each water source formation.

TABLE 6 Monitoring Wells - List all wells being measured.

Unique well number	Type of well (production, observation)	Frequency of Measurement (daily, monthly etc.)	Method of Measurement (steel tape, SCADA etc.)
655936	Observation		
208808	Production	Periodic	Sounder
208809	Production	Periodic	Sounder
208807	Production	Periodic	Sounder
208805	Production	Periodic	Sounder
208806	Production	Periodic	Sounder
201238	Production	Periodic	Sounder
201227	Production	Periodic	Sounder
110464	Production	Periodic	Sounder
165602	Production	Periodic	Sounder
191904	Production	Periodic	Sounder

Water Level Data. Summarize water level data including seasonal and long-term trends for each ground and/or surface water source. If water levels are not measured and recorded on a routine basis then provide the static water level (SWL) when the well was constructed and a current water level measurement for each production well. Also include all water level data taken during well and pump maintenance.

Static Water Level (ft) by Well

Date	1	2	3	4	5	6	7	8	9	10
9/2000	55	91	113	162	92	-	117	156	107	32
6/2002	51	76	-	134	84	-	84	116	105	34
9/2003	72	81	146	166	122	190	138	140	151	59

Water level monitoring is planned to take place during annual well inspections.

Ground Water Level Monitoring – DNR Waters in conjunction with federal and local units of government maintain and measure approximately 750 observation wells around the state. Ground water level data are available online www.dnr.state.mn.us/waters. Information is also available by contacting the Ground Water Level Monitoring Manager, DNR Waters, 500 Lafayette Road, St. Paul, MN 55155-4032 or call (651) 259-5700.

Natural Resource Impacts. Indicate any natural resource features such as calcareous fens, wetlands, trout streams, rivers or surface water basins that are or could be influenced by water withdrawals from municipal production wells. Also indicate if resource protection thresholds have been established and if mitigation measures or management plans have been developed.
---N/A---

Sustainability. Evaluate the adequacy of the resource to sustain current and projected demands. Describe any modeling conducted to determine impacts of projected demands on the resource.
Modeling conducted for existing wells predicts aquifer is adequate to sustain current demands. System-wide modeling of projected demands is not available, but preliminary modeling for the North well field suggests that the Jordan aquifer will sustain projected demands in that area.

Source Water Protection Plans. The emergency procedures in this plan are intended to comply with the contingency plan provisions required in the Minnesota Department of Health's (MDH) Wellhead Protection (WHP) Plan and Surface Water Protection (SWP) Plan.	
Date WHP Plan Adopted:	Currently under review by MDH. Expected in early 2006.
Date for Next WHP Update:	After construction of Well 12
SWP Plan:	☐ In Process ☐ Completed ☒ Not Applicable

F. CAPITAL IMPROVEMENT PLAN (CIP)

Adequacy of Water Supply System. Are water supply installations, treatment facilities and distribution systems adequate to sustain current and projected demands? ☐ Yes ☒ No If no, describe any potential capital improvements over the next ten years and state the reasons for the proposed changes (CIP Attachment 3).
Construct 3 new supply wells (assuming 1,200 gpm each), and new 1.5 MG and 2.0 MG water towers. Construction of new wells is necessary to keep up with increasing demands due to new development. New development also drives the need for the two new towers in different pressure zones.

Proposed Water Sources. Does your current CIP include the addition of new wells or intakes? ☒ Yes ☐ No If yes, list the number of new installations and projected water demands from each for the next ten years. Plans for new production wells must include the geologic source formation, well location, and proposed pumping capacity.
Three new wells are planned to be located in the North Well Field within the next 10 years, and are each expected to pump 1,200 gpm from the Jordan aquifer.

Water Source Alternatives. If new water sources are being proposed, describe alternative

sources that were considered and any possibilities of joint efforts with neighboring communities for development of supplies.
Future wells are planned to be developed from the existing source – the Jordan aquifer. Cottage Grove is also exploring the possibility of future interconnection(s) with the City of Woodbury at point(s) along the border between the two cities. This would not take place until distribution facilities are constructed in the vicinity of the common boundary to serve development on both sides of the boundary.

Preventative Maintenance. Long-term preventative programs and measures will help reduce the risk of emergency situations. Identify sections of the system that are prone to failure due to age, materials or other problems. This information should be used to prioritize capital improvements, preventative maintenance, and to determine the types of materials (pipes, valves, couplings, etc.) to have in stock to reduce repair time.
A large portion of Cottage Grove's water system is relatively new. Public Works maintains an adequate supply of repair parts for both the distribution system and the well pumphouses. The City has relationships with contractors and vendors to help ensure an adequate supply of spare parts. The City maintains a record of all breaks and repairs. Recently, the City has begun keeping better records of valve and hydrant maintenance, especially related to the valves and hydrants operated during their flushing program. The City began a pavement management plan in 1996. All sections scheduled for street repairs are leak tested, valves operated, and records are checked for occurrences of prior breaks in the area. Questionable facilities are replaced in conjunction with the street reconstruction projects. Currently the controls on two of the older wells are being replaced in order to increase the efficiency and reliability of the wells. The Well Maintenance Program implemented by the City provides for inspection and maintenance of each well once every ten years.

PART II. EMERGENCY RESPONSE PROCECURES

Water emergencies can occur as a result of vandalism, sabotage, accidental contamination, mechanical problems, power failures, drought, flooding, and other natural disasters. The purpose of emergency planning is to develop emergency response procedures and to identify actions needed to improve emergency preparedness. In the case of a municipality, these procedures should be in support of, and part of, an all-hazard emergency operations plan. If your community already has written procedures dealing with water emergencies we recommend that you use these guidelines to review and update existing procedures and water supply protection measures.

Federal Emergency Response Plan

Section 1433(b) of the Safe Drinking Water Act as amended by the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (Public Law 107-188, Title IV – Drinking Water Security and Safety) requires community water suppliers serving over 3,300 people to prepare an Emergency Response Plan. **Community water suppliers that have completed the**

Federal Emergency Response Plan and submitted the required certification to the U.S. Environmental Protection Agency have satisfied Part II, Sections A, B, and C of these guidelines and need only provide the information below regarding the emergency response plan and source water protection plan and complete Sections D (Allocation and Demand Reduction Procedures), and E (Enforcement).

Provide the following information regarding your completed Federal Emergency Response Plan:

Emergency Response Plan	Contact Person	Contact Number
Emergency Response Lead	Joe Rhode	651-402-1644
Alternate Emergency Response Lead	Rick Alt	651-295-6782
Emergency Response Plan Certification Date	June 14, 2004	

Operational Contingency Plan. An operational contingency plan that describes measures to be taken for water supply mainline breaks and other common system failures as well as routine maintenance is recommended for all utilities. Check here ☒ if the utility has an operational contingency plan. At a minimum a contact list for contractors and supplies should be included in a water emergency telephone list.

Communities that have completed Federal Emergency Response Plans should skip to Section D.

EMERGENCY RESPONSE PROCEDURES

A. **Emergency Telephone List.** A telephone list of emergency contacts must be included as Attachment to the plan (complete template or use your own list). The list should include key utility and community personnel, contacts in adjacent communities, and appropriate local, state and federal emergency contacts. Please be sure to verify and update the contacts on the emergency telephone list on a regular basis (once each year recommended). In the case of a municipality, this information should be contained in a notification and warning standard operating procedure maintained by the warning point for that community. Responsibilities and services for each contact should be defined.

B. **Current Water Sources and Service Area.** Quick access to concise and detailed information on water sources, water treatment, and the distribution system may be needed in an emergency. System operation, water well and maintenance records should be maintained in a central secured location so that the records are accessible for emergency purposes and preventative maintenance. A detailed map of the system showing the treatment plants, water sources, storage facilities, supply lines, interconnections, and other information that would be useful in an emergency should also be readily available. Check here ☐ if these records and maps exist and staff can access the documents in the event of an emergency.

C. **Procedure for Augmenting Water Supplies.** List all available sources of water that can be used to augment or replace existing sources in an emergency. In the case of a municipality, this information should be contained in a notification and warning standard operating procedure maintained by the warning point for that community. Copies of cooperative

agreements should be maintained with your copy of the plan and include in Attachment . Be sure to include information on any physical or chemical problems that may limit interconnections to other sources of water. Approvals from the MN Department of Health are required for interconnections and reuse of water.

TABLE 7 (A) Public Water Supply Systems – List interconnections with other public water supply systems that can supply water in an emergency.

Water Supply System	Capacity (GPM/MGD)	Note any limitations on use

GPM – Gallons per Minute MGD – Million Gallons per Day

TABLE 7 (B) - Private Water Sources – List other sources of water available in an emergency.

Name	Capacity (GPM/MGD)	Note any limitations on use

GPM – Gallons per Minute MGD – Million Gallons per Day

D. Allocation and Demand Reduction Procedures. The plan must include procedures to address gradual decreases in water supply as well as emergencies and the sudden loss of water due to line breaks, power failures, sabotage, etc. During periods of limited water supplies public water suppliers are required to allocate water based on the priorities established in Minnesota Statutes 103G.261.

Water Use Priorities (Minnesota Statutes 103G.261)

First Priority. Domestic water supply, excluding industrial and commercial uses of municipal water supply, and use for power production that meets contingency requirements

NOTE: Domestic use is defined (MN Rules 6115.0630, Subp. 9), as use for general household purposes for human needs such as cooking, cleaning, drinking, washing, and waste disposal, and uses for on-farm livestock watering excluding commercial livestock operations which use more than 10,000 gallons per day or one million gallons per year

Second Priority. Water uses involving consumption of less than 10,000 gallons per day

Third Priority. Agricultural irrigation and processing of agricultural products

Fourth Priority. Power production in excess of the use provided for in the contingency plan under first priority

Fifth Priority. Uses, other than agricultural irrigation, processing of agricultural products, and power production

Sixth Priority. Non-essential uses These uses are defined by Minnesota Statutes 103G.291 as lawn sprinkling, vehicle washing, golf course and park irrigation, and other non-essential uses.

List the statutory water use priorities along with any local priorities (hospitals, nursing homes, etc.) in Table 8. Water used for human needs at hospitals, nursing homes and similar types of facilities should be designated as a high priority to be maintained in an emergency. Local allocation priorities will need to address water used for human needs at other types of

facilities such as hotels, office buildings, and manufacturing plants. The volume of water and other types of water uses at these facilities must be carefully considered. After reviewing the data, common sense should dictate local allocation priorities to protect domestic requirements over certain types of economic needs. In Table 8, list the priority ranking, average day demand and demand reduction potential for each customer category (modify customer categories if necessary).

Table 8 Water Use Priorities

Customer Category	Allocation Priority	Average Day Demand (GPD)	Demand Reduction Potential (GPD)
Residential	1	2,620,000	1,050,000
Institutional	2	*(included in Commercial)*	*(see Commercial)*
Commercial	2	470,000	430,000
Industrial	2	*(included in Commercial)*	*(see Commercial)*
Irrigation	6	*(incl. in Non-essential)*	*(see Non-essential)*
Wholesale	N/A	-	-
Non-essential	6	190,000	190,000
	TOTALS	3,280,000	1,670,000

GPD – Gallons per Day

Demand Reduction Potential The demand reduction potential for residential use will typically be the base demand during the winter months when water use for non-essential uses such as lawn watering do not occur. The difference between summer and winter demands typically defines the demand reduction that can be achieved by eliminating non-essential uses. In extreme emergency situations lower priority water uses must be restricted or eliminated to protect first priority domestic water requirements. Short-term demand reduction potential should be based on average day demands for customer categories within each priority class.

Note: In an extreme emergency, Cottage Grove would require approximately 35,000 gallons per day, to supply one gallon of drinking water per day per person.

Triggers for Allocation and Demand Reduction Actions. Triggering levels must be defined for implementing emergency responses, including supply augmentation, demand reduction, and water allocation. Examples of triggers include: water demand >100% of storage, water level in well(s) below a certain elevation, treatment capacity reduced 10% etc. Each trigger should have a quantifiable indicator and actions can have multiple stages such as mild, moderate and severe responses. Check each trigger below that is used for implementing emergency responses and for each trigger indicate the actions to be taken at various levels or stages of severity in Table 9.

- ☒ Water Demand
- ☐ Treatment Capacity
- ☐ Storage Capacity
- ☐ Groundwater Levels
- ☐ Surface Water Flows or Levels
- ☐ Pump, Booster Station or Well Out of Service
- ☒ Governor's Executive Order – Critical Water Deficiency (required by statute)
- ☐ Water Main Break
- ☐ Loss of Production
- ☐ Security Breach
- ☐ Contamination
- ☒ Other (list in Table 9)

Table 9 Demand Reduction Procedures

Condition	Trigger(s)	Actions
Stage 1 (Mild)	Demand/firm cap. 95%	Total sprinkling ban
Stage 2 (Moderate)	Demand/firm cap. 96%	Eliminate Allocation Priority 6 water usage
Stage 3 (Severe)	Demand/firm cap. 99% 100%	Reduce Allocation Priority 2 water usage Reduce Allocation Priority 1 water usage
Critical Water Deficiency (M.S. 103G.291)	Executive Order by Governor & as provided in above triggers	Stage 1: Restrict lawn watering, vehicle washing, golf course and park irrigation and other nonessential uses Stage 2: Suspend lawn watering, vehicle washing, golf course and park irrigation and other nonessential uses

Note: The potential for water availability problems during the onset of a drought are almost impossible to predict. Significant increases in demand should be balanced with preventative measures to conserve supplies in the event of prolonged drought conditions.

Notification Procedures. List methods that will be used to inform customers regarding conservation requests, water use restrictions, and suspensions. Customers should be aware of emergency procedures and responses that they may need to implement.
Public service announcements, "bill stuffers," and notices in local paper will be used to inform customers regarding conservation requests, water use restrictions, and suspensions.

E. Enforcement. Minnesota Statutes require public water supply authorities to adopt and enforce water conservation restrictions during periods of critical water shortages.

Public Water Supply Appropriation During Deficiency.
Minnesota Statutes 103G.291, Subdivision 1.

Declaration and conservation

(a) If the governor determines and declares by executive order that there is a critical water deficiency, public water supply authorities appropriating water must adopt and enforce water conservation restrictions within their jurisdiction that are consistent with rules adopted by the commissioner

(b) The restrictions must limit lawn sprinkling, vehicle washing, golf course and park irrigation, and other nonessential uses, and have appropriate penalties for failure to comply with the restrictions.

An ordinance that has been adopted or a draft ordinance that can be quickly adopted to comply with the critical water deficiency declaration must be included in the plan (include with other ordinances in Attachment 7 for Part III, Item 4). Enforcement responsibilities and penalties for non-compliance should be addressed in the critical water deficiency ordinance.
Sample regulations are available at www.dnr.state.mn.us/waters

Authority to Implement Water Emergency Responses. Emergency responses could be

delayed if city council or utility board actions are required. Standing authority for utility or city managers to implement water restrictions can improve response times for dealing with emergencies. Who has authority to implement water use restrictions in an emergency?

☐ Utility Manager ☐ City Manager ☐ City Council or Utility Board
☒ Other (describe): City Administrator or City Emergency Management Director

Emergency Preparedness. If city or utility managers do not have standing authority to implement water emergency responses, please indicate any intentions to delegate that authority. Also indicate any other measures that are being considered to reduce delays for implementing emergency responses.

PART III. WATER CONSERVATION PLAN

Water conservation programs are intended to reduce demand for water, improve the efficiency in use and reduce losses and waste of water. Long-term conservation measures that improve overall water use efficiencies can help reduce the need for short-term conservation measures. Water conservation is an important part of water resource management and can also help utility managers satisfy the ever-increasing demands being placed on water resources.

> Minnesota Statutes 103G.291, requires public water suppliers to implement demand reduction measures before seeking approvals to construct new wells or increases in authorized volumes of water. Minnesota Rules 6115.0770, require water users to employ the best available means and practices to promote the efficient use of water. Conservation programs can be cost effective when compared to the generally higher costs of developing new sources of supply or expanding water and/or wastewater treatment plant capacities.

A. Conservation Goals. The following section establishes goals for various measures of water demand. The programs necessary to achieve the goals will be described in the following section.

Unaccounted Water (calculate five year averages with data from Table 1)	
Average annual volume unaccounted water for the last 5 years	194 million gallons
Average percent unaccounted water for the last 5 years	14 percent
AWWA recommends that unaccounted water not exceed 10%. Describe goals to reduce unaccounted water if the average of the last 5 years exceeds 10%.	
City is working to better estimate amount of water used for construction and other uses.	

Residential Gallons Per Capita Demand (GPCD)	
Average residential GPCD use for the last 5 years (use data from Table 1)	77 GPCD
In 2002, average residential GPCD use in the Twin Cities Metropolitan Area was 75 GPCD. Describe goals to reduce residential demand if the average for the last 5 years exceeds 75 GPCD.	

Total Per Capita Demand: From Table 1, is the trend in overall per capita demand over the past 10 years ☒ increasing or ☐ decreasing? If total GPCD is increasing, describe the goals to lower overall per capita demand or explain the reasons for the increase.
Over the last ten years the total per capita demand for any given year can vary by as much as 15% from the average for the ten year period. It is thought that the increase in total per capita demand can be attributed to an increasing ratio of commercial/industrial land use to residential land use.

Peak Demands (calculate average ratio for last five years using data from Table 1)	
Average maximum day to average day ratio	3.0
If peak demands exceed a ratio of 2.6, describe the goals for lowering peak demands.	

Continue lawn watering education and enforcement of existing regulations.

B. Water Conservation Programs. Describe all short-term conservation measures that are available for use in an emergency and long-term measures to improve water use efficiencies for each of the six conservation program elements listed below. Short-term demand reduction measures must be included in the emergency response procedures and must be in support of, and part of, a community all-hazard emergency operation plan.

1. **Metering.** The American Water Works Association (AWWA) recommends that every water utility meter all water taken into its system and all water distributed from its system at its customer's point of service. An effective metering program relies upon periodic performance testing, repair, repair and maintenance of all meters. AWWA also recommends that utilities conduct regular water audits to ensure accountability. Complete Table 10 (A) regarding the number and maintenance of customer meters.

TABLE 10 (A) Customer Meters

	Number of Connections	Number of Metered Connections	Meter testing schedule (years)	Average age/meter replacement schedule (years)
Residential	9,315	9,315		12 / As needed
Institutional	*(see Commercial)*	-	-	- / -
Commercial	213	213		/
Industrial	*(see Commercial)*	-	-	- / -
Public Facilities	*(see Commercial)*	-	-	- / -
Other				/
TOTALS	9,528	9,528		

Unmetered Systems. Provide an estimate of the cost to install meters and the projected water savings from metering water use. Also indicate any plans to install meters.
N/A

TABLE 10 (B) Water Source Meters

	Number of Meters	Meter testing schedule (years)	Average age/meter replacement schedule (years)
Water Source (wells/intakes)	11	1-2 annually	10 / When needed
Treatment Plant	--N/A--		/

2. **Unaccounted Water.** Water audits are intended to identify, quantify, and verify water and revenue losses. The volume of unaccounted-for water should be evaluated each billing cycle. The AWWA recommends a goal of ten percent or less for unaccounted-for water. Water audit procedures are available from the AWWA and MN Rural Water Association.

Frequency of water audits: ☐ each billing cycle ☐ yearly ☒ other: Intermittent

Leak detection and survey: ☒ every year ☐ every years ☐ periodic as needed
Year last leak detection survey completed: 2005

Reducing Unaccounted Water. List potential sources and efforts being taken to reduce unaccounted water. If unaccounted water exceeds 10% of total withdrawals, include the timeframe for completing work to reduce unaccounted water to 10% or less.
In 2004, Unaccounted Water was 7.6% of the total annual withdrawals. The City plans to continue annual leak detection efforts.

3. **Conservation Water Rates.** Plans must include the current rate structure for all customers and provide information on any proposed rate changes. Discuss the basis for current price levels and rates, including cost of service data, and the impact current rates have on conservation.

Billing Frequency: ☐ Monthly ☐ Bimonthly ☒ Quarterly
☐ Other (describe):

Volume included in base rate or service charge: Zero gallons

Conservation Rate Structures
- ☒ Increasing block rate: rate per unit increases as water use increases
- ☐ Seasonal rate: higher rates in summer to reduce peak demands
- ☐ Service charge or base fee that does not include a water volume

Conservation Neutral Rate Structure
- ☐ Uniform rate: rate per unit is the same regardless of volume

Non-conserving Rate Structures
- ☐ Service charge or base fee that includes a large volume of water
- ☐ Declining block rate: rate per unit decreases as water use increases
- ☐ Flat rate: one fee regardless of how much water is used (unmetered)

Other (describe):

Water Rates Evaluated: ☐ every year ☐ every years ☒ no schedule
Date of last rate change: 1/1/2006

Declining block (the more water used, the cheaper the rate) and flat (one fee for an unlimited volume of water) rates should be phased out and replaced with conservation rates. Incorporating a seasonal rate structure and the benefits of a monthly billing cycle should also be considered along with the development of an emergency rate structure that could be quickly implemented to encourage conservation in an emergency.

Current Water Rates. Include a copy of the actual rate structure in Attachment N/A or list current water rates including base/service fees and volume charges below.

Water Rates per Quarter	As of January 1, 2006
Base charge per quarter	$4.50
Usage up to 45,000 gals/qtr	$1.40/1,000 gals
Usage from 45,001-100,000 gals/qtr	$1.75/1,000 gals
Usage over 100,001 gallons per qtr	$1.95/1,000 gals

Non-conserving Rate Structures. Provide justification for the rate structure and its impact on reducing demands or indicate intentions including the timeframe for adopting a conservation rate structure.

---N/A---

4. **Regulation.** Plans should include regulations for short-term reductions in demand and long-term improvements in water efficiencies. Sample regulations are available from DNR Waters. Copies of adopted regulations or proposed restrictions should be included in Attachment of the plan. Indicate any of the items below that are required by local regulations and also indicate if the requirement is applied each year or just in emergencies.

☐ Time of Day: no watering between am/pm and am/pm (reduces evaporation) ☐ year around ☐ seasonal ☐ emergency only
☒ Odd/Even: (helps reduce peak demand) ☒ year around ☐ seasonal ☐ emergency only
☐ Water waste prohibited (no runoff from irrigation systems)
Describe ordinance:
☐ Limitations on turf areas for landscaping (reduces high water use turf areas)
Describe ordinance:
☐ Soil preparation (such as 4"-6" of organic soil on new turf areas with sandy soil)
Describe ordinance:
☒ Tree ratios (plant one tree for every 2,500 square feet to reduce turf evapotranspiration)
Describe ordinance: Section 11-6-5.D.2 describes minimum vegetation requirements.
☐ Prohibit irrigation of medians or areas less than 8 feet wide
Describe ordinance:
☐ Permit required to fill swimming pool ☐ every year ☐ emergency only
☐ Other (describe):

State and Federal Regulations (mandated)

☒ Rainfall sensors on landscape irrigation systems. Minnesota Statute 103G 298 requires "All automatically operated landscape irrigation systems shall have furnished and installed technology that inhibits or interrupts operation of the landscape irrigation system during periods of sufficient moisture. The technology must be adjustable either by the end user or the professional practitioner of landscape irrigation services."

☒ Water Efficient Plumbing Fixtures. The 1992 Federal Energy Policy Act established manufacturing standards for water efficient plumbing fixtures, including toilets, urinals, faucets, and aerators.

Enforcement. Are ordinances enforced? ☒ Yes ☐ No If yes, indicate how ordinances are enforced along with any penalties for non-compliance.
The State and Federal regulations are enforced by the Building Official at time of construction. In addition, plumbing fixtures that do not comply with the 1992 Act are no longer available for purchase.

5. **Education and Information Programs.** Customers should be provided information on how to improve water use efficiencies a minimum of two times per year. Information should be provided at appropriate times to address peak demands. Emergency notices and educational materials on how to reduce water use should be available for quick distribution during an emergency. If any of the methods listed in the table below are used to provide water conservation tips, indicate the number of times that information is provided each year and attach a list of education efforts used for the last three years.

Current Education Programs	**Times/Year**
Billing inserts or tips printed on the actual bill	4
Consumer Confidence Reports	1
Local news papers	1-2
Community news letters	4
Direct mailings (water audit/retrofit kits, showerheads, brochures)	
Information at utility and public buildings	1
Public Service Announcements	
Cable TV Programs	
Demonstration projects (landscaping or plumbing)	
K-12 Education programs (Project Wet, Drinking Water Institute)	
School presentations	2
Events (Safety Camp)	1
Community education	
Water Week promotions	

Information provided to groups that tour the water treatment plant	N/A
Website (include address: http://www.cottage-grove.org/public_works_water_conservation.htm)	Yes
Targeted efforts (large volume users, users with large increases)	
Notices of ordinances (include tips with notices)	
Emergency conservation notices (recommended)	As needed
Other:	

List education efforts for the last three years in Attachment 4 of the plan. Be sure to indicate whether educational efforts are on-going and which efforts were initiated as an emergency or drought management effort.

Proposed Education Programs. Describe any additional efforts planned to provide conservation information to customers a minimum of twice per year (required if there are no current efforts).
No additional educational efforts are currently planned.

A packet of conservation tips and information can be obtained by contacting DNR Waters or the Minnesota Rural Water Association (MRWA). The American Water Works Association (AWWA) www.awwa.org or www.waterwiser.org also has excellent materials on water conservation that are available in a number of formats. You can contact the MRWA 800/367-6792, the AWWA bookstore 800/926-7337 or DNR Waters 651/259-5703 for information regarding educational materials and formats that are available.

6. **Retrofitting Programs.** Education and incentive programs aimed at replacing inefficient plumbing fixtures and appliances can help reduce per capita water use as well as energy costs. It is recommended that communities develop a long-term plan to retrofit public buildings with water efficient plumbing fixtures and that the benefits of retrofitting be included in public education programs. You may also want to contact local electric or gas suppliers to see if they are interested in developing a showerhead distribution program for customers in your service area.

A study by the AWWA Research Foundation (Residential End Uses of Water, 1999) found that the average indoor water use for a non-conserving home is 69.3 gallons per capita per day (gpcd). The average indoor water use in a conserving home is 45.2 gpcd and most of the decrease in water use is related to water efficient plumbing fixtures and appliances that can reduce water, sewer and energy costs. In Minnesota, certain electric and gas providers are required (Minnesota Statute 216B.241) to fund programs that will conserve energy resources and some utilities have distributed water efficient showerheads to customers to help reduce energy demands required to supply hot water.

Retrofitting Programs. Describe any education or incentive programs to encourage the retrofitting of inefficient plumbing fixtures (toilets, showerheads, faucets, and aerators) or appliances (washing machines).
Cottage Grove has partnered with Xcel Energy in the past to give away 4,500 showerheads; and staff will approach Xcel about partnering on another conservation program.

Plan Approval. Water Emergency and Conservation Plans must be approved by the Department of Natural Resources (DNR) every ten years. Please submit plans for approval to the following address:

DNR Waters
Water Permit Programs Supervisor
500 Lafayette Road
St. Paul, MN 55155-4032

or Submit electronically to
wateruse@dnr.state.mn.us.

Adoption of Plan. All DNR plan approvals are contingent on the formal adoption of the plan by the city council or utility board. Please submit a certificate of adoption (example available) or other action adopting the plan.

Metropolitan Area communities are also required to submit these plans to the Metropolitan Council. Please see PART IV. ITEMS FOR METROPOLITAN AREA PUBLIC SUPPLIERS.

METROPOLITAN COUNCIL

PART IV. ITEMS FOR METROPOLITAN AREA PUBLIC SUPPLIERS

Minnesota Statute 473.859 requires water supply plans to be completed for all local units of government in the seven-county Metropolitan Area as part of the local comprehensive planning process. Much of the required information is contained in Parts I-III of these guidelines. However, the following additional information is necessary to make the water supply plans consistent with the Metropolitan Land Use Planning Act upon which local comprehensive plans are based. Communities should use the information collected in the development of their plans to evaluate whether or not their water supplies are being developed consistent with the Council's Water Resources Management Policy Plan.

Policies. Provide a statement(s) on the principles that will dictate operation of the water supply utility: for example, "It is the policy of the city to provide good quality water at an affordable rate, while assuring this use does not have a long-term negative resource impact."
To provide a safe potable supply of drinking water for our customers, and ensure the water distribution system and related facilities are managed and maintained in the most efficient and cost effective way.

Impact on the Local Comprehensive Plan. Identify the impact that the adoption of this water supply plan has on the rest of the local comprehensive plan, including implications for future growth of the community, economic impact on the community and changes to the comprehensive plan that might result.
This Plan is based on the City's 2030 Comprehensive Plan.

Demand Projections

Year	Population Served*	Average Day Demand (MGD)	Maximum Day Demand (MGD)	Projected Demand (MGY)
2010	42,200	4.3	15.4	1,587
2020	54,600	5.7	19.6	2,073
2030	68,400	7.3	24.1	2,665
Ultimate	125,200	15.4	45.1	5,621

* Population projections should be consistent with those in the Metropolitan Council's *2030 Regional Development Framework*

REVIEW OF THE PLAN

The plan must be prepared by the city according to the sequence outlined in Minnesota Statutes 473.175, and submitted to the Metropolitan Council, adjacent communities, and the county for review and comment. The Council determines if the plan is complete for review within 10 days. If incomplete, the Council will notify the community and request the necessary information. When complete the Council will complete its review within 60 days or a mutually agreed upon extension. The community officially adopts the plan after it is returned with comments by the Council.

PLAN SUBMITTAL

Plans can be submitted electronically to the Council; however, the review process will not begin until the Council receives a paper copy of the materials. Electronic submissions can be via a CD, 3 ½" floppy disk or to the email address below. Metropolitan communities should submit their plans to:

Reviews Coordinator
Metropolitan Council
230 E. 5th Street,
St. Paul, MN 55101

electronically to:
watersupply@metc.state.mn.us

ATTACHMENT 2a

Public Water Supplier: City of Cottage Grove

DNR Water Appropriation Permit Numbers: 776349

Well Field Name (if applicable): South Well Field

TABLE 4(B) Groundwater Sources – Use this attachment if there are more production wells than the space provided in the plan or if the system uses more than one well field.

Well # or name	Unique Well Number	Year Installed	Well & Casing Depth (ft)	Well Diameter (in)	Capacity (GPM)	Geologic Unit	Status
1	208808	1958	327 / 240	12	600	Jordan	Active
2	208809	1958	352 / 248	12	600	Jordan	Active
10	191904	1984	284 / 220	18	1800	Jordan	Active

Status: Active use, Emergency, Standby, Seasonal, Peak use, etc
Geologic Unit: Name of formation(s), which supplies water to the well
GPM – Gallons per Minute

Public Water Supplier: City of Cottage Grove

ATTACHMENT 2b

DNR Water Appropriation Permit Numbers: 776349???

Well Field Name (if applicable): North Well Field

TABLE 4(B) Groundwater Sources – Use this attachment if there are more production wells than the space provided in the plan or if the system uses more than one well field.

Well # or name	Unique Well Number	Year Installed	Well & Casing Depth (ft)	Well Diameter (in)	Capacity (GPM)	Geologic Unit	Status
3	208807	1960	390 / 314	12	800	Jordan	Active
4	208805	1962	418 / 340	16	1000	Jordan	Active
5	208806	1967	358 / 287	16	1000	Jordan	Active
6	201238	1973	427 / 343	20	1000	Jordan	Active
7	201117	1974	370 / 281	20	1500	Jordan	Active
8	110464	1977	400 / 313	20	1500	Jordan	Active
9	165602	1979	381 / 319	20	1500	Jordan	Active
11	655944	2004	428 / 329	24	1500	Jordan	Active

Status: Active use, Emergency, Standby, Seasonal, Peak use, etc.
Geologic Unit: Name of formation(s), which supplies water to the well
GPM – Gallons per Minute

Public Water Supplier: City of Cottage Grove

Appendix B

Well Data

City of Cottage Grove, MN
Well and Water Quality Data

	1	2	3	4	5	6	7	8	9	10	11
Year Installed	1958	1958	1960	1962	1967	1973	1974	1977	1979	1984	2004
Aquifer	Jordan	Jordan	Jordan	Jordan	Jordan	Jordan	Jordan	Jordan	Jordan	Jordan	Jordan
Service Area	Low	Low	Int/High	Int/High	Int/High	Int/High	Int/High	Int/High	Int/High	Low	High
Casing Depth (ft)	240	248	314	340	287	343	281	313	319	220	329
Total Depth (ft)	327	352	390	418	358	427	370	400	381	284	428
Diameter	12"	12"	12"	16"	16"	20"	20"	20"	20"	18"	24"
Static Water Level (ft)	59	77	127	114	115	139	75	111	105	38	101
Drawdown (ft)	76	26	73	95	51	80	110	110	128	80	72
Drawdown at gpm	800	640	800	1000	1000	1000	1500	1500	1500	2000	1500
Peak Demand Capacity (gpm)	600	600	700	1000	1000	1000	1000	1500	1500	1800	1500
Pump Type	VT	VT	VT	Sub	Sub	Sub	VT	VT	VT	VT	VT
WATER QUALITY											
Date of Test	Dec-68	Feb-75	May-85	May-85	May-85	May-85	May-85	Feb-79	Aug-81	Feb-84	3-Jul
pH	7.8	7.7	7.6	7.6	7.5	7.7	7.7	7.7	7.7	7.5	7.5
Total Alkalinity (mg/L)	220	190	210	210	210	220	180	220	220	195	223
Total Hardness (mg/L)	250	210	220	240	230	243	235	240	239	205	237
Chloride (mg/L)	4.6	4.9	3.2	2.5	2.7	N/A	10	1.7	2.8	4.0	7.1
Iron (mg/L)	0.05	0.01	0.25	3.2	0.61	<0.05	1.4	0.55	<0.95	0.1	0.42
Manganese (mg/L)	<0.02	0.07	<0.02	0.03	0.05	0.06	0.02	0.05	<0.02	<0.05	0.11

(1) Average Pumping Rate

Appendix C

Well Siting Study

COTTAGE GROVE WELL SITING STUDY
DECEMBER 2005

INTRODUCTION

Continued growth within the City of Cottage Grove indicates the need for additional water supply wells to meet projected future demands. Current estimates of ultimate population for the City are 125,000 people. This translates into a calculated maximum daily demand of 45.1 MGD (million gallons per day) for the City's water supply system. In order to meet that maximum daily demand, an estimated 15-20 future wells were initially anticipated to be required.

This well siting study summarizes previous well siting studies, and uses new and existing data to refine latest water demands and aquifer capacity. Based on this data, modeling of proposed future well sites was completed to determine if the well sites were capable of supplying demand without creating excessive drawdown or interference problems.

BACKGROUND

In June 2003, Bonestroo conducted a preliminary well siting study to locate potential sites for up to eight additional water supply wells (Wells 11-18) with one additional site for a possible 19th well. At the time of that report, ten wells were currently online for the City of Cottage Grove water supply system. The additional wells were planned to serve a population of approximately 60,000-70,000 people. The well spacing configuration shown in that report assumed all future wells would be added to the North Well Field area, with most wells between 70th and 80th street, north of the current cluster of Wells 3-9. At the time of that report, drawdown at the future well sites was not considered to be a limiting issue. However, drawdown interference from these future wells on the existing cluster of Wells 3-9 was calculated to bring these existing wells to the edge of accepted maximum drawdown levels. Wells 7, 8, and 9 were thought to slightly exceed maximum desirable drawdown levels based on these results.

Since completion of that report, the City of Cottage Grove has added Well 11 to their water supply system, with a pumping capacity of 1500 gpm (gallons per minute)

In order to meet the projected ultimate water supply demand from a population of 125,000 people, additional well sites were required to be located for this study. This study also revisited the well sites for Wells 12-18 in order to determine if a more efficient layout could be designed to limit possible interference problems with Wells 3-9.

ANALYSIS OF AQUIFER CAPACITY

Several existing aquifer pumping tests from within the City of Cottage Grove were available for use in this study. The test with the highest quality data was conducted in November 2002 on Well 8, with surrounding Wells 4, 5, 6, 7, and 9 being monitored to determine well interference. The results of this test are summarized in the June 2003 report. In brief, the results of the test showed that the Jordan sandstone aquifer has a transmissivity of 44,000 gpd/ft (gallons per day

per foot) with a storage coefficient of 0.0004. This transmissivity corresponds with the average transmissivity observed in the Jordan Aquifer in the Twin Cities area (Norvitch, R.F., Ross T.G., and Brietkrietz, A., *Water Resources Outlook for the Minneapolis-St. Paul Metropolitan Area, Minnesota*, United State Geological Survey, 1974).

Since most of the future planned wells were thought to be installed north of the cluster of Wells 3-9, an additional aquifer pumping test was conducted for the current well siting study. In June 2005, a 24-hour aquifer pumping and recovery test was conducted at Well 11. Prior to the period of pumping, Well 11 was allowed to rest for several days to return to static conditions prior to the pumping.

Results of the Well 11 aquifer test indicated that the Jordan aquifer at the Well 11 site responds very similarly to the pumping conditions observed at Well 8. Both wells exhibit the same specific capacity of approximately 22 gallons/foot. Both wells also show aquifer transmissivity of approximately 40,000-45,000 gpd/ft. This indicates that modeling parameters utilized in the June 2003 study would be applicable as far north as Well 11.

Another result of the Well 11 aquifer test indicated that pumping at Wells 3-9 had no observable impact on the aquifer at Well 11 for the duration of the test. Previous groundwater modeling efforts indicated that small levels of influence may be observed at Well 11. The lack of any observable influence appears to indicate that a well spacing of greater than 6500 feet between two wells would result in little or no well interference.

FUTURE WELL SITE IDENTIFICATION

Based on initial estimates of ultimate water demand, an additional 10-12 sites for future wells was determined to be necessary. A meeting with the City of Cottage Grove staff was held locate these new well sites and to also revisit sites currently identified for Wells 12-18. Field reconnaissance of sites for Wells 12-18 had indicated these sites were still available for well construction and represented viable sites. Upon further consideration, however, the site for Well 12 near the ice arena was removed. The site was no longer thought to be practical by City staff. Removal of this well site was also thought to limit the impact on the existing cluster of Wells 3-9. Well 12 was therefore relocated approximately 0.75 miles north of Well 11 along Tower Drive. See Figure C-1 for new location of Well 12. The sites identified for Wells 13-18 in the June 2003 report were allowed to remain unchanged for this study. The site identified in the June 2003 report for a possible Well 19 was also determined to not be desirable due to its close proximity to the existing wells. A new site for Well 19 was therefore chosen for this study

At the meeting, sites for an additional six wells (Wells 19-24) were identified for the North Well Field. For this study, the "North Well Field" refers to the wells located north of Highway 61, while the "South Well Field" refers to wells located south of Highway 61. Well sites were determined based on the following criteria:

- ✓ City-owned property (or thought to be available for City purchase)
- ✓ Access to site for well construction, maintenance and operation
- ✓ Proximity to existing trunk watermains (or possibility for extension of watermains)

- ✓ Cursory field review of site factors relating to well construction

Sites identified for Wells 19-24 are shown on Figure C-1. Other considerations for locations of these wells included data presented in the Cottage Grove Nitrates Study (Washington County Public Health and Environment, October 2003) identifying area of nitrates contamination within the Jordan aquifer. It is thought that the proposed locations for Wells 12-24 avoid areas of known nitrates contamination. However, the eastern most identified well locations may show increasing levels of nitrates, when compared to nitrates levels currently observed in the City's existing wells. While it is not expected that nitrates in this area would exceed the maximum level of 10 mg/L, additional nitrates sampling and/or test drilling may be recommended when considering utilizing these sites for Wells 16-19.

With the identification of sites for Wells 12-24 in the North Well Field, an additional six more well sites were required to meet projected ultimate demands. These six sites, after some consideration, were identified to be additional wells added to the City's South Well Field. See Figure C-1 for sites for Wells 25-30. While the South Well Field does have a higher vulnerability to contamination, it remains a relatively untapped source of high quality water for the City of Cottage Grove. At present, only Wells1, 2, and 10 are located in the South Well Field. With the completion of the City's Wellhead Protection Plan, greater efforts are underway to ensure the protection of the aquifer in this area from contamination. Assuming these efforts remain successful, the South Well Field offers an excellent source of water to supply these six additional wells.

At present, the only contamination issues facing the South Well Field are nitrates contamination in the Jordan aquifer. Nitrates sampling in the Cottage Grove Nitrates Study indicated that nitrates levels may become elevated south of Well 10. As such, when exploring the sites for Wells 25 and 26, the City should consider possible test drilling and sampling of the Jordan aquifer before installing high capacity production wells in this area.

It should be noted that the well numbers presented in Figure C-1 do not necessarily represent the planned sequence for future well installation. While it is generally assumed that the City will likely complete much of the North Well Field before expanding the South Well Field, the actual order of well installation is expected to vary somewhat from the sequence presented in Figure C-1. Well numbers assigned in this figure were only done so in order to assign an identifier for each well site when conducting modeling exercises. The only exception to this is the site identified for Well 12, which is expected to be the site for the City's next high capacity well.

PROJECTED PUMPING CAPACITY

Following the location of up to 19 future well sites, more firm estimates of ultimate water demand were developed. The City of Cottage Grove is anticipated to have an ultimate maximum daily demand of 45.1 MGD. The existing 11 wells in the City of Cottage Grove's water supply system have a current pumping capacity of 12,200 gpm or roughly 17.6 MGD. This requires that the future well sites supply approximately 27.5 MGD to reach the ultimate demand of 45.1 MGD

The capacity of the Jordan sandstone aquifer in the City of Cottage Grove shows that 1500 gpm wells can generally be expected for future water supply wells. Assuming 19 future wells are capable 1500 gpm each, this adds 41 0 MGD to the City's supply capacity. This brings the total capacity of the water supply wells to approximately 58.6 MGD. However, at a minimum, three wells out of the total of 30 should be considered not available for use any given time, due to the need for repairs and maintenance, reducing the available capacity by 4500 gpm (or 6.5 MGD), bringing the total capacity down to 52.1 MGD.

The above calculations assume that 1500 gpm wells can be located at all of the future well sites shown on Figure C-1. To be more conservative, however, future wells should be assumed to be capable of supplying 1200 gpm, instead of 1500 gpm. Assuming all future wells are only capable of 1200 gpm, the total capacity of the entire well field would be 43.9 MGD (assuming the three high capacity wells not available at any given time).

Should the City decide to discontinue usage of Wells 1 and 2 (due to the low performance of these wells), the total capacity of the well field would be reduced by approximately 1.7 MGD.

Assuming that the 19 future well sites on Figure C-1 are all capable of pumping in the range of 1200gpm to 1500gpm each, the total capacity of the wells shown in Figure C-1 will range from 43.9 MGD to 52.1 MGD (or 42.2 MGD to 50.4 MGD without Wells 1 and 2). While the City should strive for 1500 gpm wells wherever possible, these calculations indicate that ultimate demand can likely be met with several wells that pump less than 1500 gpm. Alternatively, the City may not need a total of 30 wells in the event that all future wells are capable of pumping 1500 gpm each. Assuming all future wells are capable of 1500 gpm and also assuming that Wells 1 and 2 are removed from the system, it is calculated that the City will only need 17 additional wells (instead of 19 additional wells).

WELL FIELD DRAWDOWN MODELING

After verifying the aquifer parameters in the current well field, the next step was to apply those findings to develop predictions of well interaction for the both future well fields. There were two questions that needed to be answered to test the feasibility of the proposed well field. The first was to determine the maximum allowable well drawdown at each well site, based on static water levels and well casing depths. The second was to determine how much drawdown interference can be anticipated between the wells when the entire well field is pumping. This would simulate maximum withdrawal from the aquifer, which may occur during times of drought or during emergency situations.

Static Water Level

In order to compare modeled drawdown with well field specific conditions, an understanding of static water level was essential to determine the available drawdown of the current and future well sites. Static Water Elevations were evaluated using the following data:

- Well construction data, 1960 to 2004.

Table C-1: City of Cottage Grove
North Well Field Modeled Pumping Levels

Well No.	Modeled Capacity	Top of Casing Elevation (ft.)	Top of Jordan Elevation (ft.)	SWL Elevation (ft.)	Adjusted SWL (ft.)	Existing Pump Intake Elevation (ft.)	Bottom of Casing Elevation (ft.)	Lowest Desirable PWL Elevation (ft.)	Maximum Allowable Drawdown (ft.)	Modeled Maximum Drawdown for Entire Northern Wellfield (ft.)
EXISTING WELLS										
3	700	888	590	789	769	662	574	624	**145**	**99**
4	1,000	914	590	791	771	645	575	625	**146**	**118**
5	1,000	852±	584	788	768	646	565	615	**153**	**116**
6	1,000	920	590	794	774	650	577	627	**147**	**129**
7	1,000	856	583	792	772	611	575	625	**147**	**109**
8	1,500	888	590	792	772	602	575	625	**147**	**141**
9	1,500	888	587	795	775	590	569	619	**156**	**137**
11	1,500	913	590	809	789	639	584	634	**155**	**105**
PROPOSED FUTURE WELLS										
12	1,500	N/A	~590	N/A	~795	N/A	575	625	**170**	**84**
13	1,500	N/A	~590	N/A	~790	N/A	575	625	**165**	**123**
14	1,500	N/A	~590	N/A	~780	N/A	575	625	**155**	**131**
15	1,500	N/A	~590	N/A	~775	N/A	575	625	**150**	**121**
16	1,500	N/A	~630	N/A	~790	N/A	615	665	**125**	**106**
17	1,500	N/A	~630	N/A	~795	N/A	615	665	**130**	**112**
18	1,500	N/A	~630	N/A	~800	N/A	615	665	**135**	**104**
19	1,500	N/A	~630	N/A	~805	N/A	615	665	**140**	**95**
20	1,500	N/A	~590	N/A	~790	N/A	575	625	**165**	**112**
21	1,500	N/A	~590	N/A	~795	N/A	575	625	**170**	**92**
22	1,500	N/A	~600	N/A	~745	N/A	585	635	**110**	**92**
23	1,500	N/A	~600	N/A	~745	N/A	585	635	**110**	**87**
24	1,500	N/A	~600	N/A	~745	N/A	585	635	**110**	**92**

Table C-2: City of Cottage Grove
South Well Field Modeled Pumping Levels

Well No.	Modeled Capacity	Top of Casing Elevation (ft.)	Top of Jordan Elevation (ft.)	SWL Elevation (ft.)	Adjusted SWL (ft.)	Existing Pump Intake Elevation (ft.)	Bottom of Casing Elevation (ft.)	Lowest Desirable PWL Elevation (ft.)	Maximum Allowable Drawdown (ft.)	Modeled Maximum Drawdown for Entire Northern Wellfield (ft.)
EXISTING WELLS										
10	1800	786	581	752	732	601	566	616	**116**	**116**
PROPOSED FUTURE WELLS										
25	1,500	N/A	~580	N/A	~720	N/A	565	615	**105**	**98**
26	1,500	N/A	~580	N/A	~720	N/A	565	615	**105**	**88**
27	1,500	N/A	~590	N/A	~730	N/A	575	625	**105**	**86**
28	1,500	N/A	~590	N/A	~730	N/A	575	625	**105**	**95**
29	1,500	N/A	~580	N/A	~725	N/A	565	615	**110**	**107**
30	1,500	N/A	~590	N/A	~730	N/A	565	615	**115**	**94**

- Minnesota Geological Survey Geologic Atlas C-5, Washington County, 1990, Hydrogeology Plate, Prairie du Chien – Jordan Aquifer Potentionmetric Contours.
- Static Water Level Measurements 1960 to Present, City Well & Pump Record Plans, and the Minnesota County Well Index Data Base
- Field measurements of Wells 3-9 in November 2002 and measurements from Well 11 in June 2005.

Based on this data, the static water level has been reasonably consistent over the years, with no apparent trend towards declining. However, natural fluctuation of static water levels can occur over time as a response to climatic changes (e.g. droughts), so it should be assumed that water levels can fluctuate up to 20 feet from current observed conditions. While this is a somewhat conservative estimate, it will help ensure that projected drawdown is compared against values that represent drought-like conditions. To accomplish this, 20 feet was subtracted from current static water levels in order to create the adjusted static water levels presented in Tables C-1 and C-2 for both well fields.

Jordan Formation

All of the City's wells utilize the Jordan sandstone aquifer. There is also a contribution of water from the overlying Prairie du Chien aquifer. The existing wells are generally cased 15 feet into the Jordan formation. Proposed future wells would also be cased 15 feet into the Jordan formation.

The top elevation of the Jordan formation generally increases to the east of the existing well field. Values for the top elevation of the Jordan formation were determined from information contained in well logs in the County Well Index. In areas where no nearby Jordan aquifer wells exist, estimates of Jordan top elevation were interpolated based on closest available data.

The elevation of the top of the Jordan formation for each well site is presented in Tables C-1 and C-2.

Well Pump Intake Settings

In municipal wells of this type, the top of the pump is generally set at a depth to maintain at least 30 feet submergence beneath the pumping water level. This allows a small margin of safety and helps to prevent pump cavitation.

Pump assemblies, including the suction pipe or submersible motor, are 15 to 20 feet long. The bottom of the pump assembly should no be lower than several feet above the bottom of the well casing. Adding 30 feet of submergence therefore results in a lowest desirable pumping level of 50 feet above the bottom of the casing.

Pump intake elevations for existing wells are displayed in Tables C-1 and C-2. Lowest desirable pumping levels for all existing and future wells are also shown in Tables C-1 and C-2.

Maximum Allowable Drawdown

The maximum allowable drawdown was established by subtracting the lowest desirable pumping water level from the adjusted static water level. Maximum allowable drawdown for each well site is presented in Tables C-1 and C-2.

Modeling Methodology

The numerical model used to verify the aquifer test results for the June 2003 study was found to be 90-96% accurate in predicting distance-drawdown at observation wells monitored during the aquifer test. Since the June 2005 aquifer test at Well 11 established that aquifer parameters are similar to those seen at Well 8, it is anticipated that the numerical model fits aquifer parameters at this site as well. Therefore the numerical model is thought to be a good tool in predicting well interference for the future wells in the North Well Field, assuming parameter conditions in the Jordan aquifer are close to what was observed in Wells 4, 5, 6, 8, 9, and 11.

For the South Well Field, the results of the aquifer pumping test conducted at Well 2 in September 2000 appear to closely correspond to other Jordan aquifer values measured within the City. The specific capacity of the Jordan aquifer at Well 10, however, appears to be a little higher. This means that the aquifer can yield more water at this site with less observed drawdown in the well. For the modeling study at South Well Field, however, the same model parameters were used. If anything, the results of the model are expected to be slightly more conservative than actual conditions in the vicinity of Well 10.

For the modeling scenario for the North Well Field, Well 3 was modeled at a discharge of 700 gpm. Wells 4, 5, 6, and 7 were each modeled at a discharge of 1000 gpm. Wells 8, 9, 11 and future Wells 12-24 were each modeled at 1500 gpm. For the South Well Field, Well 10 was modeled at 1350 gpm and future Wells 25-30 were modeled at 1500gpm. These discharges reflect possible use of the wells as the City's well fields near full capacity. Also, by using a pumping rate of 1500 gpm (instead of 1200 gpm), the model provides a more conservative estimate of predicted drawdown. If the wells appear to be within acceptable drawdown limits at 1500 gpm, then it is expected that 1200 gpm will result in even less drawdown per well.

Wells 1 and 2 were not modeled, due to the likelihood that both of these wells would either be phased out by the time the well field reach capacity or would be relegated to backup status for emergency use only.

All wells were modeled running simultaneously for a 24 hour period to reflect possible peak demand rates the City may experience in the summer months or during periods of drought. In reality, these modeled conditions actually exceed 45.1 MGD, because no wells are assumed to offline for maintenance for these calculations. After 24 hours of pumping, it is expected that most wells will be drawn down to within 95% of their "steady state" pumping level.

Based on the results of the Well 11 aquifer pumping test, it can also be expected that drawdown from the pumping wells produces very little, if any, drawdown interference at a distance greater than 6500 feet from the pumping well. Therefore, for the sake of this study, all modeled

predictions of drawdown assume no interaction between wells spaced greater than 6500 feet apart. As such, it is anticipated that there would be very little, if any, well interference between the North Well Field and the South Well Field. This allowed both well fields to be modeled as separate entities.

The modeled drawdown for each well was then compared to the maximum allowable drawdown established for each well. Results are summarized below.

Modeling Results – North Well Field

Results of the predictive modeling for the North Well Field are shown in Table C-1. The last column of the table represents the modeled drawdown of each well, with all wells in the well field pumping simultaneously for 24 hours. This drawdown includes the drawdown created by the pump at each well site, along with the accumulated drawdown from interference of any high capacity wells within 6500 feet of that well.

When compared to the maximum allowable drawdown, no wells in the North Well Field have a modeled drawdown that exceeds the maximum allowable drawdown. Well 8 has a modeled drawdown of 141 feet, which is 6 feet less than the maximum allowable drawdown. No other wells are modeled to come within 15 feet of the maximum allowable drawdown value.

The results at Well 8 are thought to be somewhat conservative due to the fact that all wells have been modeled as running simultaneously. However, actual well field usage will likely never call for all wells of the North Well Field to run simultaneously. Redundant wells are calculated into the system to account for any wells that may be unavailable due to maintenance and repairs. Therefore, fewer wells in operation will result in lower drawdown interference. It should also be remembered that adjusted static water levels shown in Table C-1 have a built-in conservative estimate, assuming regional water levels are 20 feet lower than current static conditions.

It should also be noted that the predictions of drawdown for Wells 7-9 (along with the other existing wells) are somewhat less than noted in the June 2003 study. This is partially the result of moving Well 12 from the Ice Arena site to the site currently shown on Figure C-1. Also, recent data from the Well 11 aquifer test indicated that very little well interference can be expected from wells greater than 6500 feet from the current wells. As such, predictions of drawdown at the existing wells have actually been reduced (despite more wells being modeled in the North Well Field).

Results of the modeling do indicate that the pump intakes on Wells 3-6 may need to be lowered slightly before the North Well Field is fully developed. The reason for lowering these pump intakes would be to accommodate additional drawdown interference from newly constructed wells in this well field. As the well field expands and more data on aquifer and well performance is collected, the need to lower these pump intakes can be evaluated at that time.

Modeling Results – South Well Field

Results of the predictive modeling for the South Well Field are shown in Table C-2. The last column of the table represents the modeled drawdown of each well, with all wells in the well field pumping simultaneously for 24 hours. This drawdown includes the drawdown created by the pump at each well site, along with the accumulated drawdown from interference of any high capacity wells within 6500 feet of that well.

When compared to the maximum allowable drawdown, no wells in the South Well Field have a modeled drawdown that exceeds the maximum allowable drawdown. The modeled drawdown for Well 10 matches the maximum allowable drawdown. Wells 25, 28, and 29 come within 15 feet of the maximum allowable drawdown. When these wells are installed, however, actual drawdown at the well field is anticipated to be somewhat less than modeled, due to the higher specific capacity seen at Well 10. For instance, actual drawdown at Well 10 is thought to be about 20 feet less than the modeled prediction. If the conditions observed at Well 10 exist throughout the proposed South Well Field, the drawdown predictions in Table C-2 can likely be reduced by 20-25 feet. Additionally, it is thought that will be very few, if any, circumstances when all of the wells in the South Well Field will be required to run simultaneously. Redundant wells are calculated into the system to account for any wells that may be unavailable due to maintenance and repairs.

As wells are added to this well field, it will be important to collect more aquifer performance data and to revise these modeled estimates accordingly.

SUMMARY OF FINDINGS

Future projected ultimate water demands show that the City of Cottage Grove will eventually have a maximum daily demand of 45.1 MGD. In order to meet this demand, the City of Cottage Grove will eventually need to install 19 additional water supply wells to meet this demand, assuming the capacities of the future wells is at least 1200 gpm per well. Actual well capacity for future wells should be planned for 1500 gpm per well, however, unless local conditions do not permit.

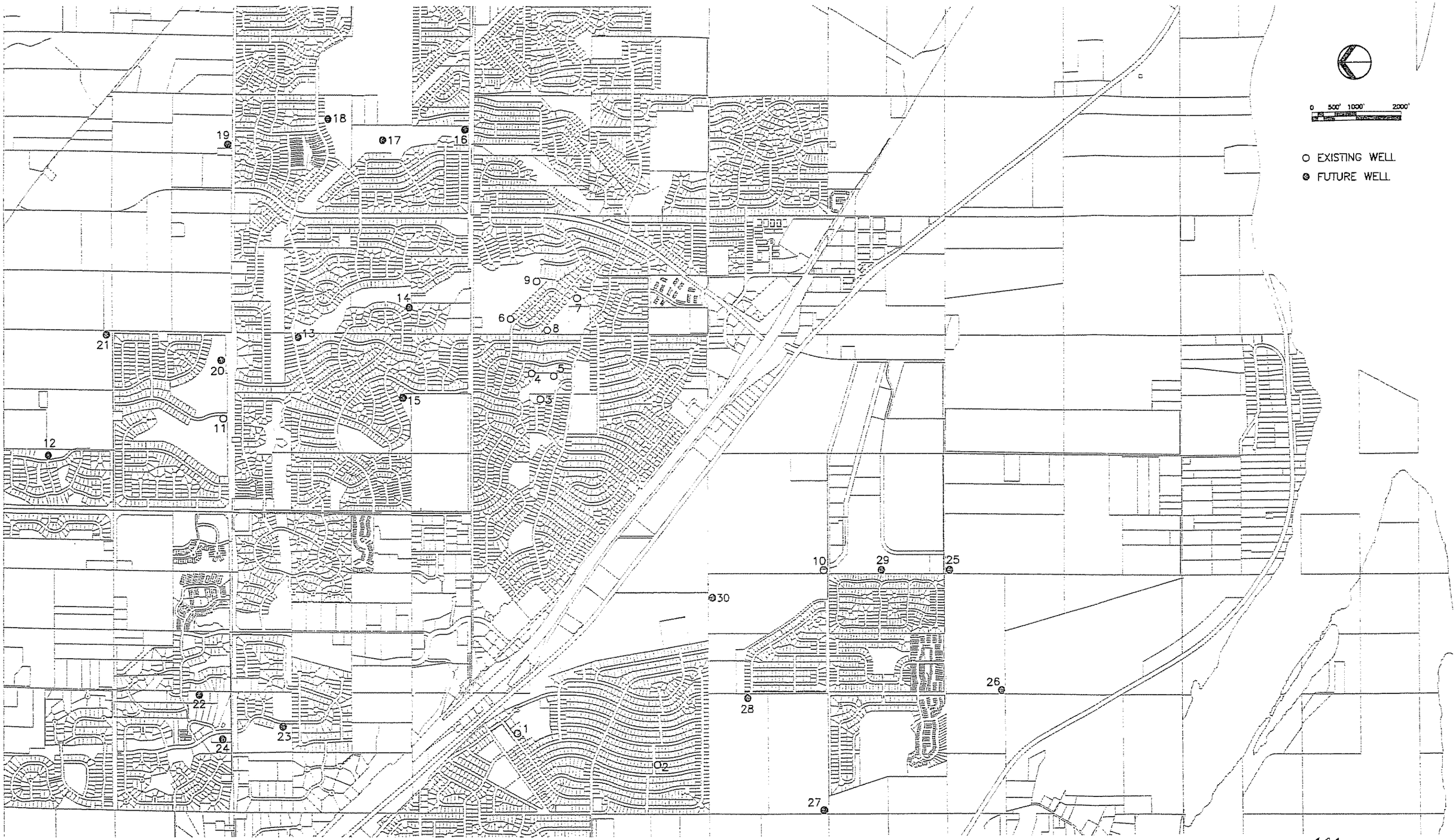
Future well sites have been identified on Figure C-1. These sites have been selected by City of Cottage Grove staff based on availability of land, proximity to water mains, and other local conditions. The 19 future wells have been primarily located in the North Well Field, but six future well sites are shown for the South Well Field. It is anticipated that the City will develop most the North Well Field before commencing with well construction in the South Well Field. Future well sites in the North Well Field are thought to be located away from the nitrates contamination in the area, with the possible exceptions of Well 16-19, which are located farther to the east. Well sites in the South Well Field south of existing Well 10 may begin to show elevated nitrates levels, based on results of the Cottage Grove Nitrates Study. Further sampling of nitrates in these areas is recommended before high capacity wells are installed in these locations.

Results of this well siting study indicate that the Jordan aquifer appears to be relatively consistent over the City of Cottage Grove. Based on the results of available aquifer tests, a numerical model was developed to predict the drawdown at each well site. This model was based on parameters of aquifer performance, aquifer storage, pumping capacity, and the proximity of other nearby wells. Results of the model are shown in Tables C-1 and C-2, allowing one to directly compare the modeled drawdown of each well against the maximum allowable drawdown at each well site. Modeling predictions show that none of the wells are anticipated to exceed the maximum available drawdown. While Well 10 appears to reach the maximum available drawdown level, the results of the modeling represent a built-in conservative estimate. Actual drawdown at the well sites is anticipated to be somewhat less than what the model has predicted under normal operating conditions

LIMITATIONS

The results of this study are based on available data at a limited number of sites. Accurate data over the entire area of the proposed well fields was not available for direct analysis. Therefore, projections of aquifer elevation, static water elevations, and available drawdown at many of these future well sites are estimated based on interpolation of data. Additionally, aquifer parameters such as specific capacity, transmissivity, and storage may vary over the area of the proposed well fields. As such, calculations of drawdown at future well sites may also vary somewhat from conditions that will be observed upon the completion of each well.

Results from this study are intended to be used as a guide to assist the City of Cottage Grove in planning for the expansion of the well fields. As expansion continues, it is recommended that the City continue to collect data pertaining to well and aquifer performance so that the predictions of this study can be refined and revised. It is recommended that an aquifer pumping test be conducted with the installation of each new well, particularly in areas farther away from wells where test information currently exists. Any variation in aquifer conditions will necessitate revising the projections presented in this well siting study.



PROPOSED FUTURE WELL SITES

COTTAGE GROVE, MINNESOTA

WELL SUPPLY & DISTRIBUTION PLAN

FIGURE C–1

Bonestroo Rosene Anderlik & Associates
Engineers & Architects

4805213EC1.dwg DATE: DECEMBER 2005 COMM. 000048–05213

Appendix D

Cost Estimate Summary

Cottage Grove Water Supply Plan
File 000048-05213-0
2030 System Cost Estimates

December 2005

SUPPLY Item	Unit Cost	Quantity	Total
1,200 gpm Supply Wells[1]	$800,000	7	$ 5,600,000
Well Sites[2]	$33,000	3	$ 100,000
			$ 5,700,000
Replacement Costs			
1,200 gpm Replacement Well[1]	$800,000	1	$ 800,000
Well Site[2]	$33,000	1	$ 33,000
			$ 833,000

STORAGE FACILITIES Item	Unit Cost	Quantity	Total
1.5 MG Elevated Reservoir[3]	$3,150,000	1	$ 3,150,000
2.0 MG Elevated Reservoir[3]	$3,750,000	1	$ 3,750,000
Reservoir Sites[4]	$187,500	2	$ 380,000
			$ 7,300,000

TREATMENT Item	Unit Cost	Quantity	Total

DISTRIBUTION Item	Unit Cost[1]	Quantity	Total
12" Water Main	$65	85,000	$ 5,500,000
16" Water Main	$80	17,500	$ 1,400,000
18" Water Main	$100	30,000	$ 3,000,000
20" Water Main	$125	17,400	$ 2,200,000
24" Water Main	$150	6,000	$ 900,000
Pressure Reducing Station	$50,000	1	$ 50,000
			$ 13,100,000

TOTAL 2030 SYSTEM COST SUMMARY	
Supply	$ 5,700,000
Treatment	$ -
Storage	$ 7,300,000
Distribution	$ 13,100,000
	$ 26,100,000

NOTES

[1] Costs include 30% Engineering, Administrative, Legal, and Contingencies
[2] Assumes 105' x 105' lot
[3] Costs include 25% Engineering, Administrative, Legal, and Contingencies
[4] Assumes 250' x 250' lot

Cottage Grove Water Supply Plan
File 000048-05213-0
Total Ultimate System Cost Estimates

December 2005

SUPPLY			
Item	**Unit Cost**	**Quantity**	**Total**
1,200 gpm Supply Wells[1]	$800,000	19	$ 15,200,000
1,200 gpm Standby Well[1]	$800,000	1	$ 800,000
Well Sites[2]	$33,000	9	$ 300,000
			$ 16,300,000

STORAGE FACILITIES			
Item	**Unit Cost**	**Quantity**	**Total**
1.3 MG Ground Reservoir[3]	$1,700,000	1	$ 1,700,000
1.5 MG Elevated Reservoir[3]	$3,150,000	2	$ 6,300,000
2.0 MG Elevated Reservoir[3]	$3,750,000	4	$ 15,000,000
Reservoir Sites[4]	$187,500	7	$ 1,300,000
			$ 24,300,000

TREATMENT			
Item	**Unit Cost**	**Quantity**	**Total**
Water Treatment Plant- North	$38,000,000	1	$ 38,000,000
Water Treatment Plant- South	$18,200,000	1	$ 18,200,000
Raw Water Main	$13,200,000	1	$ 13,200,000
South WTP Site[5]	$700,000	1	$ 700,000
			$ 70,100,000

DISTRIBUTION			
Item	**Unit Cost[1]**	**Quantity**	**Total**
12" Water Main	$65	239,000	$ 15,500,000
16" Water Main	$80	28,500	$ 2,300,000
18" Water Main	$100	80,500	$ 8,100,000
20" Water Main	$125	18,700	$ 2,300,000
24" Water Main	$150	6,700	$ 1,000,000
Pressure Reducing Station	$50,000	4	$ 200,000
			$ 29,400,000

TOTAL ULTIMATE SYSTEM COST SUMMARY	
Supply	$ 16,300,000
Treatment	$ 70,100,000
Storage	$ 24,300,000
Distribution	$ 29,400,000
	$ 140,100,000

NOTES

[1] Costs include 30% Engineering, Administrative, Legal, and Contingencies
[2] Assumes 105' x 105' lot
[3] Costs include 25% Engineering, Administrative, Legal, and Contingencies
[4] Assumes 250' x 250' lot
[5] Assumes minimum of 5 acres required

Appendix E

Water Quality Requirements

EPA National Primary Drinking Water Standards

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Acrylamide	TT[8]	Nervous system or blood problems;	Added to water during sewage/wastewater increased risk of cancer treatment	zero
OC	Alachlor	0 002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops	zero
R	Alpha particles	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation	zero
IOC	Antimony	0 006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder	0 006
IOC	Arsenic	0 010 as of 1/23/06	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards, runoff from glass & electronics production wastes	0
IOC	Asbestos (fibers >10 micrometers)	7 million fibers per Liter (MFL)	Increased risk of developing benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits	7 MFL
OC	Atrazine	0 003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops	0 003
IOC	Barium	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits	2
OC	Benzene	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills	zero
OC	Benzo(a)pyrene (PAHs)	0 0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines	zero
IOC	Beryllium	0 004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries	0 004
R	Beta particles and photon emitters	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation	zero
DBP	Bromate	0 010	Increased risk of cancer	Byproduct of drinking water disinfection	zero
IOC	Cadmium	0 005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints	0 005
OC	Carbofuran	0 04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa	0 04
OC	Carbon tetrachloride	0 005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities	zero
D	Chloramines (as Cl_2)	MRDL=4 0[1]	Eye/nose irritation; stomach discomfort, anemia	Water additive used to control microbes	MRDLG=4[1]

LEGEND

D Dinsinfectant

DBP Disinfection Byproduct

IOC Inorganic Chemical

M Microorganism

OC Organic Chemical

R Radionuclides

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Chlordane	0 002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide	zero
D	Chlorine (as Cl_2)	MRDL=4 0[1]	Eye/nose irritation; stomach discomfort	Water additive used to control microbes	MRDLG=4[1]
D	Chlorine dioxide (as ClO_2)	MRDL=0 8[1]	Anemia; infants & young children: nervous system effects	Water additive used to control microbes	MRDLG=0 8[1]
DBP	Chlorite	1 0	Anemia; infants & young children: nervous system effects	Byproduct of drinking water disinfection	0 8
OC	Chlorobenzene	0 1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories	0 1
IOC	Chromium (total)	0 1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits	0 1
IOC	Copper	TT[7]; Action Level = 1 3	Short term exposure: Gastrointestinal distress Long term exposure: Liver or kidney damage People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits	1 3
M	*Cryptosporidium*	TT[3]	Gastrointestinal illness (e g , diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
IOC	Cyanide (as free cyanide)	0 2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories	0 2
OC	2,4-D	0 07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops	0 07
OC	Dalapon	0 2	Minor kidney changes	Runoff from herbicide used on rights of way	0 2
OC	1,2-Dibromo-3-chloropropane (DBCP)	0 0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards	zero
OC	o-Dichlorobenzene	0 6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories	0 6
OC	p-Dichlorobenzene	0 075	Anemia; liver, kidney or spleen damage; changes in blood	Discharge from industrial chemical factories	0 075
OC	1,2-Dichloroethane	0 005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	1,1-Dichloroethylene	0 007	Liver problems	Discharge from industrial chemical factories	0 007
OC	cis-1,2-Dichloroethylene	0 07	Liver problems	Discharge from industrial chemical factories	0 07
OC	trans-1,2-Dichloroethylene	0 1	Liver problems	Discharge from industrial chemical factories	0 1
OC	Dichloromethane	0 005	Liver problems; increased risk of cancer	Discharge from drug and chemical factories	zero
OC	1,2-Dichloropropane	0 005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	Di(2-ethylhexyl) adipate	0 4	Weight loss, live problems, or possible reproductive difficulties	Discharge from chemical factories	0.4
OC	Di(2-ethylhexyl) phthalate	0 006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories	zero
OC	Dinoseb	0 007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables	0 007
OC	Dioxin (2,3,7,8-TCDD)	0 00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories	zero
OC	Diquat	0.02	Cataracts	Runoff from herbicide use	0.02
OC	Endothall	0.1	Stomach and intestinal problems	Runoff from herbicide use	0.1

LEGEND

D Disinfectant

DBP Disinfection Byproduct

IOC Inorganic Chemical

M Microorganism

OC Organic Chemical

R Radionuclides

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Endrin	0.002	Liver problems	Residue of banned insecticide	0.002
OC	Epichlorohydrin	TT[8]	Increased cancer risk, and over a long period of time, stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals	zero
OC	Ethylbenzene	0 7	Liver or kidneys problems	Discharge from petroleum refineries	0 7
OC	Ethylene dibromide	0 00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries	zero
IOC	Fluoride	4 0	Bone disease (pain and tenderness of the bones); Children may get mottled teeth	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories	4 0
M	*Giardia lamblia*	TT[3]	Gastrointestinal illness (e g , diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Glyphosate	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use	0.7
DBP	Haloacetic acids (HAA5)	0 060	Increased risk of cancer	Byproduct of drinking water disinfection	n/a[6]
OC	Heptachlor	0.0004	Liver damage; increased risk of cancer	Residue of banned termiticide	zero
OC	Heptachlor epoxide	0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor	zero
M	Heterotrophic plate count (HPC)	TT[3]	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water The lower the concentration of bacteria in drinking water, the better maintained the water system is.	HPC measures a range of bacteria that are naturally present in the environment	n/a
OC	Hexachlorobenzene	0 001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories	zero
OC	Hexachlorocyclopentadiene	0 05	Kidney or stomach problems	Discharge from chemical factories	0 05
IOC	Lead	TT[7]; Action Level = 0 015	Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities; Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits	zero
M	*Legionella*	TT[3]	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems	zero
OC	Lindane	0 0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, gardens	0 0002
IOC	Mercury (inorganic)	0 002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands	0 002
OC	Methoxychlor	0 04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock	0 04
IOC	Nitrate (measured as Nitrogen)	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	10
IOC	Nitrite (measured as Nitrogen)	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	1

LEGEND

D Dinsinfectant
DBP Disinfection Byproduct
IOC Inorganic Chemical
M Microorganism
OC Organic Chemical
R Radionuclides

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Oxamyl (Vydate)	0 2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes	0 2
OC	Pentachlorophenol	0 001	Liver or kidney problems; increased cancer risk	Discharge from wood preserving factories	zero
OC	Picloram	0.5	Liver problems	Herbicide runoff	0.5
OC	Polychlorinated biphenyls (PCBs)	0 0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer	Runoff from landfills; discharge of waste chemicals	zero
R	Radium 226 and Radium 228 (combined)	5 pCi/L	Increased risk of cancer	Erosion of natural deposits	zero
IOC	Selenium	0 05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum refineries; erosion of natural deposits; discharge from mines	0 05
OC	Simazine	0.004	Problems with blood	Herbicide runoff	0.004
OC	Styrene	0 1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills	0 1
OC	Tetrachloroethylene	0 005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners	zero
IOC	Thallium	0 002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories	0.0005
OC	Toluene	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories	1
M	Total Coliforms (including fecal coliform and *E coli*)	5 0%[4]	Not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present[5]	Coliforms are naturally present in the environment as well as feces; fecal coliforms and *E coli* only come from human and animal fecal waste.	zero
DBP	Total Trihalomethanes (TTHMs)	0 10 0 080 after 12/31/03	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection	n/a[6]
OC	Toxaphene	0 003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle	zero
OC	2,4,5-TP (Silvex)	0.05	Liver problems	Residue of banned herbicide	0.05
OC	1,2,4-Trichlorobenzene	0 07	Changes in adrenal glands	Discharge from textile finishing factories	0 07
OC	1,1,1-Trichloroethane	0 2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories	0.20
OC	1,1,2-Trichloroethane	0 005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories	0 003
OC	Trichloroethylene	0 005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories	zero
M	Turbidity	TT[3]	Turbidity is a measure of the cloudiness of water It is used to indicate water quality and filtration effectiveness (e g , whether disease-causing organisms are present) Higher turbidity levels are often associated with higher levels of disease-causing micro-organisms such as viruses, parasites and some bacteria These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff	n/a
R	Uranium	30 ug/L as of 12/08/03	Increased risk of cancer, kidney toxicity	Erosion of natural deposits	zero

LEGEND

D Dinsinfectant

DBP Disinfection Byproduct

IOC Inorganic Chemical

M Microorganism

OC Organic Chemical

R Radionuclides

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal
OC	Vinyl chloride	0 002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories	zero
M	Viruses (enteric)	TT3	Gastrointestinal illness (e g , diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Xylenes (total)	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories	10

NOTES

1 Definitions

- Maximum Contaminant Level Goal (MCLG)—The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
- Maximum Contaminant Level (MCL)—The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
- Maximum Residual Disinfectant Level Goal (MRDLG)—The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
- Maximum Residual Disinfectant Level (MRDL)—The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
- Treatment Technique (TT)—A required process intended to reduce the level of a contaminant in drinking water.

2 Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (ppm).

3 EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- *Cryptosporidium* (as of 1/1/02 for systems serving >10,000 and 1/14/05 for systems serving <10,000) 99% removal.
- *Giardia lamblia*: 99.9% removal/inactivation
- Viruses: 99 99% removal/inactivation
- *Legionella*. No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated, *Legionella* will also be controlled.
- Turbidity: At no time can turbidity (cloudiness of water) go above 5 nephelometric turbidity units (NTU); systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples in any month. As of January 1, 2002, for systems servicing >10,000, and January 14, 2005, for systems servicing <10,000, turbidity may never exceed 1 NTU, and must not exceed 0 3 NTU in 95% of daily samples in any month.
- HPC: No more than 500 bacterial colonies per milliliter
- Long Term 1 Enhanced Surface Water Treatment (Effective Date: January 14, 2005); Surface water systems or (GWUDI) systems serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, *Cryptosporidium* removal requirements, updated watershed control requirements for unfiltered systems)
- Filter Backwash Recycling: The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

4 No more than 5.0% samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli* if two consecutive TC-positive samples, and one is also positive for *E. coli* fecal coliforms, system has an acute MCL violation.

5 Fecal coliform and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Disease-causing microbes (pathogens) in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems.

6 Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L)
- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L)

7 Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

8 Each water system must certify, in writing, to the state (using third-party or manufacturers certification) that when it uses acrylamide and/or epichlorohydrin to treat water, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide = 0.05% dosed at 1 mg/L (or equivalent); Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent).

LEGEND

D	Dinsinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

National Secondary Drinking Water Standards

National Secondary Drinking Water Standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water EPA recommends secondary standards to water systems but does not require systems to comply However, states may choose to adopt them as enforceable standards

Contaminant	Secondary Standard
Aluminum	0 05 to 0 2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1 0 mg/L
Corrosivity	noncorrosive
Fluoride	2 0 mg/L
Foaming Agents	0 5 mg/L
Iron	0 3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6 5-8 5
Silver	0 10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

Office of Water (4606M)
EPA 816-F-03-016
www epa.gov/safewater
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Appendix F

ISO Rating Report

City of Cottage Grove

ISO/CRS
Public Protection Classification
and
Fire Suppression Rating

THE INSURANCE SERVICES ORGANIZATION

Over the past century, the United states insurance industry has evaluated and graded the fire departments of communities throughout the country. The Insurance Services Office/Commercial Risk Services (ISO/CRS) continues this city Public Protection Classification (PPC) process by application of a document titled, The Fire Suppression Rating Schedule (FSRS). The determined protection class assigned to a city can significantly impact on the amount of insurance premiums paid by both its commercial and residential property owners. A village demonstration program in New York State resulted in improving the Public Protection Class from 9 to 7. It was calculated that this improvement saved property owners almost $200,000.00 in annual insurance premiums. A total of $60,000 was donated back to the village fire department for additional improvements. The FSRS is one document that establishes fire protection functional need in three major areas. These areas are, Emergency Communications Center for handling fire alarms, Emergency Delivery System for fire suppression, and Water Supply for both domestic consumption and fire protection. A Public Protection Classification is one guide used to develop insurance premiums for commercial, industrial and residential property in a given city. Many insurance companies use rates other than ISO, when this is the case the effect of change in class may be different for their policy holders.

RATING SCHEDULE

In 1974 the rating schedule underwent a major revision. Significant changes were made in the criteria used to determine levels of needed fire protection. Needed fire flow (rate of water flow) for individual buildings was recognized as a more important factor than the population of a city. The primary emphasis changed from conflagration prevention to the ability to control individual building fires. The new focus is on *first-alarm* fire suppression capability. The rating schedule criteria has been replaced with measuring the adequacy of equipment, facilities, personnel and performance. Therefore, the better the fire protection resources are developed in a city, the better the protection class.

The insurance industry using the Rating Schedule does not require a city to purchase equipment in accordance with provisions of the Rating Schedule. The Public Protection Classification Process using the FSRS as the grading tool does not require a city to have specific fire equipment or personnel to respond to respond with equipment. Rather, the grading process gives credit for all elements of the fire protection system that relate to Fire Alarms, Fire Departments, and Water Supply that are in place when the city is evaluated.

FROM :COTTAGE GROVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:01PM P3

Although the Grading Schedule does not require the purchase of equipment, to receive maximum credit in each category the city must meet the minimum criteria established by ISO/CRS For example, in order to receive maximum credit for a first alarm engine, the engine must have all of the equipment specified by the National Fire Protection Association (NFPA) Standard 1901. The minimum number of points, a first alarm engine should earn from the ISO equipment list is 229 points for minimum equipment. The maximum credit available for an Engine is 654 points if all of the NFPA 1901 equipment is on the engine. Each of the equipment list items that are not on an Engine creates a deficiency and therefore a deduction in points. The same is true for all other categories of the ISO/FSRS. Cottage Grove Engines earned between 241.98 and 457.8 points in the 1989 evaluation.

SUMMARY OF EVALUATION AND GRADING

Under each of the three main evaluation categories are a number of rated items, each assigned a point value towards the total point grading. The main evaluation categories and sub categories are listed below

RECEIVING AND HANDLING FIRE ALARMS - 10% of Grading

- Facilities to report fires
  - number of incoming lines
  - Handling other emergency calls
  - Automatic equipment
  - Availability of business line
  - Review of directory
  - Review of recording device
  - Progression of reserved lines

- Operators on duty at the communication center
  - The number of operators on duty for fire calls should be in accordance with NFPA Standard 1221. For jurisdictions receiving 600 to 2500 alarms per year at least one operator. For jurisdictions receiving 2500 to 10000 alarms per year at least two operators.

- Facilities to dispatch fire companies to a fire
  - Review of dispatch circuits
  - Radio receivers carried by members
  - Circuits to outside coded sounding device
  - Supervision of circuit
  - Recording device
  - Emergency Power supply

FROM :COTTAGE GROVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:01PM P4

FIRE DEPARTMENT - **50% of Grading**

- Engine and Ladder-Service Companies
  - ISO considers an Engine to be capable of protecting an area within 1.5 road miles of the fire station in which it is housed. An Aerial ladder must be within 2.5 road mile of any structure that may require response by the aerial ladder in order to receive maximum points (see attachment "A" coverage map).

- Equipment carried on fire apparatus
  - National Fire Protection Association Standard 1901
  - This item includes an annual hose test, pump capacity test and ladder test.

- Fire Apparatus response on first alarm of fire
  - Basic Fire Flow
  - Distribution of Engine Companies
  - Response to Building Fires
  - Response Outside the city

- Automatic-Aid plans for city fire suppression assistance
  - Engine Companies from other fire departments outside the city but within five road miles of the city limits will be credited when they respond according to a defined plan and offset the lack of needed Engine Companies

- Response of firefighting personnel to fires
  - This is considered the most important item in the Fire Department Section because it is an open ended credit, therefore the more members a department has available for the first alarm, the more credit the city can get.
  - The fire department shall have sufficient membership to ensure the response of at least four members at the alarm of fire to a structure for each piece of first alarm equipment. (Records must show 20 members responded on first alarm to all fire calls)
  - This is supplemented by the minimum staffing requirements of NFPA which states that all fire companies shall be a minimum of four firefighters.
  - On-call members shall be credited on the basis of the average number staffing apparatus on first call alarms.

FROM :COTTAGE GROVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:02PM P5

Training of firefighting personnel
- Training records need to support that fire suppression related training is completed by the active membership. The better the participation the better the credit received for training
- Training Facilities and Their Use (hands-on training facilities yield the greatest credit)
- Training Programs
- Pre-Fire Planning

- Operational preplanning of target hazards
  - Pre-Fire Planning inspections should by conducted twice a year to earn full credit and should include construction, occupancy, special hazards, water supply, and exposures.

WATER SUPPLY - 40% of Grading

- The supply works capacity
  - minimum storage of water
  - municipal water pumps
  - water filters
  - emergency supplies

- The water main capacity
  - Primary distribution pipe heading from the supply works
  - Secondary feeder pipe forming loops around major sections of the city
  - Distribution pipe laid along individual streets

- The distribution of fire hydrants
  - For the purposes of the FSRS property within 1,000 feet of a recognize fire hydrant is considered to be protected property. A recognized hydrant has a minimum supply capability of 250 GPM at 20 psi residual pressure for a two hour duration.
  - Additional credit can also be granted to unprotected areas of the city if the department can demonstrate delivery of at 250 GPM within five minutes of arrival of the first fire apparatus, and the continual delivery of at least 250 for two hours. This translates to a supply of 30,000 gallons of water.

FROM :COTTAGE GROVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:02PM P6

COTTAGE GROVE FIRE PROTECTION RATING

The ISO conducts municipal evaluation on a 15 year schedule, in 1989 the City of Cottage Grove was given a Fire Protection Rating of 4. Having had a previous rating of 6. The breakdown of credits per category for the 1989 rating are as follows. (SeeComparison of Community ISO Ratings)

	Assigned	Maximum Credits
Receiving and Handling Fire Alarms	6.03	10.00%
Fire Department	25.55	50.00%
Water Supply	38.13	40.00 %
Total for Cottage Grove	60 84	100 00

The Public Protection Class is based on the total percentage credit as follows:

Class Rating	Percentage / Points Earned
1	90.00 or more
2	80.00 to 89.99
3	70.00 to 79.99
4	60.00 to 69.99
5	50.00 to 59.99
6	40.00 to 49.99
7	30.00 to 39.99
8	20.00 to 29.99
9	10.00 to 19.99
10	0 to 9.99

The Cottage Grove Fire Protection Rating is a class 4 by only .84% points and is 9.16 % points from a class 3 Protection Rating.

FROM :COTTAGE GROVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:02PM P7

The following are the specific deficiencies, ISO recommended corrections and my recommendation to receive maximum credit for, Receiving and Handling Alarms and the Fire Department per the 1989 evaluation. The Water Supply category is not included because the category received near maximum points.

Receiving and Handling Alarms

	Credit Earned	Maximum
Item 414, Telephone Service of Reporting Fires	1.60	2.00

ISO Recommendation, List the fire department business number and the number to report fires under Fire Department in the White Pages of the phone book. The business number must also be listed under the city name in the white pages of the phone book.

Item 422, Number of operators on Duty	1.68	3.00

ISO Recommendation, Three operators and two relief operators are needed on duty at all times.

Item 432, Supervision of Dispatch Circuits	2.75	5.00

ISO Recommendation. The circuits shall be under constant electrical supervision to give prompt warning of conditions adversely affecting operations.

Total Credit for Dispatching	6.03	10.00

Fire Division Recommendation

The addition of dispatch operators my not be possible, however changes can be made to telephone book entries. We should also insure that the circuitry is protected per item number 432. Additional changes to the paging system will be discussed under the Fire Department category.

FROM :COTTAGE GROVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:02PM P8

Fire Department

	Credit Earned	Maximum
Item 513, Engine Companies and Equipment	5.86	10.00

ISO Recommendation, Provide documentation of annual pump and hose tests and equipment listed as deficient (specific items are, Large Diameter Hose, 2 1/2 inch nozzles, hose clamp, burst hose jacket and spare hose)

Item 549, Ladder Companies and Equipment	3.61	5.00

ISO Recommendation, Provide documentation of annual pump and hose test and provide the equipment listed as deficient (specific items are, Large Diameter Hose, 2 1/2 inch nozzles, hose clamps, burst hose jackets and spare hose)

Fire Division Recommendation

Some of the equipment items listed as corrections are necessary replacements, such as the large diameter hose. Other items such as the 2 1/2 inch nozzles are becoming more necessary as the city acquires higher risk occupancies. The approximate cost of all recommended equipment is $22,000.00.

Fire Division Recommendation

In the past few years the Division has not kept up with annual pump tests however, in 1994 the Division tested and placed 6 Engineers from the part-time ranks. The Division Engineers began testing all hose and pumps in 1994 as required and all maintenance records are kept on the Divisions' "Fire House" data base.

Item 552, Pump Capacity	5.00	5.00

Full Credit

FROM :COTTAGE GROVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:02PM P9

Item 523. Reserve Engine 0.35 1.00
ISO Recommendation, One fully equipped reserve Engine is needed.

Item, 553, Reserve Ladder 0.64 1.00
ISO Recommendation, One fully equipped reserve service truck or aerial ladder is needed.

Division Recommendation

When purchasing Apparatus in the future we need to consider keeping and reconditioning Aerial Ladders and Engines for use as reserve Apparatus. With the trade-in value being so low the city will realize more benefit from maintaining a unit as a reserve

Item 561, Distribution of Engine Companies and Ladder Companies 2.17 4.00
ISO Recommendation, All protected areas of the city should be within 1 1/2 road miles of an Engine Company and within 2 1/2 road miles of an Aerial Ladder.

Fire Division Recommendation

The addition of fire station number 4 will increase the number of points in this area. (Engine and Aerial Apparatus Coverage Map)

The Fire Protection Rating requires that a minimum of two fully equipped Engines and a minimum of 8 firefighters respond on first alarm to all structure fires. To receive maximum credit in this category the Division needs to change the paging procedure so that the closest two stations are called for all reported structure fires.

ISO awards points for automatic assistance to unhydranted parts a city. Automatic Aid is different from the existing Wakota Mutual Aid agreement in that Cottage Grove Fire Department personnel would not need to ask dispatch to contact a fire department giving aid. When a structure fire is reported the aid department would be called and respond as though part of Cottage Grove Fire without being specifically requested. We should consider an automatic aid agreement with St. Paul Park for the northwest area of the city, Woodbury for common boarder areas and Hastings for areas south of 3M Cottage Grove.

FROM :COTTAGE GROUE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:03PM P10

Item 571, Number of Firefighters On Duty 4.20 15.00
ISO Recommendation. Increase the number of part-time personnel by 30 members or full-time members to provide 4 on duty at all times.

Fire Division Recommendation

The recommendation of 30 firefighters is based on an ISO formula, it is slightly over 1995 Division goals for response personnel. Additional part-time firefighters are being added as the budget allows however it is becomming increasingly difficult to attract and retain part-time personnel. Consideration must be given to new incentives for part-time firefightrers particularly during the day. The cost of additional part-time firefighters is approximately 2,500 00 per firefighter.

Item 581, Training 3.72 9.00
ISO Recommendation, Complete facilities should be provided for hands-on training and the training program improved.

Fire Department Recommendation

Training programs and record keeping have been greatly improved since the last rating. This will yield a greater percentage of points however, nearly all of the cities with a class 3 rating do have hands-on training facilities. I recommend that we reconsider acquisition of the property adjacent to Fire Station 4 for use as a training facility. Several private companies including 3M, CP Rail Road and, NSP have offered material to support a Cottage Grove Training Facility through donation of equipment.

Item 590, Pre-Planning 0.00 extra credit
ISO Recommendation, Industrial, institutional and other similar buildings should be inspected twice a year by department members. Records of the inspections should include complete up-to-date notes and sketches.

Fire Division Recommendation

In 1990 the Division began pre-fire planning on all high risk occupancies. The Division is changing the pre-plan system to make the pre-plans more user friendly, cover more specific hazards and to review and update the plans twice each year.

Total Credit for Fire Department **25.55** **50.00+**

FROM :COTTAGE GROVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:03PM P11

Conclusion

The Fire Division has made significant improvements in delivery of services and record keeping over the past seven years. Although the addition of fire station number 4 will help in the Fire Protection Rating, the station alone will not make a significant difference in the rating. Cottage Grove will be re-evaluated in 2004 therefore we will maintain our present Class 4 rating for eight more years.

ISO will re-evaluate the city upon written request. The request must contain a detailed outline of the improvements made to fire protection since the last rating. The improvements are than evaluated by ISO to determine if they are sufficient to warrant the field evaluation.
An investment in the recommended NFPA 1901 equipment, continued addition of personnel, a training facility and the delivery of Fire Station IIIs new engine would in my opinion yield a class 3 rating. In my opinion a request for evaluation at this time without the investments may have a negitive result in a higher classification. The City would than retain the higher classification until our next scheduled evaluation.

FROM :COTTAGE GROVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:03PM P12

COMPARISON OF COMMUNITY ISO RATINGS

City	ISO Rating	Type of Department
Washington County		
Cottage Grove	4	Combination
Forest Lake	5	part-time
Newport	6	part-time
St. Paul Park	5	Part-time
Woodbury	6	part-time
Stillwater	3	full-time
Anoka County		
Columbia Heights	4	Combination
Coon Rapids	5	full-time
Fridley Unprotected Areas	3 9	Combination
Dakota County		
West St. Paul	5	full-time
South St. Paul	5	full-time
Hastings Unprotected areas	4 9	Combination
Inver Grove Heights	5	part-time
Eagan	5	part-time
Apple Valley	4	full-time

FROM :COTTAGE GROUVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:03PM P13

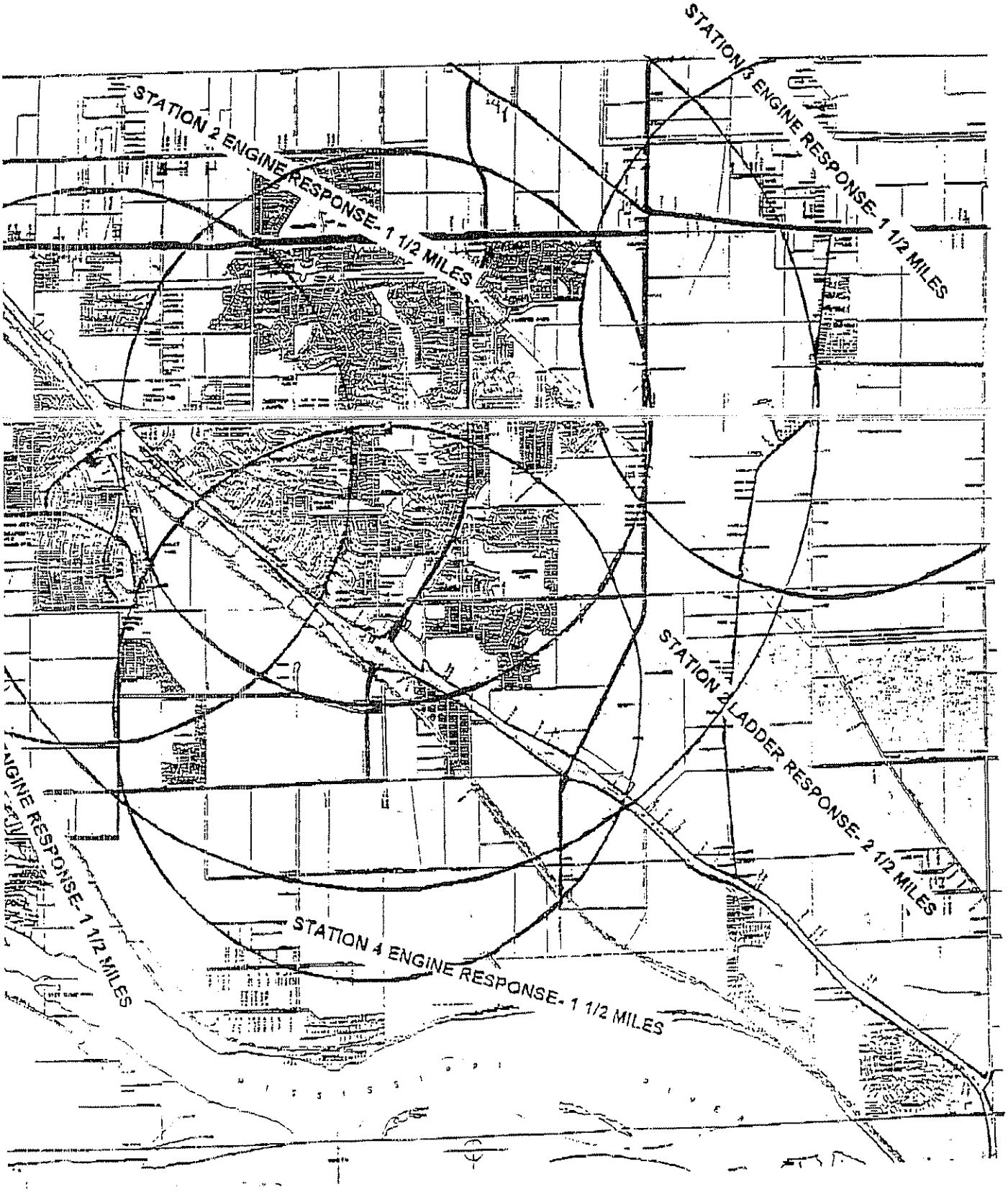
Hennepin County

Bloomington	3	part-time
Minneapolis	3	full-time
Eden Prairie	4	part-time
Unprotected Areas	9	
Edina	4	full-time
Minnetonka	4	part-time
Richfield	5	full-time

Ramsey County

St. Paul	3	full-time
Maplewood	5	part-time
North St. Paul	5	part-time
Arden Hills/ Lake Johanna	5	part-time
Roseville	3	part-time
White Bear Lake	3	part-time
Unprotected Areas	9	

FROM :COTTAGE GROVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:04PM P14



ENGINE AND AERIAL APPARATUS COVERAGE

FROM :COTTAGE GROVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:04PM P15

ISO COMMERCIAL RISK SERVICES, INC.

6550 YORK AVENUE SOUTH SUITE 600 MINNEAPOLIS MN 55435 (612) 930-4726 FAX (612) 920-0079

MERLE M. HAPPEL, CPCU
REGIONAL DIRECTOR

October 20, 1989

Honorable Richard Pederson, Mayor
Municipal Building
7516 80 St S
Cottage Grove, MN 55016

Dear Mayor:

We wish to thank you, and others for the cooperation given to our representatives during our recent survey. We have completed our evaluation of the fire insurance classification for your city and advise that the protection class has improved to 4/9. Class 4 will apply to buildings within 1000' of a fire hydrant.

Formerly Class 6 applied; the new classification will result in a decrease in the fire insurance rates for many insured commercial properties within the city. The new rates will be effective June 1, 1989.

The purpose of our visit was to gather information needed to determine a fire insurance classification which may be used to develop fire insurance rates. This survey was not conducted for property loss prevention or life safety purposes and no life safety or property loss prevention recommendations will be made.

The change from 6 to A will affect rates for sprinklered properties and some other specific [illegible] rated property. The change will affect typical mercantile properties to a degree depending upon the type of building construction, the hazard of occupancy and other rating factors. The overall effect is usually about -8% for wood frame buildings, -10% for masonry buildings and -3% for fire-resistive buildings. However, variations in construction, occupancy and private protection can result in increases or decreases from this average.

The above estimates apply only for insurance companies using ISO rates. However, numerous insurance companies use other than ISO rates so that the effect of the change in class may be different for their policy holders.

FROM :COTTAGE GROUVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:04PM P16

CLASSIFICATION DETAILS

Municipality Cottage Grove State WI Population 10,000

Date Surveyed August 1988 Total Credit 60.84 Class 4/n

SUMMARY OF CREDIT

	Assigned	Maximum Credit
Receiving and Handling Fire Alarms	6.03	10.00%
Fire Department	25.55	50.00
Water Supply	38.13	40.00
*Divergence	-8.87	
	60.84%	100.00%

The Public Protection Class is based on the total percentage credit as follows:

Class	%
1	90.00 or more
2	80.00 to 89.99
3	70.00 to 79.99
4	60.00 to 69.99
5	50.00 to 59.99
6	40.00 to 49.99
7	30.00 to 39.99
8	20.00 to 29.99
9	10.00 to 19.99
10	0 to 9.99

*Divergence is a reduction in credit to reflect a difference in the relative credits for Fire Department and Water Supply.

The above classification has been developed for fire insurance rating purposes only.

CLASSIFICATION DETAILS

Municipality Cottage Grove State MN Population 19,000

Date Surveyed August 1988 Total Credit 60.84 Class 4/9

RECEIVING AND HANDLING FIRE ALARMS

This section of the Fire Suppression Rating Schedule reviews facilities provided for the general public to report fires, and for the operator on duty at the communication center to dispatch fire department companies to the fires.

	Credit Actual	Credit Maximum
1. (Item 414) Credit for Telephone Service This item reviews the facilities provided for the public to report fires, including the listing of fire and business numbers in the telephone directory.	1.60	2.00
2. (Item 422) Credit for Operators This item reviews the number of operators on-duty at the communcation center to handle fire calls.	1.68	3.00
3. (Item 432) Credit for Dispatch Circuits This item reviews the dispatch circuit facilities use to transmit alarms to department members.	2.75	5.00
4. (Item 440) Total Credit for Receiving and Handling Fire Alarms	6.03	10.00

. (Item 581) Credit for Training		9.00
This item reviews the training facilities and their use.	3.72	
). (Item 590) Total Credit for Fire Department	25.55	50.00+

WATER SUPPLY

	Credit Actual	Credit Maximum
1. (Item 616) Credit for the Water System		
This item reviews the supply works, the main capacity and hydrant distribution.	34.53	35.00
2. (Item 621) Credit for Hydrants		
This item reviews the type of hydrants, and method of installation.	1.80	2.00
3. (Item 631) Credit for Inspection and Condition of Hydrants		
This item reviews the frequency of inspections of hydrants and their condition.	1.80	3.00
. (Item 640) Total Credit for Water Supply	38.13	40.00

FROM :COTTAGE GROUE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:05PM P19

Credit for Operators (Item 422).

For maximum credit in the Schedule, 3 operators plus 2 relief operators are needed on duty at all times. You have 2.8 operators on duty.

Credit for Dispatch Circuits (Item 432).

(431.3.-2)
For maximum credit in the Schedule, the radio alarm.dispatch circuit should be supervised in accordance with National Fire Protection Association Standard 1221.

Total credit for Receiving and Handling Fire Alarms (440).
Actual Credit 6.03%; Maximum Credit 10.00%.

FIRE DEPARTMENT

Credit for Engine Companies (Item 513). Please Note: The following comments apply only to the hydranted portion of the city.

(510.)
For maximum credit in the Schedule, 3 engine companies are needed for the Basic Fire Flow of 3000 gpm.

(511. + 512.)
You have 3 engine companies in service. Those are calculated as follows:

70% for Engine 3115 because of insufficient equipment, and lack of annual pumper and hose tests.

69% for Engine 3125 because of insufficient equipment, and lack of annual pumper and hose tests.

37% for Engine 3126 because of insufficient equipment, hose, and lack of annual pumper and hose tests (for maximum credit there should be 1200' of 2 1/2" or larger hose).

Credit for Reserve Pumpers (Item 523).

(520. + 521.)
For maximum credit in the Schedule, 1 fully-equipped reserve pumper is needed. You have no reserve pumper.

The city classification applies to properties with a needed fire flow of 3500 gpm or less. The private and public protection at properties with larger needed fire flows are individually evaluated, and may vary from the city classification.

We are attaching a copy of our Grading Sheet and the results of the hydrant flow tests witnessed during our survey. Extra copies of this letter and attachments are also enclosed so that you may distribute them to other interested parties, if you desire to do so.

If you have any questions concerning the new classification, or the resulting change in fire insurance rates, please let us know.

Yours very truly,

G Dykstra
Field Rating Representative

gd:am

cc: Denis Erickson, Fire Chief

ISO COMMERCIAL RISK SERVICES, INC.
HYDRANT FLOW DATA SUMMARY

City Cottage Grove State MN Zip 55016 Witnessed by ISO/CRS Date August 17, 1988

TEST NO.	TYPE DIST.*	TEST LOCATION	SERVICE	FLOW-GPM				PRESSURE		FLOW AT 20 PSI		REMARKS
				INDIVIDUAL HYDRANT			TOTAL	TATIC	RESID.	NEEDED **	AVAIL.	
1	Comm	Hadley & Grange	low	1690			1690	58	48	2500	3500	
2	Comm	Grove Pl & Douglas Rd	int	2120			2120	82	62	1000	3900	
3	Comm	80 & Hynes	int	1350			1350	86	70	4000	2900	
3a	Comm	80 & Hynes	int	1350			1350	86	70	3000	2900	
4	Comm	76 & Ideal	high	1500			1500	88	76	1000	3800	

THE ABOVE LISTED NEEDED FIRE FLOWS ARE FOR INSURANCE RATING PURPOSES AND ARE NOT INTENDED TO PREDICT THE MAXIMUM AMOUNT OF WATER REQUIRED FOR A LARGE SCALE FIRE CONDITION. THE AVAILABLE FLOWS ONLY INDICATE THE CONDITIONS THAT EXISTED AT THE TIME AND AT THE LOCATION WHERE TESTS WERE WITNESSED.

*Comm = Commercial; Res = Residential

**Needed is the rate of flow for a specific duration for a full credit condition. Needed Fire Flows greater than 3,500 gpm are not considered in determining the classification of the city when using the Fire Suppression Rating Schedule.

FROM :COTTAGE GROVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:05PM P22

FIRE DEPARTMENT

This section of the Fire Suppression Rating Schedule reviews engine and ladder-service companies, equipment carried, response to fires, training and available fire fighters.

	Credit	
	Actual	Maximum
1. (Item 513) Credit for Engine Companies This review is for the number of engine compa companies and the hose and equipment carried.	5.86	10.00
2. (Item 523) Credit for Reserve Pumpers This item reviews the number of reserve pumpers and their pump capacity and the hose and equipment carrried on each.	0.35	1.00
3. (Item 532) Credit for Pump Capacity This item reviews the total available pump capacity.	5.00	5.00
4. (Item 549) Credit for Ladder Service This item reviews the number of ladder and service companies and the equipment carried.	3.61	5.00
5. (Item 553) Credit for Reserve Ladder Service This item reviews the number of reserve ladder and service trucks, and the equipment carried.	0.64	1.00
6. (Item 561) Credit for Distribution This item reviews the percent of the built-upon area of the city which has an adequately-equipped, responding first-due engine company within 1 1/2 miles and an adequately-equipped, responding ladder-service company within 2 1/2 miles.	2.17	4.00
7. (Item 571) Credit for Company Personnel This item reviews the average number of equivalent fire fighters and company officers on duty with existing companies.	4.20	15.00+

FROM :COTTAGE GROVE FIRE DEPARTMENT FAX NO. :6514582863 Jun. 17 2005 02:06PM P23

FIRE INSURANCE CLASSIFICATION

IMPROVEMENT STATEMENTS

FOR

COTTAGE GROVE, MN

PREPARED BY

ISO COMMERCIAL RISK SERVICES, INC.
6550 YORK AVENUE S
SUITE 600
MINNEAPOLIS, MN 55435

OCTOBER 16, 1989

The following statements are based upon the criteria contained in our Fire Suppression Rating Schedule and upon conditions in Cottage Grove, MN on August 1988. They indicate the performance needed to receive full credit for the specific item in the Schedule and the quantity, you have provided. Partial improvement will result in receiving a partial increase in the credit. These statements relate only to the fire insurance classification of your city. They are not for property loss prevention or life safety purposes and no life safety or property loss prevention recommendations are made.

RECEIVING AND HANDLING FIRE ALARMS

Credit For Telephone Service (Item 414).

(412.B.)
For maximum credit in the Schedule, both the number to report a fire and a fire department business number should be listed under "Fire Department" in the white pages directory. Your fire number is listed and a business number is not listed under "Fire Department".

(412.C.)
For maximum credit in the Schedule, both the number to report a fire and the fire department business number should be listed under the name of the city the white pages directory. Your fire number is listed and a business number is not listed under the name of the city.

Credit for Ladder Service.

(540. + 541.)
For maximum credit in the schedule, 1 service company is needed in you city.

(542-547.)
You have 1 service company. This was calculated as 34% for Service Company 3116 because of insufficient equipment.

Credit for Reserve Ladder Service (Item 553).

(550. + 551.)
For maximum credit in the Schedule, 1 full-equipped reserve service truck is needed. You have no reserve service truck.

Credit for Distribution (Item 561).

(560.)
For maximum credit in the Schedule, all sections of the city with hydrant protection shoudl be within 1 1/2 miles of an adequately-equipped engine company and 2 1/2 miles of an adequately-equipped ladder, service, engine-ladder, or engine-service company. The distance to be measured along all-weather roads.

Credit For Company Personnel (Item 571).

An increase in the on-duty company personnel by one person will increase the fire department credit by .17% and an increase in the response by other Fire Department members by one person wall increase the ifre deparmtne credit by .24%.

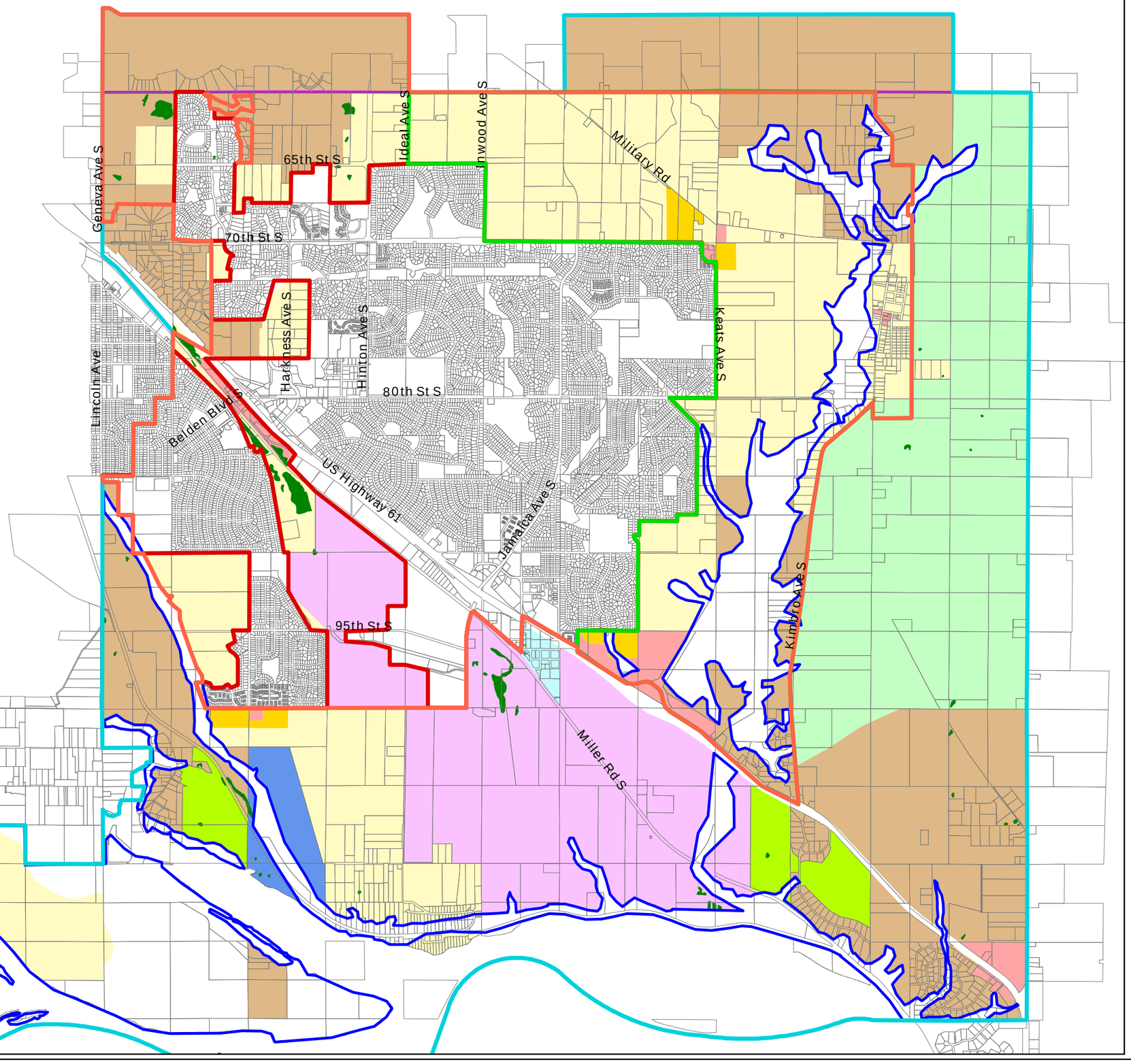
Credit For Training (Item 581).

(580.A.-G.)
For maximum credit in the Schedule, complete facilities should be provided for training and the training program should be improved. You receive 41% credit for the current training program and the use of facilities.

(580.H.)
For maximum credit in the Schedule, pre-fire planning inspections of each commercial, industrial institutional and other similar type building should be made twice a year by company members. Records of the inspections should include complete and up-to-date notes and sketches.

Appendix G

Supplemental Maps



City of Cottage Grove Minnesota

FUTURE LAND USE MAP

Water Supply & Distribution Plan

Legend

Land Use
- Agricultural
- Commercial
- Golf
- High Density Residential
- Industrial
- Low Density Residential
- Medium Density Residential
- Mixed Use
- Rural Residential
- State Scientific Area

- 2030 Service Boundary
- East Ravine Area
- Serviced Area (12/05)
- Ultimate Service Boundary
- Sensitive Areas (9/99)
- NWI Wetland

3500 0 3500 Feet

N W E S

January 2006

Bonestroo Rosene Anderlik & Associates
Engineers & Architects

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Color Coding Legend
Node: Available Fire Flow (gpm)

<= 1,000.00
<= 2,000.00
<= 3,500.00
<= 6,000.00

EXISTING FIRE FLOW MAP

City of
Cottage Grove
Minnesota

UNSERVICEABLE AREAS OF DENMARK TOWNSHIP

WATER SUPPLY AND DISTRIBUTION PLAN

JANUARY 2006

0 1500' 3000' 6000'

SCALE: 1" = 3000'

UNSERVICEABLE AREAS

Bonestroo
Rosene
Anderlik &
Associates
Engineers & Architects

STATIC WATER PRESSURE MAP

City of Cottage Grove

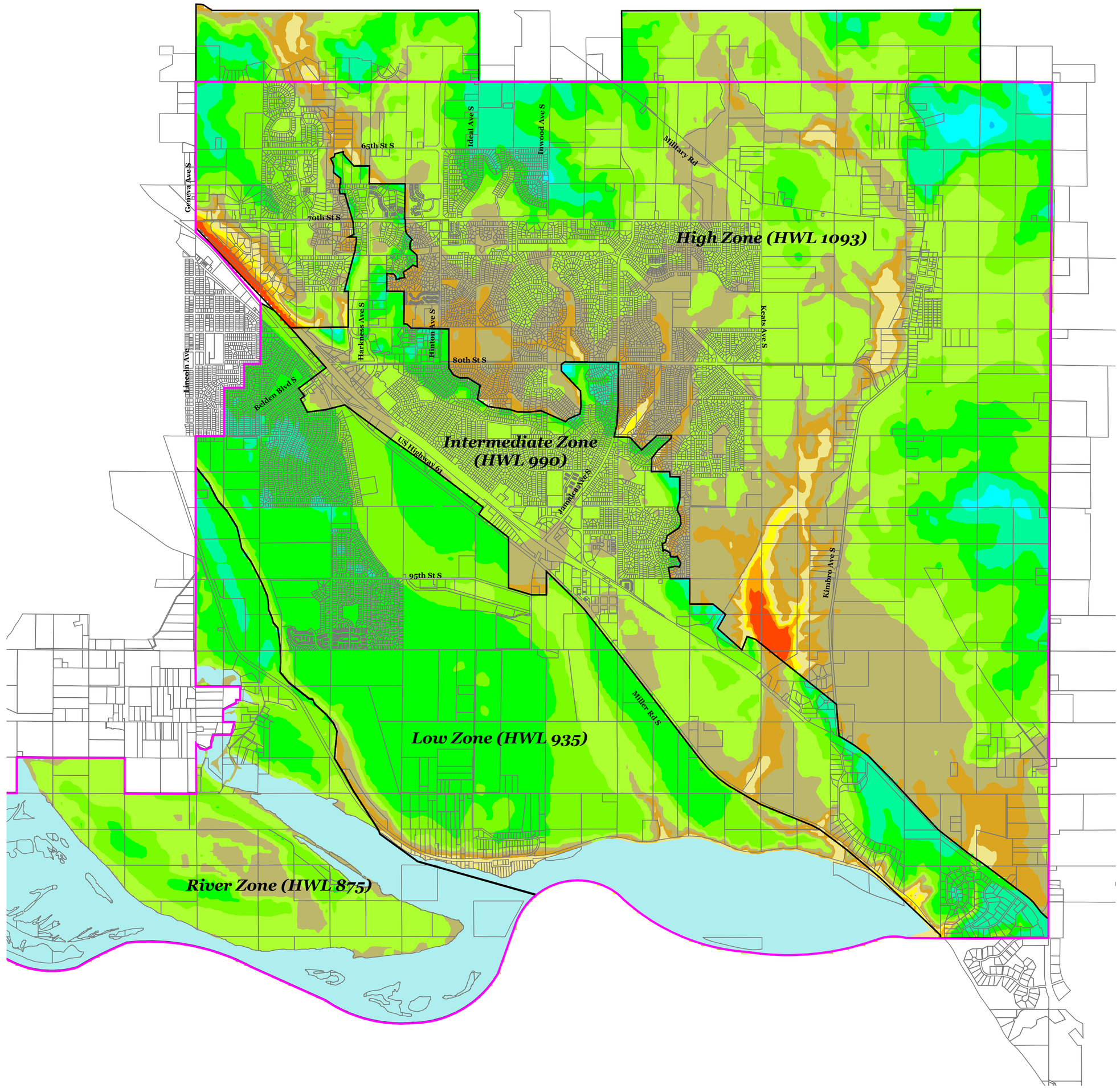
January, 2006

Legend (in PSI)

- 0 - 20
- 20 - 30
- 30 - 40
- 40 - 50
- 50 - 60
- 60 - 70
- 70 - 80
- 80 - 90
- 90 - 100
- 100 - 110
- 110 - 120
- 120 - 130
- 130 - 140
- 140 - 150
- 150 - 160
- 160 - 170
- 170 - 180
- 180 - 190

N W E S

Feet
2000 0 2000



This map displays the Static Water Pressure (in PSI) for the City of Cottage Grove, Minnesota. Static water pressure is a function of the high water elevation (HWL) of the City's storage facility (feet above sea level) and the elevation of the landscape at any given location. The equation to calculate static water pressure is:

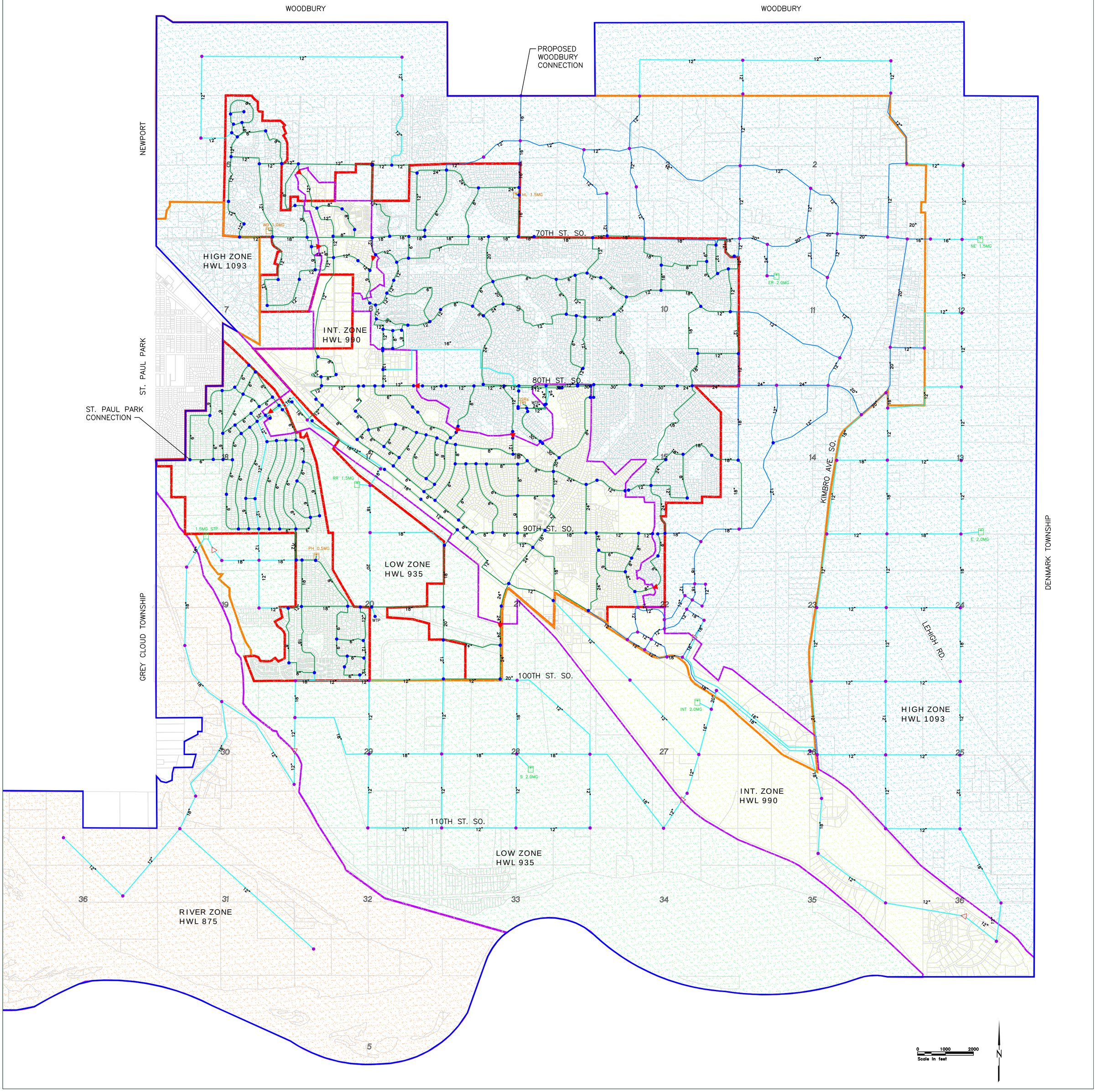
(HWL - Elevation) / 2.31 = PSI

* This map was derived from DEM data provided by the USGS.

Bonestroo Rosene Anderlik & Associates
Engineers & Architects

City of Cottage Grove Minnesota

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LEGEND

- EXISTING NODE
- EXISTING PIPE
- EXISTING RESERVOIR
- EXISTING PRV
- 750 FIRE FLOW (gpm)
- PRESSURE ZONE BOUNDARY
- PROPOSED NODE
- PROPOSED PIPE
- PROPOSED RESERVOIR
- PROPOSED PRV
- EXISTING CITY LIMITS
- ULTIMATE SERVICE AREA
- 2030 SERVICE AREA

CITY OF COTTAGE GROVE

WATER SUPPLY and DISTRIBUTION PLAN

FIGURE 1. FUTURE TRUNK WATER SYSTEM MAP

JANUARY 2006

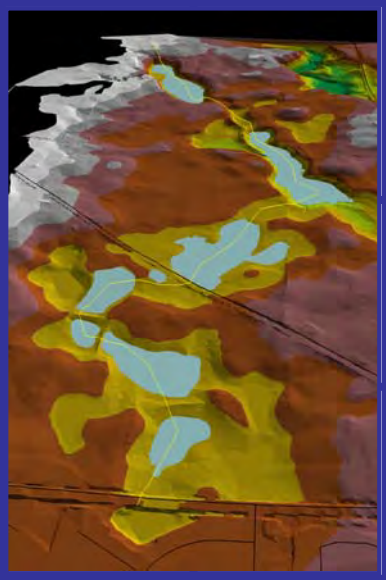
City of Cottage Grove Minnesota

Bonestroo Rosene Anderlik & Associates
Engineers & Architects

Cottage Grove East Ravine AUAR



Stormwater Management
June 14, 2005



EMMONS & OLIVIER RESOURCES

Stormwater Management

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Methodology **5**

Hydrologic and Hydraulic Modeling 5

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INTRODUCTION/BACKGROUND

The current hydrology of the study area is characterized by numerous landlocked depressions, some of which are relatively shallow and others that are quite deep. The overall goal of the stormwater practices being proposed for the East Ravine area of Cottage Grove is to minimize the generation of stormwater runoff created by urbanization. This will be accomplished by retaining the runoff in a series of natural infiltration basins rather than concentrate to a single point for collection, treatment and discharge. This approach mimics the current infiltration patterns that presently exist in the study area of Cottage Grove. The net result will be minimization and, in some areas, avoidance of discharge of stormwater to surface waters; which in turn will lessen the overall amount of pollutants reaching downstream water bodies such as Cottage Grove Ravine Park Lake and the Mississippi River. Ultimately this approach results in less burden on the environment, improves quality of life issues for residents of the city, and lessens potential future city costs for treating and/or retrofitting storm water outfalls that would be necessary from stricter regulations.

Traditionally, construction of impervious surfaces where none exist creates an increase in the speed and volume that stormwater runs off of the landscape. In the not too distant past, the goal of an urban drainage system was to rush water away as fast as possible into a receiving stream or nearby lake or wetland. When it became evident that this was accelerating the degradation of water bodies, the approach changed to the routing of water into detention ponds. Although many of these ponds were designed according to EPA's Nationwide Urban Runoff Program (NURP) criteria based on 1980s studies, they too have some deficiencies in effective treatment and management of runoff. NURP ponds could not recharge the groundwater and were not addressing stream degradation from excess rate and volumes of runoff. These ponds are limited in their ability to removal all pollutants from the stormwater runoff, creating diminished water quality in sensitive lakes, rivers and wetlands. Creation of a traditional NURP pond based stormwater management system for Cottage Grove would necessitate the discharge of new runoff to the Mississippi River, adding pollutants and volumes of water that are not present today.

Today, we have learned that there are better ways to treat runoff water which is to let it soak into the ground as close to its source as possible and mimic the natural hydrology of the system. In fact, soaking in every drop of precipitation where it falls is a good goal to strive for. This not only limits the volume and rate of runoff that occurs, it also eliminates the migration of polluting material that is picked up by runoff as it flows over urban surfaces. In addition, natural groundwater recharge is preserved. So called "alternative" runoff management practices merely seek to mimic the way precipitation would behave without human intervention; that is, it attempts to soak water into the ground as if the land's surface did not have impervious surfaces. In this respect, the practices are an alternative to the "collect and concentrate" approaches of the past. The environmental benefits of this approach include reduced wetland and open space impacts, potential regulatory credits (suitable for NPDES Phase II, TMDLs, and watershed/local

stormwater planning), reduced runoff and erosion, closer to natural water infiltration/recharge, reduced negative upland habitat impact (ex. trees), enhanced public awareness, and the opportunity for retrofitting into existing developed areas.

The geology within the East Ravine area of the City of Cottage Grove has resulted in closed basin drainage; that is, stormwater runoff flows to low areas that in most cases do not have outlets at normal water levels. Under existing conditions, water flows into these existing natural basins and leaves through a combination of seepage (infiltration) into the ground and evaporation. The issue facing the City is how to address stormwater management for the East Ravine project area under developed conditions while preserving the benefits (ecological, financial, water quality preservation and flood protection) of the closed basin drainage systems.

To take advantage of the good soils and geologic conditions in the city, this study proposes a stormwater management approach that minimizes connected impervious surfaces, increases flow path and time over pervious surfaces, and decentralizes treatment (smaller localized treatment as opposed to large-scale facility development) is appropriate as a first measure of control. Once these measures have been implemented as standard practice, an approach can be explored for collection and further treatment of excess water in the numerous existing natural basins. A carefully planned and engineered approach that combines a number of alternative practices with infiltration will meet the city's goal. This infiltration approach would mimic the natural condition rather than simply collect and dispose the runoff to the Mississippi River.

Requiring developers to implement alternative stormwater management practices would further reduce the overall volume of water draining to the closed basins, thus preserving the regional stormwater basins proposed in this report. The best potential for these practices is infiltration of water close to the location where the precipitation deposits it. Next, protecting the numerous natural basins that collect water in large events and allow it to infiltrate is important. Infiltrating this water mimics the natural system that existed prior to development. On-site runoff control approach tends to be more economical because there is less or no need to build expensive, artificial storage and conveyance facilities designed for large events. Development can also be designed to minimize or eliminate curbs, gutters, wide roadways, and the inlets/outlets and pipes that must accompany all of these features. Rather, this approach is flexible in its application from use on a lot-by-lot basis to entire portions of a community. In places where water level fluctuation can cause problems, any mix of alternative and traditional uses is possible.

The South Washington Watershed District (SWWD) has begun to implement a regional project which will convey runoff through the East Ravine project area in a system of detention areas and interconnecting pipes. As of the date of this report, the SWWD has completed land acquisition for an approximately 150 acre area of Neighborhood 1 North. When fully complete, the SWWD system will create a stormwater link to the Mississippi River. The SWWD has expressed a willingness to work with the City of Cottage Grove towards a combined City/Watershed District

stormwater management system. The proposed Cottage Grove stormwater plan utilizes the natural detention areas acquired by the SWWD, but does not anticipate the need to rely on the proposed connecting storm drains, thereby protecting the Mississippi River and minimizing inputs to the regional park from the effects of local urbanization.

This report details efforts to create a management strategy for the East Ravine area of Cottage Grove that utilizes a combination of approaches. The goals of the management strategy are to ensure responsible, proactive management of stormwater to protect local and regional water resources while also providing a reasonable level of safety for houses and other structures from regional flooding. The approaches are:

- Construct a city-based stormwater management system (ponds and/ infiltration basins) along parkways and in green spaces that utilizes existing infiltration capacities of the soils;
- Cooperate with the SWWD towards combined Cottage Grove/SWWD stormwater infiltration management areas;
- Require developers to include local and on-site infiltration as part of their development plans equivalent to approximately 15% of the runoff of the 5-yr event which is approximately 0.2" of runoff; and
- Provide emergency overflow routes from stormwater management basins in the event that a storm occurs which is greater than the design storm for these basins.

METHODOLOGY

Hydrologic and Hydraulic Modeling

Hydrology and hydraulics were modeled using XP-Software's XP-SWMM program (version 9.1) to size stormwater basins and connecting conveyance systems. The base XP-SWMM model was provided by the South Washington Watershed District (SWWD). Most of the input parameters set by HDR Engineering for the SWWD were maintained in the analysis of future conditions.

The model skeleton is shown in Figures 1 though 4. All runoff hydrology and hydraulic storage features (including manholes and ponds) are represented by nodes. A triangle indicates that stage/storage (pond) information is modeled. Stormwater conveyance (swales, pipes, culverts, weirs, and natural channels or swales) are represented within the model links.

Neighborhood 1 (North and South) was brought to a more refined level of detail than that of area within Neighborhood 2. Model input data necessary included the generation of proposed subwatershed boundaries, area, weighted average percent impervious based on proposed land use

as shown in Table 1, subwatershed time of concentration (runoff width and slope factors), pond, and conveyance data. Model hydrologic input data per subwatershed is contained in Appendix A.

Stormwater basin input parameters are contained in Appendix B.

Table 1. Impervious Surface for Proposed Land Uses

Land Use	% Impervious
Low Density	35
Mid Density	63
High Density	75
Mixed Use - Commercial	90
Parks/Open Space	3
Greenbelt	56
Public	50
Stormwater Treatment (water surface area)	100

Assumptions

The design and sizing of stormwater conveyance is an iterative process between the landscape architects, planners, road designers, and water modelers. For this reason, it was necessary to pick a starting place by making assumptions and iterating from that point forward. The following assumptions were used for the initial sizing of the Cottage Grove stormwater management network of swales, ponds, and pipes:

1. For the determination of basin high water elevations (flood event):
   - No pond infiltration during the event.
   - Ponds begin dry except for the 6.0"/24-hr event or where ponds are located in areas with shallow bedrock or possible high groundwater levels.
   - About 15% of the 5-yr post development runoff volume is attenuated at the local/neighborhood scale.
2. For design of the local storm sewer piped conveyance system:
   - 5-yr 24-hr (3.6 inch) rainfall event used for sizing.
   - Initial time of concentration equal to 15 minutes.
   - General layout such that street flows are conveyed in stormsewer pipes and lot flows are conveyed through backyard swales.
   - Runoff computed using Curve Numbers set in Cottage Grove Surface Water Management Plan.
3. For SWWD regional stormwater basin (CD-P86 north and south):
   - Basin stage/storage determined from existing 2 ft topography

- Overflow weir from CD-P86 north to south at 904 ft as shown on proposed grading plan sheet (Wenck Figure No. 1) received from Matt Moore of the SWWD on 3/30/2004.

4. Determination of landscape runoff:
   - Future/proposed % impervious computed as a weighted average based on land use sketches provided by HKGi.
   - Estimated % impervious of each land use as shown in Table 1.
   - Landscape initial abstractions (depression storage) and infiltration defined using SWWD average "summer" infiltration as defined by HDR.
5. For determination and application of 15% runoff volume attenuation:
   - Computed average 15% runoff volume from a 5-yr 24-hr event (3.6 inches) on proposed land use conditions
   - Modeled 15% runoff attenuation by increasing pervious depression storage by 0.16 inches to 0.27 inches, depending on the volume of runoff from the drainage area.
6. For preliminary pond design:
   - Using CP-2.11 as a prototype and 5:1 minimum side slopes provided conservative area/depth relations as listed below:
   - Pond area available 8 ft below the MPF = MPF area x 0.30 (30% of MPF)
   - Pond area available 6 ft below the MPF = MPF area x 0.45 (45% of MPF)
   - Pond area available 4 ft below the MPF = MPF area x 0.65 (65% of MPF)
   - Pond area available 2 ft below the MPF = MPF area x 0.80 (80% of MPF)
7. For water quality and volume control design:
   - Assumed pond invert (or water level) 2 feet below the outlet invert.
   - Utilizes 15% volume reduction on-site.
8. Woodbury contributions computed assuming existing pre-development conditions (peak rates) maintained.
9. The SCS Type II storm distribution was assumed appropriate.

Precipitation Events

Typically, stormwater facilities are designed to convey and manage the runoff from defined rainfall events. The City of Cottage Grove sizes storm drains to convey the runoff from the more frequent 5-year/24-hour rainfall event. Stormwater basins are sized to hold the runoff from either a 100-year/24-hour event, or the 100-year/10-day event, whichever is larger. The East Ravine project area is subject to precipitation requirements by both the City of Cottage Grove and the South Washington Watershed District, as defined below:

5-year/24 hour rainfall event

Cottage Grove defines the 5-year event as 3.6" of rainfall in 24-hours. SWWD does not define a 5-year event standard for local storm sewer design.

100-year/24-hour rainfall event

Cottage Grove defines the 100-year event as 6" of rainfall in 24-hours. This value is consistent with data contained in the 1992 Minnesota Hydrology Guide, prepared by the US Department of Agriculture, Soil Conservation Service.

The SWWD has opted to utilize rainfall data from the Midwest Climate Center (Huff and Angels' 1992 Bulletin 71), which defines the 100-year event for the southeast Metro area as 6.3" in 24-hours. The SWWD further defines a larger 24-hour event that represents the upper limit of a 100-year event for the purpose of testing the adequacy of the 2-foot freeboard between the high water level of the basins and the lowest opening floor elevation of adjacent structures. This event is 7.8" in 24-hours.

100-year/10-day runoff and rainfall events

The Cottage Grove Surface Water Management Plan requires an analysis of a 10-day runoff event equal to 7.2" of runoff. Cottage Grove Public Works staff advised that this analysis has not been imposed on recent developments. Therefore, this event was not analyzed for the East Ravine project area.

The SWWD defines the 10-day 100-year event as 9.3 inches of rainfall. The SWWD further defines a larger event that represents the upper limit of a 100-year event for the purpose of testing the adequacy of the 2-foot freeboard between the high water level of the basins and the lowest opening floor elevation of adjacent structures. This event is set at 10.6" rainfall in 10 days.

The SWWD no longer utilizes the 10-day 7.2" runoff event in their design and Cottage Grove has not been using this event in their review or design.

STORMWATER QUANTITY

Existing drainage

Neighborhoods 1 and 2 are presently closed drainage basin areas of primarily agricultural land use. The runoff in the land locked areas is fully managed by small swales and depressions. The area is favorable to infiltration due to the sandy soils and significant depth to groundwater or bedrock. There are exceptions to this pattern where bedrock does come close to the surface,

primarily in the western portion of Neighborhood 1 - North and in outcropped knobs within Neighborhood 2. The northern portion of Neighborhood 1 - South drains east to East Ravine Regional Park through 6 culverts located across County Road 19 into the East Ravine. The Cottage View Drive-In sub-area of Neighborhood 1 - South is landlocked without a natural or constructed outlet. Figure 5 denotes the major drainage basins that currently exist in the East Ravine area.

The stormwater management goal for this project is to utilize the natural drainage and infiltration capabilities of the existing land. Stormwater management areas along the parkways will be utilized to collect, infiltrate and direct overflow of runoff from adjacent neighborhoods. Overflow from the parkway stormwater basins will be directed to larger natural infiltration basins which have the capacity to infiltrate all the runoff from a 100-year storm event. Emergency overflow from the larger infiltration basins for events greater in intensity than a 100-year event could be provided either through the existing Cottage Grove drainage system and/or through the future regional stormwater conveyance system being planned by the South Washington Watershed District.

SWWD existing conditions model

Existing conditions were evaluated using an XP-SWMM model created by HDR Engineering for the South Washington Watershed District (SWWD), created on May 16, 2003. No changes were made to the background conditions of the model, as described in the section titled Methodology.

Other background information was taken from technical reports listed in Appendix E.

Design Standards

The City of Cottage Grove, South Washington Watershed District (SWWD) and the Minnesota Pollution Control Agency (MPCA) have defined standards for management of stormwater runoff. Specific standards, for such items as storm drain design, flood protection and infiltration basin design. Appendix F contains a matrix comparing the design standards used to size the recommended stormwater management facilities. The storm sewer system was designed using standards set by the City of Cottage Grove, where pipe conveyance was sized based on a 5-yr 24-hr rainfall event.

Woodbury flows

The northern edge of Neighborhood 1 - North between Military Road and the western boundary of the East Ravine project area receives overland drainage from Woodbury. Presently this area of Woodbury is undeveloped, with the current land use primarily agricultural. Woodbury's long-term plan forecasts development of this area to occur after 2020. The existing condition model was used to determine the flow rates from Woodbury to be accommodated by the proposed Cottage Grove drainage systems. Capacity for runoff from Woodbury in both the storm drains

and stormwater management basins should be limited to not exceed existing conditions. Special consideration must be made to accommodate this runoff in the period between completion of the Cottage Grove and Woodbury drainage networks. Further discussion is contained in the section titled Phasing.

Future Drainage Basins

Existing runoff drainage basins were overlaid onto the land use plan created by HKGi. Sub-catchment areas tributary to each designated stormwater management area were defined assuming that the future grading plan will generally follow the topography of the existing land. Storm drains for Neighborhood 1 - North and Neighborhood 1 - South were aligned to convey the street runoff and yard drainage to a downstream stormwater basin. Proposed sub-catchment areas and drainage links are noted in Figure 6.

Stormwater Management Basin Configuration

Basins and corresponding sub-catchment areas were numbered following the numerical system established in the existing conditions drainage model prepared by the SWWD. Sub-catchment drainage areas tributary to each stormwater management basin were measured and input into the XP-SWMM model. Basin area was defined by the area of the basin at the lowest contour. Initial basin outlet elevation was set at 2' above the basin floor. Outlet structures were sized to keep the maximum water bounce during a 100-year event equal to or less than 8 feet in depth. Pond High Water Level (HWL) was based on critical the 100-yr 24-hr precipitation event.

STORM DRAIN DESIGN

As required by the Cottage Grove Surface Water Management Plan, dated November, 1997, all storm drains and culverts were sized to convey the peak runoff from a 5-year rainfall event (3.6" in 24-hours). A unit flow for each land use type was computed using HydroCAD version 7.0. HydroCAD version 7.0 was used to create a SCS Type II hydrograph for each land use using the following input parameters:

- 100-acre catchment
- Curve numbers from Table 2
- 15 minute Time of Concentration

Peak flows from the hydrograph were used to compute a runoff rate per acre (in cubic feet per second). The per acre unit flows were applied to the sub-catchment tributary to each storm drain to determine the flows through each segment. Storm drain alignments followed street alignments wherever feasible. Drainage swales noted on the land use plan are reserved for yard drainage and would not receive much street runoff. These localized swales are set to overflow into the street drains. In some areas, the topography requires that the storm drains follow the same alignment as the yard swales. For these areas, a 40' utility easement would need to be reserved

for construction and maintenance of the storm drain. Exploring the use of overland flow corridors, potentially as internal pathways during final design may be appropriate in some areas.

Storm drain and culvert alignments are shown in Figure 7.

Table 2: Runoff Curve Number Values by Land Use Type

Land Use Type	CN Value
Open, Parks	58
Rural Residential	66
Low Density Single Family Residential	72
Medium Density Single Family Residential	78
High Density Single Family Residential	84
Commercial, Industrial	92
Open Water	99
Special	As required

Storm drains in the westerly half of Neighborhood 1 North were extended to convey the runoff from Woodbury. These storm drains were sized to convey the existing runoff that is generated by a 5-year rain event. Flows exceeding the 5-year event would use overland routes as they do in the neighborhoods. Future development in Woodbury which would increase both the rate and volume of runoff contributed to the Cottage Grove drainage system would need to implement practices and structures to limit the maximum rate of discharge to existing runoff rates.

Infiltration basins where necessary, are linked by culverts sized to convey the excess runoff during a 100-year event.

STORMWATER BASIN DESIGN

Building Elevation

According to the requirements of by both the City of Cottage Grove and the South Washington Watershed District, the lowest opening and exposed building wall elevation of structures should be set at 2 feet above the high water elevation from a 100-year event. As described above, the 100-year event is defined differently by these agencies. Therefore, to ensure compatibility with the future SWWD regional system and to meet Cottage Grove requirements, the high water

elevation was computed for the events used by both entities and the highest was used to set the lowest opening elevation for each stormwater basin.

Cottage Grove Public Works staff requested that additional safeguards be incorporated into the analysis that determines the lowest floor elevation. Infiltration basins are assumed to not infiltrate, plus the base elevation of the basin is set at the outlet elevation and not at the bottom of the dry basin, except for regional infiltration basins.

The following scenarios were used to compute the high water elevation:

1. 6"/24-hour rainfall event, without infiltration, starting with water at outlet invert
2. 6.3"/24-hour rainfall event, without infiltration, starting dry
3. 9.3"/10-day rainfall event, without infiltration, starting dry

Two foot freeboard was added to the critical high water elevation, and the following events were run to determine if the runoff would be fully contained below the freeboard elevation. If the high water elevation of these events was higher than the freeboard elevation, then the higher of the two was used to set the lowest opening/ exposed building elevation.

1. 7.8"/24-hour rainfall event, without infiltration, starting dry
2. 10.6"/10-day rainfall event, without infiltration, starting dry

Appendix C contains the results of this analysis. The critical high water elevation for each basin is highlighted. The recommended low floor opening elevation would be set at 2 feet above the critical high water elevation for each basin. One exception was made to the 2 foot freeboard for basin CP-2.15, which is the emergency overflow of high water in Shepard's Woods Pond. At the request of Cottage Grove Public Works staff, the lowest floor opening elevation for this basin was set above the emergency overflow culvert, which was slightly higher.

Stormwater Management Basins

Stormwater Ponds

Half of the stormwater basins within the Neighborhood 1 - North drainage basin CP-2 (also described as Shepard's Wood Pond) are assumed here to function as stormwater ponds to be conservative. Geologic mapping of the area shows that bedrock is near the surface for stormwater basins CP-2.4 and CP-2.5. These basins are considered wet for all events and do not infiltrate under any conditions. Basins CP-2.10, CP-2.12, CP-2.14, CP-2.15, and CP-2.16 are considered wet due to their proximity to Shepard's Wood Pond. For the models that allow infiltration, these basins are utilize to infiltrate out the sides of the basin at a slow rate when the pond elevation rises above the normal water level. The next stage of design for these basins

should involve detailed geologic soil borings to determine the exact elevation of bedrock and groundwater for all stormwater basins in CP-2. It is possible, however, that the bedrock and especially the groundwater will be lower than assumed here. If soil borings prove that these stormwater ponds are not near the local groundwater or bedrock elevation, then these basins could be redesigned as infiltration basins. In either case, it is recommended that soil investigations be conducted as part of the next stage of design. As currently modeled, the more conservative assumption of these basins not infiltrating has been used to ensure a conservative design,.

Features of stormwater ponds include a permanent pool below the outlet, an outlet structure that controls the rate of runoff during a 100-year storm event to pre-development rates, a 10 foot wide vegetated shelf surrounding the entire basin, and, in the areas near bedrock used as a drinking water aquifer, a clay liner. A native vegetation buffer is recommended for the area above the normal water level. It is also recommended that all ponds be constructed with a multi-stage outlet that allows drawdown of water levels in the fall. Increasing pond storage capacity in winter allows retention of snowmelt, which will provide detention above the ice layer and allow slow release of spring snowmelt which likely is high in chlorides from winter road salt usage.

Constructed Infiltration Basins

All stormwater basins, not designated to be ponds, and which are adjacent to parkways or otherwise in the upper reaches of the major drainage areas are assumed to be constructed basins. Such basins may need significant grading and other alterations to achieve the shape defined in this analysis. Since these basins are constructed, it is assumed that the optimum infiltration rates will be slower than current infiltration rates for the site. Operation of these basins, including computation of the overflow rates and drawdown times, were based on an infiltration rate of 0.5 inches per hour for ideal outwash soils and 0.2 inches per hour for average till soils (only found in CP-2). These infiltration rates were applied over the outlet area to convert from inches per hour to an outflow rate in cubic feet per second.

Features of the constructed infiltration basins include creation of a filter strip and or inlet settling basin, grading and shaping, installation of inlet and outlet structures, and vegetation appropriate for infiltration basins.

Natural Infiltration Basins

The larger basins at the furthest most downstream areas of each major drainage area except CP-2 are typically natural infiltration basins. Additional construction is not needed to shape these basins. Because only minor construction is needed for these sites, it is assumed that the existing infiltration rates will be preserved. Operation of these basins, including overflow computations and drawdown rates, were based on an infiltration rate of 0.60 in/hr to 0.75 in/hr, depending on the water depth (deeper water equates to faster infiltration). These values come from 8 years of infiltration basin monitoring and analysis in the immediate region. As described in the

constructed basin section above, special care should be taken during construction to prevent compaction of the soils and siltation by sediment released by construction activities.

Features of the natural infiltration basins include creation of a filter strip and or inlet settling basin, installation of inlet and outlet structures where necessary, and minor re-vegetation as appropriate for infiltration basins.

Monitoring of natural infiltration basins will be necessary to ensure adequate infiltration is occurring and also to protect and preserve groundwater quality. The monitoring of the natural infiltration basins should be coordinated with the SWWD, with the City of Cottage Grove responsible for monitoring of the necessary constructed and natural basins if the SWWD is not monitoring those basins.

The data collected from the monitoring efforts will be used to document infiltration rates on a site-by-site basis. The documented infiltration rates will establish a baseline for future operation and maintenance activities. Accumulated sediment can lower the infiltration rates of basins. Should the basin infiltration rates fall below a yet to be determined standard, maintenance will need to be done to restore the infiltration basins' capacity by removing accumulated fine sediment loads.

The monitoring effort should not be limited exclusively to infiltration rates, but should also monitor the water quality entering the infiltration basins. The MPCA and Department of Health (DOH) have concerns about large-scale infiltration efforts and the impact infiltration could have on groundwater quality. Groundwater monitoring wells will also be needed, typically three per basin, at the regional infiltration basins. Monitoring should include water levels through time (for groundwater mounding) and water quality.

Drawdown times

Drawdown times for the infiltration basins were computed for two purposes. First, the draw downs for a range of moderate events will allow comparison to actual monitored rates and will guide future O & M efforts. Second, the basins within the boundary of SWWD CD-P86 (East Ravine basins CP-3.22, CP-3.9, CP-3.11, CP-3.13, CP-3.18, and CP-3.19) were assessed to ensure that the majority of the Cottage Grove local runoff is infiltrated before the regional water pumped from CD-P85 into CD-P86. Local Cottage Grove runoff was redistributed among the basins to optimize the infiltration drawdown time to ensure that the SWWD drawdown conditions are met. Predicted drawdown times for each basin are detailed in Appendix F.

Outlets and Emergency Overflows

As described above, the outlet structures have been sized to convey stormwater runoff from basin to basin during a 100-year precipitation event. The elevation of the outlet for each basin is set at two feet above the infiltration basin floor for most cases. If not adequately maintained, the soils may slowly fill with silt and other fine particles typically found in urban stormwater runoff. Therefore, outlet structures should include a valve or removable weir which will allow for

drawdown of any permanent pool of water that forms below the normal outlet elevation. This valve would serve the purpose of draining the basin for maintenance and can recreate storage capacity in the event that a large storm occurs before maintenance can be performed. Figure 8 is a possible configuration of such an outlet structure.

Interior basins

As required by the city current standard as shown in the Cottage Grove Surface Water Management Plan, stormwater basins are sized to allow no greater than an 8 foot water bounce during a 100-year storm event. Outlets are sized to limit this bounce to a maximum height less than the 8 foot allowed. Emergency overflows from these basins, for storm events that create a bounce greater than the predicted maximum bounce, will overflow onto the street and to the next basin downstream.

Shepard's Woods Pond

The natural overflow from Shepard Woods Pond, a land-locked basin, is through a low point easterly of the existing pond. For purposes of emergency overflow to protect future structures, a culvert was set at this natural low point. Emergency overflow would be directed to the major drainage basin to the east, CP-3.13. The elevation of this culvert would be set at an elevation above the high water elevation set for Shepard Woods Pond.

CP-3

Cottage Grove area CP-3 drains through the SWWD site named CD-P86. Infiltration basin CD-P86 south (CP-3.9, CP-3.11, CP-3.13, CP-3.18, CP-3.19) is of adequate size to infiltrate all the runoff during a 100-year precipitation event for runoff from Cottage Grove. The City of Cottage Grove has two options for an emergency overflow: 1) utilize excess capacity in the existing Cottage Grove storm drainage system located immediately to the south of CD-P86; or 2) utilize with the SWWD for emergency overflow capacity in their future regional storm conveyance system. Figure 6 shows the potential emergency overflow routes.

Option #1 would direct emergency overflow through existing Cottage Grove pond East Draw #P-811. Since this it is recommended that detailed analysis of the existing system be conducted to determine if any structural improvements are needed to convey emergency flows. Option #2 is feasible at such time that the SWWD completes their regional pipe from CD-P86 to the proposed basin located in Neighborhood #2. Selection of this option would involve negotiations between the City and the SWWD on issues such as capacity and cost sharing. This option may result in properties within this major drainage basin would be subject to an annual stormwater utility charge from the SWWD. Since this is an emergency overflow situation and not a normal outlet it is recommended that the City consider proposing a user-fee scenario, which would involve payment to the SWWD only if, and when, the emergency capacity is utilized.

Unnamed Basin (CP4-3_1.1)

This natural basin is large enough to fully contain and infiltrate all the runoff from a 100-year/ event. This analysis assumes that the excess runoff from a greater event will overflow across an existing natural overflow to Vandeberg Pond (EW1-2a_1). The SWWD has proposed to incorporate this basin into their regional network, but has not scheduled acquisition of the property. At some undefined date in the future, the SWWD plans to construct a pipe that will provide an overflow into the East Ravine Regional Park. The City of Cottage Grove may opt to utilize this future SWWD outlet for emergency overflow if the Vandeberg Pond route becomes unfeasible. If this option is chosen, the Neighborhood #1 North recommendations for cost sharing with SWWD would also apply to this basin.

CR 19 to East Ravine

NRL2-21, NRL2-22, ERL2-9, ERL2-8, ERL2-4, and ERL2-4A are all basins in Neighborhood 1 - South that presently drain to the East Ravine Regional Park through culverts under County Road 19. The outlets from these basins are sized to limit the maximum water bounce during a 100-year precipitation event to 8 feet or less. Rate control will allow the peak runoff rates to be less than currently exist. Existing culverts will be utilized for emergency overflow from these areas. Volume control is important in these areas to reduce any impacts to the park channel or lake. Park improvements could be coordinated with SWWD improvement plans.

Cottage View

The Cottage View area of Neighborhood 1 - South is land-locked under existing conditions. The Cottage Grove Surface Water Management Plan recommends that this area be drained to an existing wetland south of Highway 61. Appendix C of the Cottage Grove Stormwater Management Plan, dated June 8, 2000 limits the rate of discharge to this future storm drain during a 100-year/24-hour event to 8.1 cubic feet per second. This maximum outlet rate was used to size the infiltration basin proposed in this plan. The maximum proposed conditions rate of discharge is 8.0 cubic feet per second, meeting the Cottage Grove requirements.

Other areas

Two areas in the far westerly portion of Neighborhood #1 will overflow into the existing Cottage Grove storm drainage system. Basin CP-25.1 will drain to a 24” storm drain proposed for construction in Cottage Grove area West Draw #25. Basin CP-6.7 will drain to an existing 12” culvert at 70th St. which is part of Cottage Grove area Central Draw #67. Future ponds proposed in the Cottage Grove Stormwater Management Plan contain capacity for these two areas of Neighborhood 1 North.

Sub-Basins Descriptions

Neighborhood 1 North

CP-2.2 Outlets through orifice and into drop structure before entering CP-2.3.

CP-2.3 Outlets through orifice and into drop structure before entering CP-2.4. It also receives flow from Woodbury (W1).

CP-2.4 & CP-2.5 Located in area with shallow bedrock, zero infiltration modeled under any scenario. The two ponds equilibrate with each other for larger rainfall events.

CP-2.7 This pond receives the Woodbury runoff from watershed W2.

CP-2.8 This pond receives the Woodbury runoff from watershed W3.

CP-2.11 This pond receives the Woodbury runoff from watershed W4.

CP-2.10, CP-2.12, CP-2.14, CP-2.15 & CP-2.16 These ponds begin wet for all scenarios because of their proximity to Shepard's Wood Pond and the possibility that a high water table is present. Also infiltration basin design requirements include a mandatory 3' vertical separation from the water table.

CP-2.15 Primary outlet west to basin CP-2.16 is the only outlet utilized for 100-yr events. The emergency overflow east through backyard swales and into CP-3.13 will be utilized for larger events.

CP-2.17 Shepard's Wood Pond, located in average soil, no infiltration assumed until water level rises one foot above its NWL, then at 0.2 in/hr out the side of the pond.

CP-3.6 Drains into a natural channel which drains into CP-3.9.

CP-3.8 This infiltration basin receives all the impervious runoff from this area. It then flows into the dry CP-3.8b and continues downstream.

CP-3.8b, CP-3.8c & CP-3.8d These basins begin dry and receive no initial runoff, only that which has passed through the upstream pond (CP-3.8). They eventually drain into a natural channel which drains into CP-3.9.

CP-3.9 Part of SWWD CD-P86 Large natural basin with almost identical size and shape to existing; little grading required. Existing berm downstream of the Military Road culvert is the controlling outlet. SWWD plans propose to create a channel through CP-3.9 to create a water pathway to the proposed outlet at 70th St. Creating this channel will increase infiltration capacity and have a minor effect on the HWLs.

CP-3.10 This basin in some respects, will behave as an extension of CD-P86, while also serving local drainage needs and treatment.

CP-3.11 Part of SWWD CD-P86. Large natural basin with almost identical size and shape to existing basin, only a small amount of grading required near housing boundary.

CP-3.13 Part of SWWD CD-P86

CP-3.18 Part of SWWD CD-P86

CP-3.19 Part of SWWD CD-P86. Currently modeled without an outlet, however at some future time an outlet will be added by South Washington Watershed District. An existing 24" culvert from this basin to Cottage Grove pond ED-P3A2 could be utilized as part of an emergency overflow.

CP-3.21 Runoff from this area naturally drains to SWWD CD-P86. SWWD has indicated that this basin would not be available for local on-site stormwater management. Therefore it is assumed that space in this development area must be made available for onsite infiltration and treatment before overflow to CD-P-86N.

CP-3.22 SWWD CP-86. Extremely large, deep basin that only a small amount of Cottage Grove stormwater will enter. SWWD is preparing plans for temporary overflow from this area into Gables Lake in Neighborhood 2. In the future, overflow of SWWD water will be directed into Cottage Grove basin CP-3.9.

CP-25.1 Drains east through existing culvert. This culvert could be replaced with a smaller culvert, or an orifice could be added to lessen flow rates leaving the study area. City plans for a park may also effect the configuration of this basin.

CP-6.7 Drains south through existing culvert. This culvert could be replaced with a smaller culvert, or an orifice could be added to lessen flow rates leaving the study area. The pond volume could also be increased because not all of the green space available was utilized for the pond.

C-69 Undeveloped area that currently flows south into an existing drainage system. Since the area is protected by a conservation easement, no change in land use proposed and no improvements are needed.

Neighborhood 1 South

All ponds in this area meet the MPCA requirement that ½" of runoff from new impervious surfaces must infiltrate in 48 hours or less. The ponds located in the commercial area in the southern portion of Neighborhood 1 South (named SP-xx) have infiltration drawdown times that are slower than what is generally acceptable for infiltration basins for the 2-year precipitation event. Some additional on site runoff storage is recommended for this commercial region (e.g. depressed parking lot islands, raingardens, vegetated swales, etc.). It is also recommended that additional maintenance be scheduled for these infiltration basins.

The east draining ponds (named EP-xx or ERL-xx) and the northern draining ponds (NP-xx) or NRL-xx) are all infiltration ponds with generally acceptable drawdown times. These areas contain a number of shallow natural infiltration basins and one large one (ERL-2-5b). The EP or NP label denotes a constructed basin while the ERL or NRL name represents a natural basin with no change in storage volume.

Neighborhood 2

Neighborhood 2 was not taken to the level of detail of Neighborhood 1. Therefore there are fewer specific comments about basins.

No Cottage Grove stormwater was added to the northernmost basin (GL1-1_1). This basin likely has sufficient capacity to receive extra stormwater runoff coming from future development likely to occur to the north.

The land use plan for the areas designated as stormwater basins MR-1 and WR-1 did not set aside a specific site for stormwater management. The East Ravine Regional Park exists immediately downstream of this site; and there are not any sites in the park which could be utilized for stormwater management. Therefore space in these development areas must be made available for on-site infiltration and treatment.

GROUNDWATER MOUNDING

Modeling

Groundwater mounding was analyzed for the infiltration basins in the eastern portion of Neighborhood 1. These basins are underlain by Superior Lobe outwash consisting of sands, loamy sands, and gravels approximately 80 feet thick or greater (*cf* SWWD MW-3 *in* EOR, 2001). These outwash deposits are underlain by the subcropping St. Peter Sandstone, a fine- to medium-grained quartz sandstone approximately 50 feet thick with its base at an elevation of approximately 790 ft MSL (Figure 9). The base of the St. Peter is generally comprised of siltstones and claystones constituting an aquitard and was considered the base of the aquifer within which the mounding occurs. The water table in this area is approximately 840 feet MSL or approximately 60 to 70 feet below the land surface in low areas.

The mounding within the hydrogeologic system was analyzed using HANTAXIS (GeoHydroCycle, 1991), a transient, analytic model which calculates the groundwater mounding at a particular time after a finite period of infiltration from a rectangular area on the land surface.

Because the specific hydrogeologic conditions are not known, the expected mounding was determined for the outwash materials and the St. Peter using hydraulic conductivities of 95 and 11 ft/day, respectively (EOR, 2001)[Note: Bibliographic citation: Emmons & Olivier Resources, Inc., (November, 2001) Infiltration Management Study, Phase II Report; South Washington Watershed District.]

Local flows from the Cottage Grove area did not produce mounding under the basins to cause any limitations to infiltrating the water or limits to adjacent structures. A simplified, conservative analysis of regional flows from the SWWD overflow were also analyzed.

For regional/SWWD flows, the model was used to assess the groundwater mounding under a representative infiltration basin after 30 days' ponding in CD-P85 and CD-P86N and after 20 days' ponding for basins south with an average infiltration rate of 1.5 feet per day (0.75 in/hr).The individual predicted groundwater mounding ranged from 3 to 52 feet for the smallest to largest infiltration basin, respectively. These bounding values correspond to a depth to the water table mounding of approximately 53 to 8 feet, respectively. Further analysis involved superpositioning of the mounding for adjacent basins indicated that areas near the south group of basins (3.9 through 3.19). The compound effects of superimposed mounding could result in potential problems for adjacent basements. These results, using the conservative infiltration durations of 20-30 days, indicate that groundwater mounding should be considered in the final design of regional infiltration areas. Further analysis of mounding is warranted particularly with the design of the SWWD overflow. The critical event, 100-year hydrographs provided by SWWD as part of the overflow design indicate water present for approximately 5-15 days, depending on the basin. Analysis of "wet period" infiltration scenarios is also warranted in addition to the single events discussed here. This analysis is outside the current scope of the project, but should be consider as the regional system is designed.

Further analysis is recommended including the reduced duration indicated by SWWD and extended wet periods. Final results may warrant modification of the basins' configuration and size. Also, additional field data collection is needed to determine the potential ground water mounding effects beneath and surrounding regional infiltration basins including existing ground water levels, stratigraphy, and hydrogeology.

Monitoring

Monitoring of groundwater mounding will be required for the regional infiltration basins. Installation of groundwater mounding wells will be coordinated by SWWD and the City of Cottage Grove.

The groundwater monitoring effort should be focused on the natural depression areas, where the majority of the water volume will be infiltrated. A number of wells should be positioned adjacent to and at distances up to 2,000 feet from the natural infiltration basins. Groundwater levels will need to be monitored during dry and wet periods to determine the effect of peak infiltration events on the groundwater elevation and seasonal ground water fluctuations.

EAST RAVINE REGIONAL PARK

Existing conditions

Within the Regional Park is a dry ravine that drains to Ravine Lake. Runoff flows through this ravine from areas immediately to the north and west of the park. Presently there are no runoff controls in place. Care should be taken to ensure that increased rates or volumes of post development runoff do not contribute to erosion in this ravine.

Proposed conditions

Pre- and post- development runoff volumes were checked to determine if this proposal would increase flows through East Ravine Regional Park. As a result of this project, flows through the park will actually decrease after full development. This reduction in flows is caused by the proposal to construct infiltration basins and severely limit the overflow that drains through the existing culverts. Therefore no additional improvements or erosion control measures are necessary for East Ravine Regional Park.

STORMWATER QUALITY

South Washington Watershed District

The South Washington Watershed District (SWWD) currently has an approved Watershed Management Plan, adopted in 1997, and watershed Rules, adopted in 1999. The Plan and Rules outline the water quality goals, policies, and requirements for the watershed.

Watershed requirements for water quality are based on the downstream receiving waterbody. In the East Ravine project area there are 10 identified wetlands classified as SWWD Protect or Manage 1 category wetlands and 2 lakes, including Gables Lake and East Ravine Regional Park Lake, which are classified as SWWD Concern lakes. In addition, a portion of the Cottage View area of Neighborhood 1 South drains to a wetland complex to the west of the project area where the wetlands are classified as Protect category wetlands. All of the identified wetlands and lakes have the same water quality standard based on annual total phosphorus loads to the waterbody. The SWWD requires that developed annual total phosphorus loads not exceed 75% above predevelopment annual total phosphorus loads for each of the waterbodies. In addition, 50-100 foot buffers are required around each of the wetlands.

Shepard's Woods Pond is classified as a Protect wetland. Therefore, SWWD rules require that the post development annual total phosphorus loading must not exceed 75% above the predevelopment annual total phosphorus loading. All grading and construction should be set back from this wetland by a minimum of 100 feet.

Watershed Rules, Section IX, describes SWWD watershed water quality standards as follow:

A. Any activity conducted pursuant to a permit must meet the runoff water quality management standards and criteria set forth in the Plan both for wetlands and waterbodies.

B. Where runoff from lands that are urban or suburban in character is contributing to the pollution of the water resources of the District, every effort should be made to abate the impurities at its source including the use of infiltration practices. Where this proves to be impractical or impossible, an effective system of filters, ponds,

or constructed treatment wetlands, where practical, will be constructed and maintained by the project applicant or the local municipality.

C. Stormwater ponds draining into DNR protected wetlands, District priority wetlands, or infiltration basins shall incorporate a skimming device capable of retaining floating liquids and debris. In pond networks, it may be adequate to provide the skimming device in the most downstream pond as determined by the District Technical Professional.

D. Stormwater ponds will require long-term maintenance by the pond owner or designated responsible entity including the following:

1. Field inspection every five years by pond owner to determine functioning condition. If a pond is not performing to its full design potential, the owner must return the pond to a good functioning condition.

2. Inlets and outlets will be inspected every two (2) years and as needed maintenance performed by the pond owner as necessary.

MPCA

On August 1, 2003, the Minnesota Pollution Control Agency issued General Permit MN R100001, which regulates discharge of stormwater associated with construction activities. This general permit contains requirements for sizing permanent stormwater management systems that will affect the design of the stormwater management basins in the East Ravine project area.

Wet sediment basins must be designed with a permanent pool below the outlet pipe, must control the rate of discharge, must be designed to prevent short-circuiting and must have a stabilized emergency overflow. All wet sediment basins are designed to contain the required permanent pool.

The MPCA General Permit states that “infiltration basins must have a reasonable chance of achieving approximately 80% removal of total suspended solids from a water quality event.” MPCA presently defines a water quality event as ½“ of runoff from all new impervious surfaces. Requirements for infiltration basins include rigorous sediment control during construction, pretreatment device or filtration strip, discharge of water quality volume in 48 hours or less, and 3 foot separation between bottom of basin and seasonal high groundwater table.

Results

The water quality requirements of the MPCA and the SWWD are greatly exceeded for all areas that are part of the natural infiltration basins. Drainage to Shepard’s Wood Pond could be an exception due to management class. Runoff from the 100-year precipitation event is fully infiltrated in the proposed systems. Therefore the minimum requirement of the MPCA of infiltration of ½” of runoff and the SWWD requirement for a 2-year event are met.

All water quality basins will be designed to standards set by MPCA. Water quality requirements of the SWWD will be met by limiting the post development volume of runoff in a 2-year rainfall event to no greater than 75% above predevelopment volumes. If post development runoff volumes are equal to or less than predevelopment volumes, then annual total phosphorus loads limitations will be met. It can be seen in Table 3 that the proposed infiltration basins will decrease the total volume of runoff to Gables Lake and East Ravine Lake. The pre- vs. post-runoff volumes to Shepard's Woods Pond do increase, however they increase by less than the allowable 75% increase. Therefore, additional on-site infiltration techniques which infiltrate the runoff from a 2-year precipitation event will be required for the areas tributary to the stormwater ponds within the Shepard's Woods Pond drainage area.

Table 3: Pre- and Post- Development Volume Comparison

Waterbody	Pre-development Runoff volume	Post-development volume
Gables Lake	9.4 acre-feet	5.3 acre-feet
East Ravine Lake	4.9 acre-feet	4.5 acre-feet
Shepard's Woods Pond	15.8 acre-feet	19.3 acre-feet

Other practices

As described in the section titled Methods, it was assumed that future developments would include onsite features that would retain a minimum of 15% of the runoff volume from a 5-year precipitation event. Techniques to retain this runoff would be determined by the future developers. Options could include a combination of the following techniques:

- Minimized impervious surfaces, such as narrower driveways and streets;
- Reduced compaction of residential grass areas and reapplication of organic topsoil, which would allow for optimized infiltration;
- Directed runoff from rooftops and/or driveways to lawns or raingardens rather than directly to street;
- Incorporation of infiltration features, such as rock infiltration trenches, into backyard drainage swales.

Most of the information available today on alternative stormwater best management practices (BMPs) can be obtained in reference material compiled by the Center for Watershed Protection the Low Impact Development Center, the U.S. EPA, or various professional trade groups. Additional information can also be obtained from environmental organizations and occasionally from local governments that post information on their websites. Since this material is readily obtainable and summarizes state-of-the-art installations, these web sites and the links they

provide to other informative sites along with EOR's experienced-based knowledge of the practices provide key sources of information for this section.

Specific sources of information for this study and among the best to look for additional information are:

- Low Impact Development Center, Beltsville, Maryland (www.lowimpactdevelopment.org)
- Center for Watershed Protection, Ellicott, Maryland (www.cwp.org and www.stormcenter.net)
- U.S. Environmental Protection Agency, Office of Water, Washington D.C. (www.epa.gov/owow)
- Stormwater Magazine, Santa Barbara, CA (www.stormh2o.com)
- The Natural Resources Defense Council (NRDC), New York, NY (www.nrdc.org)
- The Puget Sound Action Team, Olympia, WA (www.psat.wa.gov)
- Prince George's County, Maryland (www.goprincegeorgescounty.com)

Successful incorporation of practices that result in runoff reductions greater than 15% would allow resizing of the stormwater management basins recommended in this report and better protect the regional and natural basins.

Construction practices

Special care must be taken during construction to prevent compaction of the soils and siltation by sediment released during construction activities. Strict erosion control practices, such as salvaging of topsoil and re-vegetation of exposed soils should be required for all construction activities. Temporary sediment basins should be constructed upstream of each designated infiltration basin to capture the sediment that is captured by the runoff. The infiltration basins should be fenced to prevent construction equipment from compaction of the underlying soils, and the final infiltration basin should not be constructed until after the construction sites in the sub-catchment area are stabilized.

Maintenance Requirements

Formally establishing a City controlled O&M program is essential to effectively implementing alternative stormwater management. The following steps are adapted from EPA's recommended steps to establish such a program:

1. Establish a regulatory framework (ordinance or regulations) within which to formalize a cooperative agreement with a homeowner, developer or any other entity, including the City, that will be maintaining an alternative system;
2. Incorporate maintenance into design and construction specifications, including pre-treatment;
3. Identify the mechanism for stable, long-term funding (even if it is the homeowner);
4. Formalize a regular inspection schedule, criteria for departing from the schedule (ex. after a large event or when a problem is evident) and keep a log of inspections;
5. Define triggers for action (ex. 5" of sediment accumulation will trigger action to clean a forebay);
6. Prevent sediment, debris and litter from moving into and accumulating into the system;
7. Make provisions for monitoring (visual or actual sampling) of treatment criteria;
8. Develop a training and education program, possibly with a certification element;
9. If water is not draining down after 4 to 6 days, remove accumulated fine sediments until coarse soils are exposed and replant with raingarden vegetation; and
10. Develop an informational booklet for homeowners on need and role of infiltration raingardens in neighborhoods.

Maintenance Personnel and Staffing

The public works maintenance functions for infiltration basins will include such activities as maintaining pre-treatment systems, keeping streets clean, monitoring (visually) drainage functions, and maintaining open space areas. If the City intends to rely heavily on biological system components (ex. bioretention or raingardens), it should eventually acquire some staff or train staff with some botanical/ecological background to manage or assist homeowners in managing those features.

Installation of alternative practices into a commercial, industrial or institutional setting should include a plan for who will maintain the system. Typically, a landscape firm or division of the company is charged with grounds maintenance. The responsibilities for maintenance should be clearly set out in the development-related permits issued by the City. Failure to comply with the agreement will mean that the City has to undertake the effort and charged back costs to the property owner, so careful structuring of the agreement is warranted.

The inclusion of alternative management techniques can often be an appealing aspect of a home site. Asking a homeowner to maintain a simple practice, such as a raingarden, can result in a commitment by that homeowner to the alternative management philosophy. This should be treated as an amenity because it usually involves aesthetically pleasing additions to a neighborhood. Experience in Maplewood, Minnesota has shown that most residents view

upkeep of these facilities as part of maintaining their property value. However, changing ownership, poor owner health, lack of interest or many other conditions could mean that maintenance fails over time. The City again must be prepared to take over or re-negotiate for the maintenance of properties where maintenance does not otherwise occur.

Finally, maintenance should be an essential component of any alternative design. This must then be followed-up with adequate training of whoever is charged with the operation and maintenance of the facility. This is much easier to accomplish with City staff than with homeowners or commercial land managers. In any case, it should be fully defined before the system is implemented.

Enforcement

If the City does not chose to be the maintenance provider for all alternative systems installed within the City, it will need to develop some enforcement provisions defining how it will deal with owners/operators who are unwilling or unable to correct problems. Good examples of ordinance or regulations can be reviewed at www.stormcenter.net. Appendix E contains an example of a Stormwater Management/BMP Facilities Agreement from Albemarle Co., VA. The City will also need to define how it will financially implement the desired maintenance practices, keeping in mind that any non-City failure to maintain could mean a responsibility shift to the City to correct the problem.

Maintenance Checklist

The easiest way to assure that desired maintenance is performed is to develop a formal checklist of the various activities that need to be performed. The checklist could include the information contained in Table 4, but in a format that walks the maintenance staff or homeowner who might be unfamiliar with the system through a prescribed series of routine steps designed to assure continued effective operation of the system. A checklist not only assures that certain tasks are completed on a routine basis, it also assures consistency among inspectors and provides a historic record of maintenance and system performance. It also identifies consistently those elements causing problems and those elements that need little attention.

STORMWATER MANAGEMENT PRACTICE	MAINTENANCE ACTIVITY	FREQUENCY
Bioretention (raingarden) - Soil and Mulch	• Visually inspect and repair erosion • Check the pH and apply an alkaline product, such as limestone, if needed • Re-mulch any void areas by hand as needed • Add a fresh mulch layer • Remove old mulch layer before applying new one in the spring • Remove and replace soil that has lost its ability to reduce pollutants	• Monthly • Annually • As needed • Spring and fall • Every 2-3 years • As needed (about every 10-20 years)
Bioretention (raingarden) – Plants	• Immediately after the completion of cell construction, water plant material for 14 consecutive days unless there is sufficient natural rainfall • When trees have taken root, or at least by 6 months, remove stakes and wires • Visually inspect vegetation for disease or pest problems. If treatment is warranted, use the least toxic approach • Remove and replace all dead and diseased vegetation considered beyond treatment • During times of extended drought, look for physical features of stress (un-revived wilting, yellow, spotted or brown leaves, loss of leaves, etc.). Water in the early morning as needed • Weed regularly • Prune excess growth (trimmed materials may be recycled back in with replenished mulch or land filled if there is a concern of heavy metals accumulation) • Replace vegetation in void areas	• As needed • As needed • Monthly • Twice a year, from March 15th to April 30th and October 1st to November 30th • As needed • As needed • Annually • As needed
Bioretention (raingarden) – Drainage	• Inspect the cell and make sure that the drainage paths into and within the system are clear and that ponding water dissipates over 4-6 hours (Water may pond for longer times during the winter and early spring)	• After rainfall events
Permeable Pavement/Pavers - Cleaning	• Inspection of the site after construction • Routine inspection after stabilization to assure rapid water removal and surface integrity • Conventional street sweepers equipped with vacuums, water, and brushes to restore permeability , followed by proper disposal of material collected • Follow the sweeping with high-pressure hosing of the surface pores (if necessary, add additional aggregate fill material made up of clean gravel) • Potholes and cracks can be filled with patching mixes, and spot clogging of porous concrete may be fixed by drilling approximately 0.5-inch holes every few feet • Replace damaged interlocking paving blocks • Develop plan to minimize winter sanding and de-icing	• Weekly or more often if clogging apparent • Annual detail inspection and routinely after rain events • Four times per year • After sweeping • As needed • As needed • Incorporate into maintenance plan
Dry Detention Pond	• Inspect for operation as designed • Clean and remove of debris after major storm events (>2” rainfall) • Harvest vegetation when a 50% reduction in the original open water surface area occurs • Repair embankment, side slopes and control structure if inspection reveals problem • Remove accumulated sediment from forebays or sediment storage areas when 60% of the original volume has been lost • Removal of accumulated sediment from main cells of pond once 50% of the original volume has been lost	• Annually • As needed • As needed • As needed • As needed (about every 5 years) • As needed (about every 10-20 years)
Constructed Wetland	• Inspect for operation as designed and health of vegetation • Repair erosion and replace unhealthy vegetation • Remove accumulated debris/sediment from pre-settling area (forebay)	• Annually • As needed • As needed (about every 5 years)

STORMWATER MANAGEMENT PRACTICE	MAINTENANCE ACTIVITY	FREQUENCY
Infiltration basin/trench	• Clean and remove debris after major storm events • Mow and maintain upland vegetated areas • Pre-settlement area sediment inspection • Inspect infiltration media/aggregate during dry weather to make sure well drained and functioning • Clean and/or replace infiltration media/aggregate • Remove accumulated sediment from forebays or sediment storage areas when 50% of the original volume has been reduced • Conduct inspection to assure that system de-waters within 24-48 hours; if not, replace clogged media	• As needed • Monthly • Annually • Annually • As needed after inspection • As needed (about every 5 years) • Semi-annual
Sand Filter	• Inspect for filtration design capacity retention • Remove trash and debris from control openings • Repair leaks from the sedimentation chamber or deterioration of structural components • Remove the top few inches of sand, and cultivation of the surface, when filter bed is clogged • Clean out accumulated sediment from sedimentation chamber once depth exceeds 12 inches • Clean out accumulated sediment from filter bed chamber once depth exceeds approximately ½ inch, or when the filter layer will no longer draw down within 24 hours	• Annually • As needed • Immediately when discovered • As needed (about 5-10 years) • As needed (about every 5 years) • As needed (about 5-10 years)
Vegetated Filter Strips	• Mow or trim vegetation to height appropriate for vegetation (ex. native grasses let grow to full height, turf grass cut to 3-4”) • Remove litter/debris • Apply nutrients/pesticide after testing and/or inspection determines need • Aerate soil on the filter strip • Repair eroded or sparsely vegetated areas	• Weekly during growing season; dictated by type of vegetation • Weekly • As needed; do not over apply • Every 1-2 years • As needed
Dry Swales, Grassed Channels, Biofilters	• Inspect for proper operation and for erosion in or close to facility • Mow or trim vegetation; replace damaged or missing vegetation • Remove litter/debris • Stabilize eroded side slopes and bottom • Apply nutrients/pesticide after testing and/or inspection determines need • De-thatch swale bottom and removal of thatching • Disk, roto-till and/or aerate swale bottom • Scrape swale bottom and remove sediment to restore original cross section and infiltration rate • Seed or sod to restore ground cover (use proper erosion and sediment control)	• Annually (more frequently when new) • Weekly during growing season; dictated by type of vegetation • Weekly • Immediately upon discovery • As needed; do not over apply • Annually • Annually • Every 5 years • As needed
Disconnected Impervious Areas	• Inspect after rainfall events to assure proper drainage as designed, including movement of water away from building foundations • Repair vegetation damage or loss from extended wetness	• As needed • As needed
Preservation of Open Space	• Inspect to assure land being maintained according to habitat plan and that vegetation and other desirable resources remaining in good condition	• Annually

Compiled from following references: LID Center’s “Bioretention Maintenance”; LID Center’s “Permeable Pavers Maintenance”; EPA’s National Mgmt. Measures to Control NPS Pollution from Urban Areas - Management Measure 11: O&M; and CWP “Fact Sheet” series

CONSTRUCTION COST ANALYSIS

Stormwater Management Areas

Unit prices for stormwater management areas, such as ponds and infiltration basins, were derived by computing a generic unit price for a typical basin, comprised of the features described in the section titled Stormwater Management. A cost per acre was applied to the specific pond or basin size for each area. Land purchase was not included in pond or basin estimates.

Storm drains and culverts

Storm drain and culvert estimates for Neighborhood 1 North and 1 South are more detailed than for the stormwater basins. Components of the estimate include pipe length, catch basins, manholes, and flared-end sections. Detailed designs were not created for storm drains or culverts in Neighborhood #2. Therefore the construction cost estimate was based on a pro-ration between Neighborhood #1 and #2 based on relative percentage of land use.

East Ravine

The rate of runoff from the future developed areas to the East Ravine Regional Park is at or below the rates currently draining through the ravine. Therefore, no additional construction activities are recommended.

Total Construction Cost

Construction cost estimates were prepared using 2004 construction prices. No inflation adjustments were applied. Projects contained in the Cottage Grove CIP or the Cottage Grove Surface Water Management Plan is not included in these estimates. Mobilization, erosion control, engineering fees and a contingency are included in these estimates. Table 5 summarizes the construction cost for the stormwater management components of the Cottage Grove East Ravine area.

Table 5: Construction Cost Estimate

Neighborhood	Drainage Basin	Storm Drain Cost	Basin/Pond Cost	Total Cost
1N	CP-2	$2,400,000	$4,400,000	$6,800,000
1N	CP-3	$4,400,000	$2,700,000	$7,100,000
1N	CP-6	$200,000	$120,000	$320,000
1N	CP-25	$100,000	$130,000	$230,000
2	All	$10,500.000	$12,500,000	$23,000,000
1S	NP	$900,000	$450,000	$1,350,000
1S	EP	$1,100,000	$370,000	$1,470,000
1S	SP	$800,000	$1,200,000	$2,000,000
Total		$20,400,000	$21,870,000	$42,270,000

PHASING

General

One clear benefit of this proposal to maintain natural basins for stormwater management relates to phasing of construction. Typically, stormwater management systems of interconnected storm drains and NURP ponds must be phased such that the most downstream area is constructed first. Construction phasing for this system of independent drainage basins can be linked to the phasing needs of the other components of the public infrastructure (sanitary sewer, roads, and/or water distribution). However, the construction within each drainage basin should start with the stormwater basins. In most neighborhoods, this would require that the green spaces and parkways be constructed first. Once the basins are in place and operational, then the storm drains can be connected to each basin. If it is necessary to break the drainage basins into smaller phases, then the lowest stormwater basins should be constructed in the early phases, proceeding to upper stormwater basins in the later phases. Figure 10 outlines the areas of each drainage basin that should be considered a single phase.

Neighborhood 1 - North

The large infiltration basins in Neighborhood 1 North (CP-3.22, CP-3.9, CP-3.11, CP-3.13, CP-3.18 and CP-3.19) are proposed to be on land presently owned by the SWWD. The SWWD is presently working on improvements for basin CP-3.22. Improvements for the remainder of their land have not yet been scheduled. The City of Cottage Grove should closely coordinate construction of these basins with the SWWD. The City should also determine which emergency overflow route from these basins is preferred. If it is preferred that emergency flows should be

directed through the existing stormwater drainage network, then it should be determined if improvements in the existing system are necessary before the infiltration basins are constructed. If it preferred that emergency overflows be directed to the future SWWD pipe, then close coordination on construction of this pipe is needed before the infiltration basins can be constructed.

The stormwater system in drainage basin WD-25 will eventually connect to a storm drain and pond proposed in the Cottage Grove Capital Improvement Program. These downstream facilities must be in-place before any improvements can be made in this drainage basin.

Neighborhood 2

The SWWD has unscheduled plans to construct a storm drain from Basin CP-3.19 in Neighborhood 1 North to Basin CP4-3 in Neighborhood 2. Figure 7 also notes a proposed alignment for the SWWD pipe. The City of Cottage Grove should coordinate construction of Neighborhood 2 with the SWWD plans to construct this pipe.

Neighborhood 1 - South

The only stormwater system that needs careful timing in Neighborhood 1 South is the area tributary to Basin WP-23. This basin will drain to future storm drain proposed in the Cottage Grove Surface Water Management Plan. Once the proposed storm drain is in place, then the stormwater management system of this basin can be constructed.

APPENDIX A

Model Hydrology Input Parameters

Neighborhood 1 North: Hydrology Data

Basin Name	Drainage Area [ac]	Percent Impervious	Width [ft]	Slope [ft/ft]
CP-2.2	8.1	38.2	221	0.006
CP-2.3	43.8	41.5	356	0.006
CP-2.4	17.6	39.8	254	0.011
CP-2.5	18.2	44.3	216	0.008
CP-2.6	7.5	35.0	232	0.019
CP-2.7	37.5	37.7	222	0.010
CP-2.8	17.1	45.5	410	0.007
CP-2.9	8.4	35.0	140	0.008
CP-2.10	6.9	41.0	138	0.015
CP-2.11	17.4	37.5	244	0.004
CP-2.12	14.2	39.2	174	0.006
CP-2.14	28.7	41.6	138	0.011
CP-2.15	42.9	35.9	304	0.008
CP-2.16	32.3	40.7	320	0.011
CP-2.17	81.4	26.2	573	0.013
CP-2.18	23.2	37.7	163	0.015
CP-3.1	19.1	35.0	137	0.017
CP-3.3	21.7	36.8	225	0.010
CP-3.4	42.3	38.7	318	0.012
CP-3.5	15.3	34.0	238	0.008
CP-3.6	12.7	37.2	256	0.001
CP-3.8	15.0	47.2	332	0.010
CP-3.9	105.0	29.5	517	0.006
CP-3.10	31.3	36.4	454	0.011
CP-3.11	20.6	17.2	263	0.004
CP-3.13	43.1	34.4	300	0.008
CP-3.15	16.6	42.6	346	0.004
CP-3.17	18.4	37.6	182	0.006
CP-3.18	41.7	37.1	634	0.008
CP-3.19	118.7	35.0	472	0.008
CP-3.21	25.4	35.3	394	0.007
CP-3.22	50.4	3.8	486	0.010
CP-25.1	18.1	40.5	343	0.008
CP-6.7	29.0	41.3	394	0.006

Additional Horton pervious depressional storage for Neighborhood 1 North is 0.22".

Neighborhood 2: Hydrology Data

Basin Name	Drainage Area [ac]	Percent Impervious	Width [ft]	Slope [ft/ft]
00+00A	19.1	14.8	713	0.033
00+00B	22.6	9.8	812	0.054
03+00MC	9.2	6.0	611	0.015
05+27T	22.9	19.0	587	0.050
05+38GL_1	100.5	6.6	838	0.019
06+60ER	83.3	9.3	1151	0.026
07+84MR	37.6	21.5	612	0.039
08+08M	29.3	12.2	683	0.021
10+00MC	31.0	6.0	1557	0.017
11+97A	20.2	22.8	574	0.042
12+19B	19.9	14.8	700	0.038
19+00MC	13.4	6.0	741	0.013
24+76ER	42.8	9.0	921	0.012
27+00MC	47.8	6.1	886	0.038
29+02R	10.5	34.9	315	0.029
44+15GL_1	53.8	6.1	1403	0.029
45+15MC	70.2	7.2	698	0.018
45+20ER	29.7	11.6	622	0.016
76+00MC_1	15.2	13.3	276	0.015
CP4-1_1.1	78.5	48.0	418	0.002
CP4-1_1.2	82.7	40.5	641	0.007
CP4-1_1.3	40.5	31.7	568	0.002
CP4-1_1.4	32.1	30.6	3489	0.002
CP4-2_1.1	52.5	82.8	502	0.003
CP4-2_1.2	56.5	51.8	1069	0.004
CP4-3_1	263.0	33.9	3424	0.004
EW1-1_1	52.1	6.0	709	0.031
EW1-2a_1.1	211.1	22.8	1664	0.014
EW1-2a_1.2	186.7	35.1	1418	0.017
EW1-2b_1	16.4	16.7	1045	0.032
EW1-5	40.2	11.6	632	0.018
EW1-6_1	25.2	3.0	945	0.029
GL1-1_1	133.0	30.0	2682	0.047
GL1-2	137.2	7.2	1496	0.016
GL1-2A	776.2	7.7	3938	0.010
GL2-2_1.1	50.5	31.2	549	0.010
GL2-2_1.2	42.3	29.2	526	0.009
GL2-2_1.3	17.6	7.0	307	0.006
GL2-2_1.4	141.3	6.5	899	0.012
MC-1	19.4	38.7	1176	0.039
MC-2	40.5	41.5	1763	0.042
MC-3	69.1	42.2	2007	0.036
ML7-3	2.7	34.9	237	0.052
ML7-3A	20.6	12.1	452	0.014
MR-1	52.0	35.8	1192	0.037
MR7-1	24.2	8.8	810	0.009
MR7-2	65.4	7.3	1152	0.006

Basin Name	Drainage Area [ac]	Percent Impervious	Width [ft]	Slope [ft/ft]
MR7-4	35.3	7.9	1670	0.050
MR8-1A	68.8	8.4	1248	0.021
RL1-1	163.3	8.0	1904	0.025
RL1-2	158.0	8.8	2434	0.014
RL1-3	23.1	9.8	644	0.034
RL1-4	36.6	7.1	827	0.028
RL1-5	92.1	7.1	1054	0.020
RL2-1	134.1	24.7	2199	0.050
RL2-14	11.5	7.1	622	0.040
RL2-15C	60.3	6.5	1172	0.033
RL2-16A	16.4	8.6	834	0.072
RL2-16B	16.6	7.5	785	0.072
RL2-17	78.5	7.5	1603	0.023
RL2-17A_1	28.7	3.0	756	0.020
RL2-19_1	96.4	39.9	1265	0.017
RL2-20	16.3	6.3	672	0.043
RL2-3	22.8	6.0	671	0.081
WR-1	68.7	57.6	1872	0.033

Additional Horton pervious depressional storage for Neighborhood 2 is 0.16".

Neighborhood 1 South: Hydrology Data

Basin Name	Drainage Area [ac]	Percent Impervious	Width [ft]	Slope [ft/ft]
EP-1	39.3	44.7	778	0.014
ERL2-4	6.3	41.0	267	0.045
ERL2-4A	6.3	41.0	337	0.049
ERL2-5a	26.3	51.1	410	0.014
ERL2-5b	14.5	47.3	395	0.013
ERL2-5c	8.0	8.1	349	0.020
ERL2-8	5.7	20.0	319	0.036
ERL2-9	21.5	7.1	501	0.031
NP-1	30.5	41.7	415	0.001
NP-2	15.1	36.8	298	0.002
NP-3	27.3	44.8	990	0.010
NRL2-21	11.1	15.1	508	0.031
NRL2-21A	25.7	18.9	610	0.015
NRL2-21B	43.3	20.4	1313	0.014
NRL2-21C	13.4	12.2	530	0.021
NRL2-21D	8.7	29.4	538	0.020
NRL2-21E	17.1	28.9	572	0.010
NRL2-22	9.5	16.1	460	0.029
SP-1	8.1	71.2	773	0.006
SP-2	43.8	81.6	243	0.008
SP-3	17.6	90.7	100	0.020
SP-4	18.2	90.3	181	0.022
SP-5	37.5	90.0	163	0.020
SP-6	17.1	90.6	147	0.076
SP-7	6.9	90.7	97	0.113
SP-8	17.4	87.7	274	0.012
SP-9	14.2	91.0	225	0.065
SP-10	28.7	90.5	249	0.085
SP-11	42.9	91.0	375	0.180
SP-12	32.3	90.4	167	0.050
SP-13	81.4	90.2	729	0.029

Additional Horton pervious depressional storage for Neighborhood 1 South is 0.27" (SP ponds) and 0.16" (EP, ERL, NP, NRL ponds). Difference in storage due to land use differences.

APPENDIX B

Stormwater Basin Data

Neighborhood 1 North: Basin Data

Basin Name	Type	Drainage Area [ac]	Basin Area [ac]			Volume at HWL [ac-ft]	Pond Outlets to Basin:	Pond Bottom	Outlet Elevation	Outlet Description
			At base	At Outlet	At HWL					
CP-2.2	Infiltration	8.1	0.20	0.30	0.48	1.7	CP-2.3	980	982	6" orifice
CP-2.3	Infiltration	43.8	0.90	1.35	2.65	12.0	CP-2.4	963	965	8" orifice
CP-2.4	Pond	17.6	0.44	0.67	1.40	6.7	CP-2.7	953	955	6" orifice
CP-2.5	Pond	18.2	0.51	0.76	1.41	6.1	CP-2.7	954	956	6" orifice
CP-2.7	Infiltration	37.5	0.48	0.71	1.53	7.5	CP-2.8	934	936	18" RCP
CP-2.8	Infiltration	17.1	0.73	1.10	2.24	10.5	CP-2.10	932	934	21" RCP
CP-2.10	Pond	6.9	0.30	0.45	0.86	3.8	CP-2.12	922	924	30" RCP
CP-2.11	Infiltration	17.4	0.36	0.54	1.17	5.7	CP-2.12	941	943	12" RCP
CP-2.12	Pond	14.2	0.28	0.42	0.80	3.5	CP-2.17	921	923	30" RCP
CP-2.14	Pond	28.7	0.33	0.50	0.98	4.4	CP-2.15	926	928	12" RCP
CP-2.15	Pond	42.9	0.57	0.86	1.66	7.4	CP-2.16	920	922	18" RCP
CP-2.16	Pond	32.3	0.46	0.69	1.15	4.4	CP-2.17	920	922	18" RCP
CP-2.17	Pond	81.4	14.60	20.76	19.05	87.6	CP-3.13	920	927	Backyard Swale
CP-3.3	Infiltration	21.7	0.40	0.60	1.10	4.7	CP-3.6	908	910	12" RCP
CP-3.4	Infiltration	42.3	0.43	0.65	1.44	7.4	CP-3.3	908	910	12" RCP
CP-3.5	Infiltration	15.3	0.27	0.41	0.68	2.6	CP-3.6	906	908	12" RCP
CP-3.6	Infiltration	12.7	0.54	0.80	1.35	5.0	CP-3.9	906	908	12" RCP
CP-3.8	Infiltration	15.0	0.19	0.29	0.49	1.9	CP-3.8b	938	940	12" RCP
CP-3.8b	Infiltration	-	0.13	0.20	0.28	0.8	CP-3.8d	932	934	12" RCP
CP-3.8c	Infiltration	-	0.27	0.41	0.76	3.2	CP-3.9	922	924	12" RCP
CP-3.8d	Infiltration	-	0.14	0.21	0.34	1.2	CP-3.8c	926	928	12" RCP
CP-3.9	Infiltration	105.0	4.66	19.15	15.31	36.1	CP-3.11	898	898	Channel
CP-3.10	Infiltration	31.3	0.25	0.38	0.77	3.6	CP-3.11	896	900	48" RCP
CP-3.11	Infiltration	20.6	0.98	2.84	2.85	7.7	CP-3.13	897	898	36" RCP
CP-3.13	Infiltration	43.1	0.58	0.88	1.47	5.5	CP-3.18	896	896	36" RCP
CP-3.15	Infiltration	16.6	0.37	0.55	0.94	3.6	CP-3.18	900	902	6" orifice
CP-3.17	Infiltration	18.4	0.20	0.30	0.50	1.8	CP-3.18	906	908	12" RCP
CP-3.18	Infiltration	41.7	2.44	3.65	6.81	29.3	CP-3.19	896	896	60" RCP
CP-3.19	Infiltration	118.7	1.07	1.60	3.34	16.0	- -	896	906	70th St
CP-3.21	Infiltration	25.4	0.18	0.27	0.56	2.6	CP-3.22		910	12" RCP
CP-3.22	Infiltration	50.4	1.49	60.21	4.42	10.3	CP-3.9	878	904	Constructed Weir
CP-25.1	Infiltration	18.1	0.61	0.92	1.22	3.1	out	978	980	24" RCP (ex.)
CP-6.7	Infiltration	29.0	0.48	0.72	1.06	3.1	out	976	978	24" RCP (ex.)

NOTE: Basins for SWWD defined rainfall events start empty, except basins with initial water level at outlet, labeled "Pond", because they are near Shepard's Pond or have shallow depth to bedrock.

Neighborhood 2: Basin Data

Basin Name	Type	Drainage Area [ac]	*Basin Area [ac]*			Volume at HWL [ac-ft]	Pond Outlets to Basin:	Pond Bottom	Outlet Elevation	Outlet Description
			At base	At Outlet	At HWL					
44+15GL_1	Natural	53.8	-	-	0.08	0.01	40+91GL	971	971	-
CP4-1_1.1	Constructed	78.5	0.53	0.80	1.67	8.05	CP4-1_1.2	926	927	24" RCP
CP4-1_1.2	Constructed	82.7	0.98	1.48	3.22	16.15	CP4-1_1.3	922	925	27" RCP
CP4-1_1.3	Constructed	40.5	0.48	0.72	1.24	4.76	CP4-1_1.4	922	924	27" RCP
CP4-1_1.4	Constructed	32.1	0.45	0.68	1.17	4.56	CP4-1_1.4d	920	922	24" RCP
CP4-2_1.1	Constructed	52.5	0.46	0.69	1.53	7.97	CP4-2_1.2	922	924	24" RCP
CP4-2_1.2	Constructed	56.5	1.72	2.58	4.63	19.33	CP4-2_1.2d	920	922	18" RCP
CP4-3_1	Natural	263.0	-	-	17.09	130.06	RL2-19_1	887	919	-
EW1-1_1	Natural	52.1	-	-	2.46	3.06	1	890	892	-
EW1-2a_1.1	Constructed	211.1	-	-	6.61	16.34	EW1-2a_1.2	850	852	36" RCP
EW1-2a_1.2	Natural	186.7	-	-	31.13	77.22	--	844	914	-
EW1-2b_1	Natural	16.4	-	-	2.53	3.08	EW1-1_1	890	896	-
EW1-6_1	Natural	25.2	-	-	0.36	0.63	09+83I	858	861	-
GL1-1_1	Natural	874.0	-	-	9.68	52.13	9	874	900	-
GL1-2	Natural	920.0	-	-	18.95	68.59	6	920	926	-
GL2-2_1.1	Constructed	50.5	0.62	0.93	1.65	6.74	GL2-2_1.2	886	888	12" RCP
GL2-2_1.2	Constructed	42.3	0.56	0.85	1.61	7.07	GL2-2d1	880	882	12" RCP
GL2-2_1.4	Natural	141.3	-	-	9.72	39.73	--	852		-
MC-1	Constructed	19.4	0.54	0.81	1.53	6.68	MC-2	908	910	8" Orifice
MC-2	Constructed	40.5	0.59	0.89	1.65	7.08	MC-3	894	896	18" RCP
MC-3	Constructed	69.1	0.50	0.76	1.68	8.79	79+00MC_1	882	884	30" RCP
MR-1	Constructed	52.0	0.45	0.68	1.45	7.21	06+14M	806	808	21" RCP
MR7-4	Natural	35.3	-	-	3.71	6.04	3M82+30	765	765	-
RL2-1	Natural	134.1	-	-	27.76	24.70	MR7-4	770	770	-
RL2-15C	Natural	60.3	-	-	4.73	24.68	55+00MC	842	850	-
RL2-16A	Natural	16.4	-	-	1.42	2.87	RL2-16B	848	860	-
RL2-16B	Natural	16.6	-	-	1.44	2.83	RL2-15B1	846	860	-
RL2-17A_1	Natural	28.7	-	-	0.41	0.58	13+18H	872	876	-
RL2-19_1	Constructed	96.4	1.71	2.56	4.44	17.51	MC-1	912	914	12" RCP
RL2-20	Natural	16.3	-	-	0.91	0.45	01+96G	858	858	-
RL2-3	Natural	22.8	-	-	1.88	6.35	04+00MC	776	783	-
WR-1	Constructed	68.7	0.90	1.35	2.91	14.38	10+00WR	862	864	24" RCP

Neighborhood 1 South: Basin Data

Basin Name	Type	Drainage Area [ac]	*Basin Area [ac]*			Volume at HWL [ac-ft]	Pond Outlets to Basin:	Pond Bottom	Outlet Elevation	Outlet Description
			At base	At Outlet	At HWL					
EP-1	Constructed	39.3	0.45	0.67	1.43	7.03	ERL2-5a	878	880	12" RCP
ERL2-4	Natural	6.3	-	-	0.26	0.87	E. Ravine	858.85	866	7' weir
ERL2-4A	Natural	6.3	-	-	0.24	0.87	ERL2-4	866	872	Natural outlet
ERL2-5a	Natural	26.3	-	-	1.14	1.93	ERL2-5b	868	868	Natural outlet
ERL2-5b	Natural	14.5	-	-	2.98	18.88	ERL2-5c	856	869	Natural outlet
ERL2-5c	Natural	8.0	-	-	0.71	0.99	ERL2-8	868	874	Natural outlet
ERL2-8	Natural	5.7	-	-	0.17	0.38	E. Ravine	859.2	866	6' weir
ERL2-9	Natural	21.5	-	-	0.24	0.62	E. Ravine	850	857	6' weir
NP-1	Constructed	30.5	0.42	0.63	1.09	4.24	NP-3	904	906	12" RCP
NP-2	Constructed	15.1	0.28	0.41	0.60	1.69	NP-3	904	906	12" RCP
NP-3	Constructed	27.3	0.66	0.99	1.75	7.12	NRL2-22	896	898	12" RCP
NRL2-21	Natural	11.1	-	-	1.36	4.80	E. Ravine	885.5	893	7' weir
NRL2-21A	Natural	25.7	-	-	3.20	7.34	NRL2-21	894	900	6' weir
NRL2-21B	Natural	43.3	-	-	2.71	6.00	NRL2-21A	904	910	36" RCP
NRL2-21C	Natural	13.4	-	-	0.70	2.89	61+14WR	904	910	36" RCP
NRL2-21D	Natural	8.7	-	-	0.75	3.09	NRL2-21C	906	912	36" RCP
NRL2-21E	Natural	17.1	-	-	0.60	1.53	NRL2-21D	912	914	36" RCP
NRL2-22	Natural	9.5	-	-	0.90	3.35	E. Ravine	886.34	894	7' weir
SP-1	Constructed	24.8	1.08	1.62	2.60	9.08	SP-2	892	894	6" orifice
SP-2	Constructed	5.6	0.13	0.20	0.40	1.91	SP-3	884	886	6" orifice
SP-3	Constructed	2.8	0.14	0.20	0.39	1.69	SP-5	874	876	6" orifice
SP-4	Constructed	5.0	0.10	0.14	0.29	1.33	SP-5	874	876	6" orifice
SP-5	Constructed	6.0	0.24	0.36	0.80	4.08	SP-6	868	870	6" orifice
SP-6	Constructed	1.7	0.07	0.10	0.22	1.09	SP-7	864	866	6" orifice
SP-7	Constructed	0.7	0.04	0.06	0.11	0.48	SP-8	856	858	6" orifice
SP-8	Constructed	21.4	0.40	0.60	1.33	6.75	SP-9	850	852	8" orifice
SP-9	Constructed	2.1	0.14	0.20	0.41	1.94	SP-10	842	844	8" orifice
SP-10	Constructed	4.6	0.15	0.23	0.45	2.07	SP-11	832	834	8" orifice
SP-11	Constructed	0.9	0.06	0.09	0.16	0.61	SP-12	824	826	8" orifice
SP-12	Constructed	3.1	0.08	0.12	0.21	0.90	SP-13	820	822	8" orifice
SP-13	Constructed	46.8	0.85	1.27	2.83	14.73	out	814	816	12" RCP

APPENDIX C

High Water Elevation and Lowest Opening Elevations

Neighborhood 1 North: Lowest Opening Elevation

Highlighted HWL indicates the critical event for the lowest opening elevation

Basin Name	Outlet Elevation	24-hr HWL			10-day HWL		CG 6.0" Bounce [ft]	Lowest Opening Elevation
		CG 6.0"	SWWD 6.3"	FB (>+2') SWWD 7.8"	SWWD 9.3"	FB (>+2') SWWD 10.6"		
CP-2.2	982	984.9	984.3	*985.4*	984.1	*984.6*	2.9	986.9
CP-2.3	965	969.7	969.3	*970.8*	968.8	*969.6*	4.7	971.3
CP-2.4	955	960.3	960.2	*961.6*	960.0	*960.7*	5.3	962.2
CP-2.5	956	960.3	960.2	*961.5*	960.0	*960.7*	4.3	962.2
CP-2.7	936	941.7	941.9	*944.3*	940.2	*941.1*	5.7	944.3
CP-2.8	934	939.9	940.1	*942.7*	938.4	*939.3*	5.9	942.7
CP-2.10	924	927.2	927.0	*927.8*	926.5	*926.7*	3.2	929.0
CP-2.11	943	948.5	948.7	*951.7*	946.6	*947.8*	5.5	951.7
CP-2.12	923	926.3	926.2	*927.3*	925.7	*926.4*	3.3	928.3
CP-2.14	928	932.7	933.0	*934.5*	931.8	*932.5*	4.7	935.0
CP-2.15	922	926.6	926.8	*928.2*	925.8	*926.4*	4.5	929
CP-2.16	922	925.3	925.5	*926.8*	925.4	*926.4*	3.3	927.5
CP-2.17	927	925.1	925.2	*926.8*	925.4	*926.4*	**5.1**	927.2
CP-3.3	910	914.1	913.6	*915.2*	913.4	*914.0*	4.1	916.1
CP-3.4	910	915.9	915.7	*917.6*	915.1	*915.9*	5.9	917.9
CP-3.5	908	911.3	910.7	*911.8*	910.7	*911.3*	3.3	913.3
CP-3.6	908	911.3	910.7	*911.7*	910.7	*911.2*	3.3	913.3
CP-3.8	940	943.2	943.5	*944.7*	941.7	*942.3*	3.2	945.2
CP-3.8b	934	935.7	935.6	*936.5*	935.1	*935.4*	1.7	937.7
CP-3.8c	924	928.2	927.6	*929.1*	927.3	*928.0*	4.2	930.2
CP-3.8d	928	930.9	930.4	*931.7*	929.9	*930.5*	2.9	932.9
CP-3.9	898	901.5	901.2	*901.9*	901.3	*901.7*	**3.5**	903.5
CP-3.10	900	901.5	901.2	*901.9*	901.3	*901.7*	1.5	903.5
CP-3.11	898	901.5	901.2	*901.9*	901.3	*901.7*	**3.5**	903.5
CP-3.13	896	901.5	901.2	*901.9*	901.3	*901.7*	5.5	903.5
CP-3.15	902	905.4	904.9	*906.1*	904.7	*905.2*	3.4	907.4
CP-3.17	908	911.0	911.2	*912.5*	909.9	*910.4*	3.0	913.0
CP-3.18	896	901.5	901.2	*901.9*	901.3	*901.7*	5.5	903.5
CP-3.19	906	901.5	901.2	*901.9*	901.3	*901.7*	5.5	903.5
CP-3.21	910	914.9	915.3	*917.2*	913.4	*914.3*	4.9	917.3
CP-3.22	904	881.4	881.4	*883.3*	881.1	*881.8*	**3.4**	883.1
CP-25.1	980	981.4	980.9	*981.4*	980.9	*981.1*	1.4	983.4
CP-6.7	978	979.9	979.8	*980.5*	979.3	*979.4*	1.9	981.9

NOTE: Bolded "CG Bounce" values indicate that basins started below outlet elevation.
Highlighted Lowest Opening Elevation was set by top of Emergency Overflow culvert.

Neighborhood 2: Lowest Opening Elevation

Highlighted HWL indicates the critical event for the lowest opening elevation

Basin Name	Outlet Elevation	*24-hour HWL*			*10-day HWL*		CG 6.0" Bounce [ft]	Lowest Opening Elevation
		CG 6.0"	SWWD 6.3"	FB (>+2') *SWWD 7.8"*	SWWD 9.3"	FB (>+2') *SWWD 10.6"*		
44+15GL_1	971	972.1	972.1	*972.4*	971.9	*971.9*	0.9	974.1
CP4-1_1.1	926	933.3	933.4	*935.3*	932.1	*933.0*	7.3	935.4
CP4-1_1.2	922	930.3	930.1	*931.1*	929.5	*930.3*	8.3	932.3
CP4-1_1.3	922	928.1	927.8	*930.6*	927.4	*928.1*	6.1	930.6
CP4-1_1.4	920	926.0	925.8	*927.0*	925.6	*926.1*	6.0	928.0
CP4-2_1.1	922	929.9	930.1	*931.8*	928.5	*929.4*	7.9	932.1
CP4-2_1.2	920	926.6	926.3	*927.5*	926.0	*926.6*	6.6	928.6
CP4-3_1	887	902.8	902.7	*905.2*	903.3	*904.9*	15.4	905.3
EW1-1_1	890	893.0	893.0	*893.4*	892.8	*893.0*	3.0	895.0
EW1-2a_1.1	850	853.7	853.9	*854.7*	853.5	*853.8*	3.7	855.9
EW1-2a_1.2	844	846.5	846.8	*847.9*	846.5	*847.1*	2.5	848.8
EW1-2b_1	890	891.4	891.5	*891.9*	891.2	*891.5*	1.4	893.5
EW1-6_1	858	862.2	862.3	*862.8*	861.8	*862.0*	4.2	864.3
GL1-1_1	874	883.6	884.7	*889.6*	882.5	*885.2*	9.6	889.6
GL1-2	920	926.9	927.1	*928.0*	926.3	*926.9*	6.9	929.1
GL2-2_1.1	886	892.3	892.2	*894.0*	891.3	*892.0*	6.3	894.3
GL2-2_1.2	880	887.2	886.8	*888.4*	886.3	*887.1*	7.2	889.2
GL2-2_1.4	852	857.3	857.5	*859.6*	856.6	*857.6*	5.3	859.6
MC-1	908	915.4	915.0	*916.0*	914.8	*915.4*	7.4	917.4
MC-2	894	900.3	900.3	*901.8*	899.1	*899.7*	6.3	902.3
MC-3	882	889.7	890.1	*892.0*	887.9	*888.7*	7.7	892.1
MR-1	806	813.4	813.7	*815.6*	811.9	*812.8*	7.4	815.7
MR7-4	765	772.7	772.9	*774.1*	771.1	*772.2*	7.4	774.9
RL2-1	770	772.7	772.9	*774.1*	772.5	*772.6*	2.7	774.9
RL2-15C	842	851.7	851.8	*852.4*	851.6	*851.9*	9.7	853.8
RL2-16A	848	851.1	851.3	*852.1*	850.8	*851.2*	3.1	853.3
RL2-16B	846	850.1	850.2	*851.0*	849.7	*850.1*	4.1	852.2
RL2-17A_1	872	876.7	876.7	*876.9*	876.6	*876.6*	4.7	878.7
RL2-19_1	912	918.3	918.0	*919.5*	917.4	*918.1*	6.3	920.3
RL2-20	858	858.5	858.5	*858.7*	858.3	*858.4*	0.5	860.5
RL2-3	776	780.2	780.5	*782.9*	779.2	*780.2*	4.2	782.9
WR-1	862	869.6	869.7	*871.2*	868.7	*869.4*	7.6	871.7

Neighborhood 1 South: Lowest Opening Elevation

Highlighted HWL indicates the critical event for the lowest opening elevation

Basin Name	Outlet Elevation	*24-hr HWL*			*10-day HWL*		CG 6.0" Bounce [ft]	Lowest Opening Elevation
		CG 6.0"	SWWD 6.3"	*FB (>+2') SWWD 7.8"*	SWWD 9.3"	*FB (>+2') SWWD 10.6"*		
EP-1	880	885.4	885.6	*887.4*	884.3	*885.1*	5.4	887.6
ERL2-4	866	866.6	866.7	*867.1*	866.5	*866.6*	0.6	868.7
ERL2-4A	872	872.7	872.7	*873.3*	872.5	*872.6*	0.7	874.7
ERL2-5a	868	870.2	870.3	*871.8*	870.5	*871.4*	2.2	872.5
ERL2-5b	869	870.2	870.3	*871.8*	870.5	*871.4*	1.2	872.5
ERL2-5c	874	870.2	870.3	*871.8*	870.5	*871.4*	-3.8	872.5
ERL2-8	866	866.8	866.9	*867.2*	866.5	*866.5*	0.8	868.9
ERL2-9	857	858.1	858.2	*858.6*	857.8	*858.0*	1.1	860.2
NP-1	906	910.1	909.9	*911.4*	909.3	*909.9*	4.1	912.1
NP-2	906	908.6	908.2	*909.5*	907.8	*908.2*	2.6	910.6
NP-3	898	902.8	902.3	*903.6*	901.8	*902.6*	4.8	904.8
NRL2-21	893	893.2	893.3	*894.1*	893.0	*893.3*	0.2	895.3
NRL2-21A	900	900.4	900.5	*901.2*	900.2	*900.5*	0.4	902.5
NRL2-21B	910	905.2	905.4	*906.3*	905.0	*905.4*	-4.8	907.4
NRL2-21C	910	911.0	911.2	*912.1*	910.6	*911.2*	1.0	913.2
NRL2-21D	912	912.8	912.9	*913.5*	912.6	*913.0*	0.8	914.9
NRL2-21E	914	915.7	915.8	*916.3*	915.5	*915.6*	1.7	917.8
NRL2-22	894	894.5	894.5	*894.5*	894.4	*894.5*	0.5	896.5
SP-1	894	897.0	896.2	*897.1*	896.2	*896.7*	3.0	899.0
SP-2	886	891.2	890.7	*891.8*	890.2	*890.9*	5.2	893.2
SP-3	876	880.6	880.0	*881.0*	880.0	*880.7*	4.6	882.6
SP-4	876	880.9	881.0	*882.0*	880.3	*880.9*	4.9	883.0
SP-5	870	876.0	875.3	*876.6*	875.4	*876.3*	6.0	878.0
SP-6	866	871.7	871.3	*872.0*	871.4	*872.0*	5.7	873.7
SP-7	858	862.3	862.0	*862.6*	862.1	*862.5*	4.3	864.3
SP-8	852	858.0	857.7	*859.0*	857.3	*858.1*	6.0	860.0
SP-9	844	849.1	848.8	*849.8*	848.8	*849.4*	5.1	851.1
SP-10	834	838.9	838.6	*839.5*	838.8	*839.5*	4.9	840.9
SP-11	826	829.7	829.3	*831.1*	829.6	*830.7*	3.7	831.7
SP-12	822	826.1	825.6	*826.8*	825.7	*826.4*	4.1	828.1
SP-13	816	822.1	822.0	*823.4*	821.4	*822.2*	6.1	824.1

APPENDIX D

Infiltration Capacities and Drawdown Times

Neighborhood 1 North: Infiltration Basin Analysis

Basin Name	Type of Pond	Infiltration Rate [in/hr]	Equivalent Infiltration Rate* [cfs]	Outlet Elevation	2-yr			5-yr			100-yr		
					HWL	Volume infiltrated [ac*ft]	Drawdown time [days]	HWL	Volume infiltrated [ac*ft]	Drawdown time [days]	HWL	Volume infiltrated [ac*ft]	Drawdown time [days]
CP-2.2	Infiltration	0.2	0.06	982	981.9	0.6	5.5	982.3	0.7	6.3	984.2	0.8	6.7
CP-2.3	Infiltration	0.2	0.27	965	965.4	3.5	6.8	966.0	3.7	7.3	969.2	4.5	8.8
CP-2.4	Pond	0	-	955	956.6	-	-	957.5	-	-	960.1	-	-
CP-2.5	Pond	0	-	956	957.1	-	-	957.5	-	-	960.1	-	-
CP-2.7	Infiltration	0.2	0.14	936	936.9	2.3	8.6	937.6	2.6	9.6	941.6	-	13.0
CP-2.8	Infiltration	0.2	0.22	934	934.6	3.2	7.7	935.2	3.7	8.8	938.9	5.2	12.2
CP-2.10	Pond	0	-	924	925.1	-	-	925.7	-	-	928.2	-	-
CP-2.11	Infiltration	0.2	0.11	943	943.3	1.2	6.0	943.7	1.2	6.0	948.7	1.2	6.1
CP-2.12	Pond	0	-	923	924.3	-	-	925.1	-	-	927.1	-	-
CP-2.14	Pond	0	-	928	929.8	-	-	930.4	-	-	933.1	-	-
CP-2.15	Pond	0	-	922	923.9	-	-	924.4	-	-	926.8	-	-
CP-2.16	Pond	0	-	922	923.3	-	-	923.7	-	-	925.4	-	-
CP-2.17	Pond	0	-	927	921.3	-	-	921.7	-	-	924.3	-	-
CP-3.3	Infiltration	0.5	0.30	910	910.6	1.7	3.3	910.9	1.9	3.6	913.7	2.6	4.7
CP-3.4	Infiltration	0.5	0.33	910	911.4	2.1	3.6	912.1	2.2	3.8	915.9	2.9	4.9
CP-3.5	Infiltration	0.5	0.20	908	908.1	1.0	2.8	908.6	1.3	3.7	910.6	2.0	5.2
CP-3.6	Infiltration	0.5	0.40	908	908.0	1.5	2.3	908.6	2.6	3.7	910.5	3.7	5.0
CP-3.8	Infiltration	0.5	0.14	940	940.7	0.8	3.1	941.2	0.8	3.1	944.2	0.8	3.1
CP-3.8b	Infiltration	0.5	0.10	934	934.3	0.5	3.0	934.7	0.5	3.0	935.7	0.5	3.1
CP-3.8c	Infiltration	0.5	0.21	924	924.3	1.1	3.0	924.6	1.1	3.1	927.7	1.1	3.1
CP-3.8d	Infiltration	0.5	0.10	928	927.0	0.1	1.0	928.3	0.6	3.1	930.5	0.6	3.1
CP-3.9	Infiltration	0.5	9.66	898	897.9	11.5	1.0	898.2	19.2	1.4	900.5	68.9	4.0
CP-3.10	Infiltration	0.5	0.19	900	899.4	1.1	3.3	900.0	1.1	3.4	901.8	2.0	5.8
CP-3.11	Infiltration	0.5	1.43	898	897.6	1.1	0.8	898.5	3.7	1.7	900.5	10.5	4.1
CP-3.13	Infiltration	0.5	0.44	896	898.0	2.1	2.8	898.6	2.5	3.3	900.5	4.6	5.7
CP-3.15	Infiltration	0.5	0.28	902	902.1	1.4	3.0	902.5	1.5	3.2	904.9	2.0	4.0
CP-3.17	Infiltration	0.5	0.15	908	908.5	0.8	3.1	908.8	0.8	3.1	911.5	1.1	4.1
CP-3.18	Infiltration	0.5	1.84	896	898.0	8.4	2.7	898.6	10.6	3.3	900.6	19.4	5.7
CP-3.19	Infiltration	0.5	0.81	906	898.0	3.7	2.7	898.6	4.8	3.4	900.6	8.5	5.7
CP-3.21	Infiltration	0.5	0.14	910	911.1	0.7	3.0	912.0	0.7	3.0	915.8	0.7	3.0
CP-3.22	Infiltration	0.75	15	904	878.0	-	0.0	878.0	6.0	0.6	878.5	11.9	0.8
CP-25.1	Infiltration	0.5	0.46	980	979.4	1.4	1.9	980.0	4.8	5.6	980.9	5.3	6.2
CP-6.7	Infiltration	0.5	0.36	978	978.3	1.9	3.1	978.6	4.2	6.2	979.8	4.2	6.3

NOTE: Infiltration rate applied over outlet area to get outflow rate in cfs for constructed basins and at average depth for natural basins (maximum is 15 cfs)

Neighborhood 2: Infiltration Basin Analysis

Basin Name	Type of Pond	Infiltration Rate [in/hr]	Equivalent Infiltration Rate* [cfs]	Outlet Elevation	2-yr			5-yr			100-yr		
					HWL	Volume infiltrated [ac*ft]	Drawdown time [days]	HWL	Volume infiltrated [ac*ft]	Drawdown time [days]	HWL	Volume infiltrated [ac*ft]	Drawdown time [days]
44+15GL_1	Pond	-	-	971	971.7	-	-	971.8	-	-	972.1	-	-
CP4-1_1.1	Infiltration	0.5	0.40	926	928.9	-1.4	2.2	929.9	-1.4	2.2	933.3	-1.5	2.3
CP4-1_1.2	Infiltration	0.5	0.74	922	926.3	-6.8	5.0	926.9	-6.8	5.0	929.8	-7.2	5.3
CP4-1_1.3	Infiltration	0.5	0.37	922	924.9	-2.3	3.5	925.4	-2.3	3.5	927.6	-2.6	4.0
CP4-1_1.4	Infiltration	0.5	0.34	920	922.9	-2.1	3.5	923.4	-2.1	3.5	925.6	0.3	
CP4-2_1.1	Infiltration	0.5	0.35	922	925.7	-1.9	3.1	926.7	-1.8	3.0	930.0	-1.9	3.2
CP4-2_1.2	Infiltration	0.5	1.30	920	922.9	-7.7	3.4	923.6	-8.0	3.5	926.1	-9.3	4.0
CP4-3_1	Pond	-	-	887	892.1	-	-	894.4	-	-	900.6	-	-
EW1-1_1	Pond	-	-	890	891.7	-	-	892.1	-	-	893.0	-	-
EW1-2a_1.1	Pond	-	-	850	851.9	-	-	852.4	-	-	853.8	-	-
EW1-2a_1.2	Pond	-	-	844	844.5	-	-	844.8	-	-	846.6	-	-
EW1-2b_1	Pond	-	-	890	890.3	-	-	890.5	-	-	891.5	-	-
EW1-6_1	Pond	-	-	858	860.5	-	-	861.3	-	-	862.3	-	-
GL1-1_1	Pond	-	-	874	877.0	-	-	878.2	-	-	884.7	-	-
GL1-2	Pond	-	-	920	922.9	-	-	923.7	-	-	927.1	-	-
GL2-2_1.1	Infiltration	0.5	0.47	886	888.3	-2.4	3.0	888.8	-2.4	3.0	891.9	-3.0	3.6
GL2-2_1.2	Infiltration	0.5	0.43	880	882.5	-2.4	3.2	883.5	-2.6	3.5	886.6	-3.8	4.8
GL2-2_1.4	Pond	-	-	852	852.7	-	-	853.5	-	-	857.2	-	-
MC-1	Infiltration	0.5	0.41	908	909.7	-1.8	2.6	911.7	-2.8	3.9	914.5	-4.4	5.8
MC-2	Infiltration	0.5	0.45	894	896.5	-2.3	3.0	897.2	-2.9	3.7	900.2	-4.6	5.5
MC-3	Infiltration	0.5	0.38	882	885.7	-2.0	3.1	886.6	-2.4	3.6	890.1	-3.8	5.5
MR-1	Infiltration	0.5	0.34	806	809.0	-1.8	3.1	809.8	-1.8	3.0	813.6	-1.8	3.1
MR7-4	Pond	-	-	765	767.5	-	-	768.3	-	-	772.9	-	-
RL2-1	Pond	-	-	770	772.2	-	-	772.3	-	-	772.9	-	-
RL2-15C	Pond	-	-	842	847.4	-	-	849.6	-	-	851.8	-	-
RL2-16A	Pond	-	-	848	848.8	-	-	849.5	-	-	851.3	-	-
RL2-16B	Pond	-	-	846	847.6	-	-	848.3	-	-	850.2	-	-
RL2-17A_1	Pond	-	-	872	876.3	-	-	876.4	-	-	876.7	-	-
RL2-19_1	Infiltration	0.5	1.29	912	914.2	-6.9	3.1	914.8	-6.9	3.1	917.7	-11.0	4.7
RL2-20	Pond	-	-	858	858.1	-	-	858.2	-	-	858.5	-	-
RL2-3	Pond	-	-	776	776.4	-	-	777.0	-	-	780.4	-	-
WR-1	Infiltration	0.5	0.68	862	865.3	-3.6	3.1	866.3	-3.6	3.1	869.6	-3.8	3.2

Neighborhood 1 South: Infiltration Basin Analysis

Basin Name	Type of Pond	Infiltration Rate [in/hr]	Equivalent Infiltration Rate* [cfs]	Outlet Elevation	2-yr			5-yr			100-yr		
					HWL	Volume infiltrated [ac*ft]	Drawdown time [days]	HWL	Volume infiltrated [ac*ft]	Drawdown time [days]	HWL	Volume infiltrated [ac*ft]	Drawdown time [days]
EP-1	Infiltration	0.5	0.34	880	880.9	1.7	3	881.9	1.8	3.1	885.5	2.0	3.4
ERL2-4	Infiltration	0.6	0.17	866	863.6	0.5	1.9	864.9	0.7	2.6	866.6	1.0	3.5
ERL2-4A	Infiltration	0.6	0.09	872	870.1	0.5	3.2	871.4	0.8	4.8	872.7	0.9	5.5
ERL2-5a	Infiltration	0.6	0.12	868	868.5	0.2	1.1	868.6	0.2	1.1	869.4	0.6	3.0
ERL2-5b	Infiltration	0.75	1.37	869	862.6	5.2	2.3	864.6	8.4	3.5	869.4	21.2	8.2
ERL2-5c	Infiltration	0.6	0.07	874	868.4	0.1	1.3	869.0	0.3	2.6	869.5	0.5	3.8
ERL2-8	Infiltration	0.6	0.05	866	865.3	0.3	3	866.2	0.3	3.8	866.8	0.3	3.8
ERL2-9	Infiltration	0.6	0.71	857	854.8	0.4	0.7	856.9	0.8	1.0	858.1	0.8	1.0
NP-1	Infiltration	0.5	0.32	906	906.5	1.7	3.1	906.9	1.7	3.1	909.6	2.0	3.6
NP-2	Infiltration	0.5	0.21	906	906.0	1.0	2.9	906.4	1.1	3.0	908.0	1.1	3.0
NP-3	Infiltration	0.5	0.50	898	898.2	2.7	3.1	898.7	2.7	3.1	901.9	3.7	4.1
NRL2-21	Infiltration	0.6	0.79	893	887.7	0.5	0.7	888.3	0.8	0.9	890.3	2.8	2.2
NRL2-21A	Infiltration	0.6	0.77	900	895.6	1.1	1.1	896.6	1.2	1.2	900.2	11.5	7.9
NRL2-21B	Infiltration	0.6	1.19	910	902.8	1.7	1.1	903.3	2.8	1.6	905.2	5.9	2.9
NRL2-21C	Infiltration	0.6	0.20	910	904.7	0.3	1.2	905.7	0.6	2.0	910.9	2.9	7.6
NRL2-21D	Infiltration	0.6	1.41	912	907.1	3.4	1.6	908.6	7.3	3.0	912.8	21.3	8.0
NRL2-21E	Infiltration	0.6	0.81	914	913.9	2.9	2.2	914.5	3.7	2.7	915.7	3.5	2.6
NRL2-22	Infiltration	0.6	0.51	894	888.8	0.7	1.1	893.0	3.2	3.6	894.4	5.3	5.6
SP-1	Infiltration	0.5	0.82	894	981.4	3.6	2.6	982.2	4.5	3.2	984.1	6.5	4.4
SP-2	Infiltration	0.5	0.10	886	965.1	0.6	3.2	965.9	0.6	3.4	969.0	0.8	4.5
SP-3	Infiltration	0.5	0.10	876	954.4	0.6	3.4	955.9	0.6	3.6	958.9	0.9	4.8
SP-4	Infiltration	0.5	0.07	876	955.5	0.4	3.3	956.2	0.4	3.3	958.6	0.4	3.5
SP-5	Infiltration	0.5	0.18	870	936.7	1.2	3.6	937.5	1.3	3.9	941.4	1.7	5.2
SP-6	Infiltration	0.5	0.05	866	934.4	0.3	3.6	935.1	0.4	4.1	938.9	0.5	5.3
SP-7	Infiltration	0.5	0.03	858	925.0	0.2	3.6	925.8	0.2	4.0	928.4	0.3	5.3
SP-8	Infiltration	0.5	0.30	852	943.1	2.0	3.8	943.7	2.3	4.3	948.6	3.2	5.7
SP-9	Infiltration	0.5	0.10	844	924.4	0.7	3.9	925.3	0.8	4.4	927.3	1.1	5.8
SP-10	Infiltration	0.5	0.12	834	928.6	0.9	4.1	929.4	0.9	4.5	932.4	1.3	5.9
SP-11	Infiltration	0.5	0.05	826	922.7	0.4	4.3	923.4	0.4	4.7	926.0	0.5	6.1
SP-12	Infiltration	0.5	0.06	822	922.4	0.4	4.0	922.9	0.5	4.5	924.8	0.6	5.8
SP-13	Infiltration	0.5	0.64	816	920.6	4.3	3.8	921.3	5.0	4.3	923.5	6.7	5.7

NOTE: Infiltration rate applied over outlet area to get outflow rate in cfs for constructed basins

APPENDIX E

Technical References

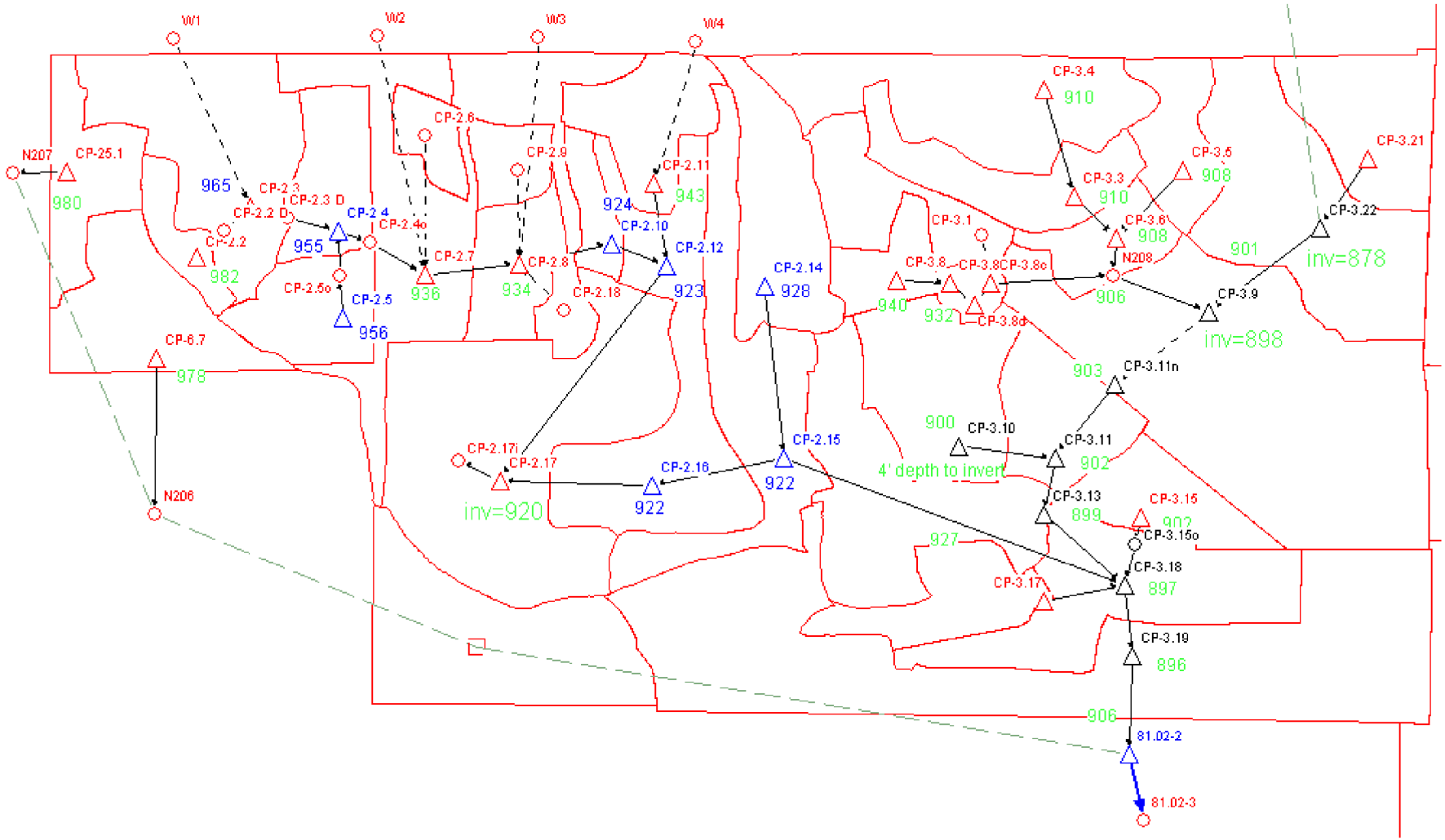
Stormwater Management

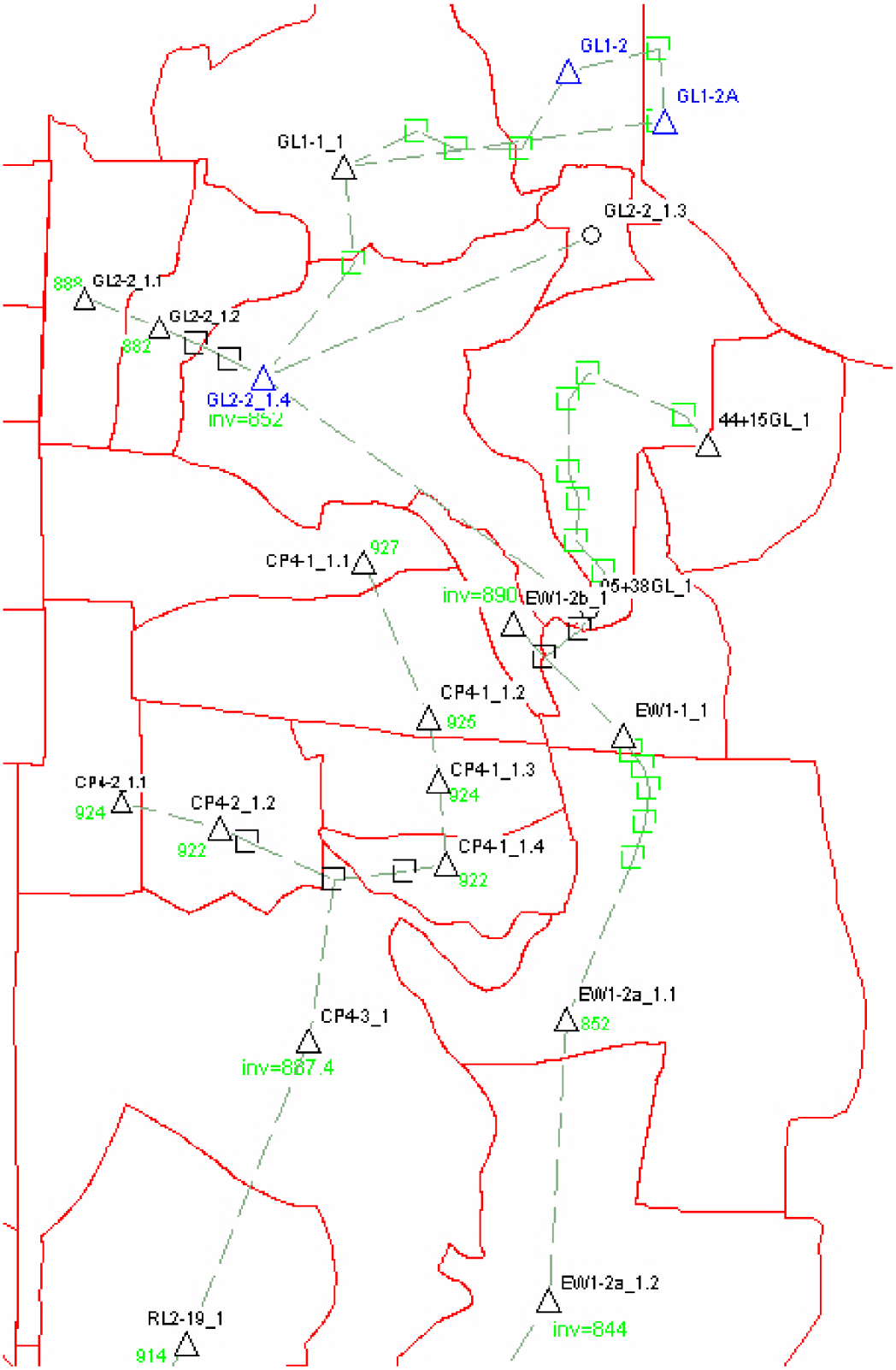
Report Reference	Report Name	Author	Owner	Adopted/Finalized/Creation Date
1	City of Cottage Grove Comprehensive Plan 2020		CG	Adopted - October 18,2000
2	City of Cottage Grove Surface Water Management Plan	BRAA	CG	Draft? - November, 1997
3	Engineer's Report: Central Draw Project and Flood Storage Area Maps	HDR	SWWD	Final - June 2002
4	Existing Conditions Cover Memorandum, August 16, 2000.DOC	EOR	SWWD	16-Aug-00
5	Future Conditions Cover Memorandum, Nov 1, 2000.doc	EOR	SWWD	1-Nov-00
7	City of Cottage Grove Alternative Urban Arawide Review (AUAR) Final Report	BRAA	CG	Adopted - December 3, 1997
8	City of Cottage Grove West Draw Study Area AUAR Draft Report	BRAA	CG	Draft - September, 1997
9	City of Cottage Grove Surface Water Management Plan	BRAA	CG	1st Draft - September, 1997
10	City of Woodbury Storm Drainage Plan	BRAA	WBY	31-Jul-79
11	City of Woodbury, Environmental Assessment Worksheet, Bailey Lake Stormwater Manage	3arr, NET	WBY	Feb-94
12	City of Woodbury Water Supply and Distribution Plan	BRAA	WBY	26-Apr-91
13	City of Cottage Grove Comprehensive Sewer Policy Plan	BRAA	CG	May 1992, 1996 Update
14	SWWD Central Draw Project and Flood Storage Area Maps	HDR	SWWD	Final - June 2002
15	SWWD Infiltration Management Study Phase I Report	EOR	SWWD	Draft - October 14, 1998
16	SWWD Annual Financial Report	TR	SWWD	Final - December 31, 1994
17	Powers Lake Management Plan, Washington County, MN	BRAA	SWWD	Final? - March 2000
18	City of Cottage Grove Surface Water Management Plan	BRAA	CG	Official Draft - November 1997
19	SWWD Erosion Potential by Shear Strees Analysis of Cottage Grove Ravine Regional Park	EOR	SWWD	Final? - January 28, 2002
20	Regional Park Lake Assessment, Washington County	BWS	SWWD	Final? - June 2000
21	Comprehensive Lake Management Plan for Ravine Lake, Washington County	BWS	SWWD	Final? - January 2003
22	SWWD Watershed Management Plan	BRAA	SWWD	Final? - July 1997, 2002 Update

APPENDIX F

Design Standard Matrix

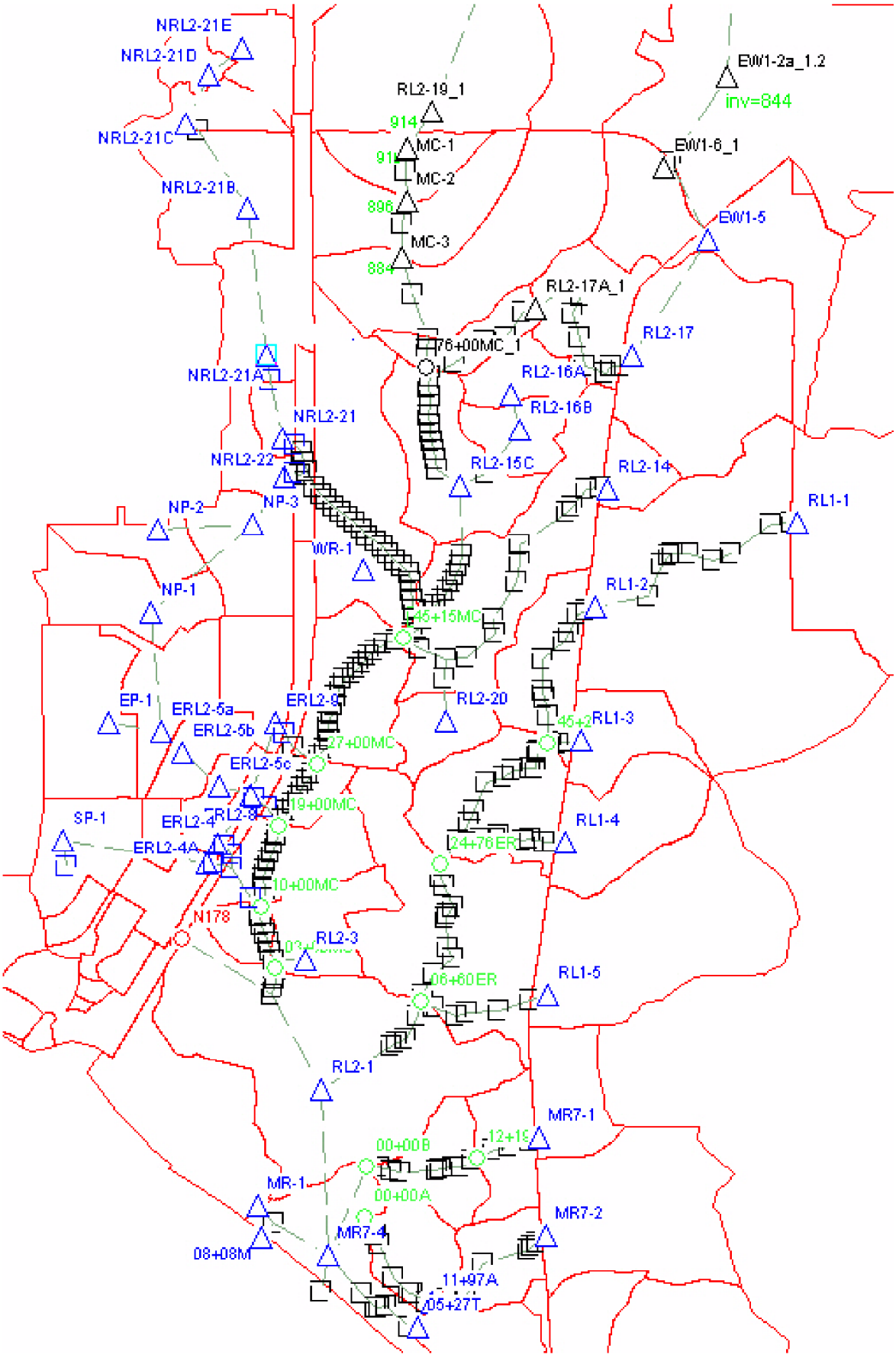
Facility	Cottage Grove SWMP	SWWD Rules	MPCA Phase II Erosion Control Permit
Flood Protection	2 foot freeboard over 100-year flood elevation (lowest opening)	2 foot freeboard over 100-year flood elevation (lowest exposed building wall)	
Detention Basins/Ponds	100-year, 24 hr or -10 day, which ever is greatest SCS TR-20 5- year bounce = 2 feet; 10-year bounce = 2.5 feet outflow = 2 to 5 yr pre-development flows peak discharge velocities into ravine < 5 fps Outlet riprap = 15 feet length, 10 feet width Clay lining not standard practice to encourage infiltration emergency overflow for storms exceeding 100-year erosion protection along overflow routes runoff reduction and infiltration encouraged hydraulically efficient shapes max pond depth = 7to8 feet side slopes not greater than 3:1 vegetated fringe 10-foot wide maintenance access to key pond areas skimming at pond and wetland outlets, 12" - 15" below NWL flow at skimmers < 1fps for 5 year event 2 or 3 cells considered for regional facilities	Post-development phosphorus loads limited to 75% increase above pre-development sealing of pond bottom not standard practice hydraulically efficient shape depths between 4 and 10 feet vegetated fringe, bench covered with topsoil to support veg. maintenance and sediment removal access required skimming structures for comm/ind ponds and at all outlets that discharge to waters	water quality volume = 1/2 of runoff from new impervious surface water quality volume is not discharged at rate greater than 5.66 cfs per acre of surface area basin outlets must have energy dissipation stabilized emergency overflow to accommodate storms in excess of basin design configuration to minimize scour or solids resuspension permanent volume must reach minimum depth of 3 feet and not greater than 10 feet adequate maintenance access (8'wide) for future maintenance of basin
Infiltration - for areas of high capacity and natural depressions	model basins as wet basins without infiltration capacity locate overflow 5 to 8 feet below natural overflow pretreatment for infiltration practices encourage on-site infiltration practices	 infiltration ponds encouraged design must include pre-treatment for sediment	pretreatment device, such as vegetated strip, sm sediment basin, or wq inlet must be used infiltration systems must not be excavated to final grade until contributing drainage area stabilized rigorous sediment and erosion controls during construction sized to infiltrate or filter volume of 1/2 inch from new impervious surfaces water quality volume shall discharge in 48 hours or less on site testing of soils to ensure 3' separation above seasonally saturated soils or bedrock calculations and computer model results must be included in SWPPP adequate maintenance access (8 feet) use for areas of vehicle fueling or maintenance areas is prohibited
Misc	erosion control plan in conformance with MPCA standards erosion control plan in conformance with SWWD rules wetland buffers as required by SWWD	maintenance program must be established by city in local plan	
Storm drain design	time of concentration > 15 minutes for trunk systems n = 0.013 open channels n = 0.04 trunk lines = 24" and greater manholes no greater than 400' for 15" drains and smaller manholes no greater than 500' for 18" to 30" lateral systems designed for 5 year event surcharging allowed, low areas must have drainage route ponding on street must meet 100-year design criterion ponding on street < 1 foot at deepest point storm drainage facilities designed with efficient hydraulic characteristics inlet structures to eliminate overland flow of 600' or 5 cfs for a 10-year event energy dissipation required outfall velocities < 4 fps do not require energy dissipation, must have riprap overland flow velocities greater than 8 fps require city approval open channels recommended minimum slope of 2% maintained in unlined channels slopes less than 1.5% are not allowed riprap at all channel junctions drainage facilities to take advantage of natural draws		
New developments	regional treatment ponds to serve areas between 20 and 60 acres phosphorus load = 175% of predevelopment load phosphorus concentration from treatment basins < 200 ppb		
Alternative stormwater management methods			achieve 80% removal of TSS all calculations must be in SWPPP 2-year monitoring plan required mitigation plan to treat water quality volume in case monitoring data shows system not effective design must consider public safety, health and water quality concerns proprietary information will not be considered no construction until MPCA approves


W1
W2
W3
W4
N207
CP-25.1
980
965
CP-2.3
CP-2.3 D
CP-2.2 D
CP-2.2
982
CP-2.4
CP-2.4o
955
CP-2.5o
CP-2.5
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CP-2.6
CP-2.7
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932
CP-3.8d
N208
906
CP-3.9
inv=898
903
CP-3.11n
900
CP-3.10
CP-3.11
902
4' depth to invert
CP-3.13
899
CP-3.15
907
CP-3.15o
927
CP-3.17
CP-3.18
897
CP-3.19
896
906
81.02-2
81.02-3


GL1-2
GL1-2A
GL1-1_1
GL2-2_1.3
888
GL2-2_1.1
GL2-2_1.2
882
GL2-2_1.4
inv=852
44+15GL_1
CP4-1_1.1
927
inv=890
EW1-2b_1
05+38GL_1
CP4-1_1.2
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EW1-1_1
CP4-1_1.3
924
CP4-2_1.1
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CP4-1_1.4
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RL2-19_1
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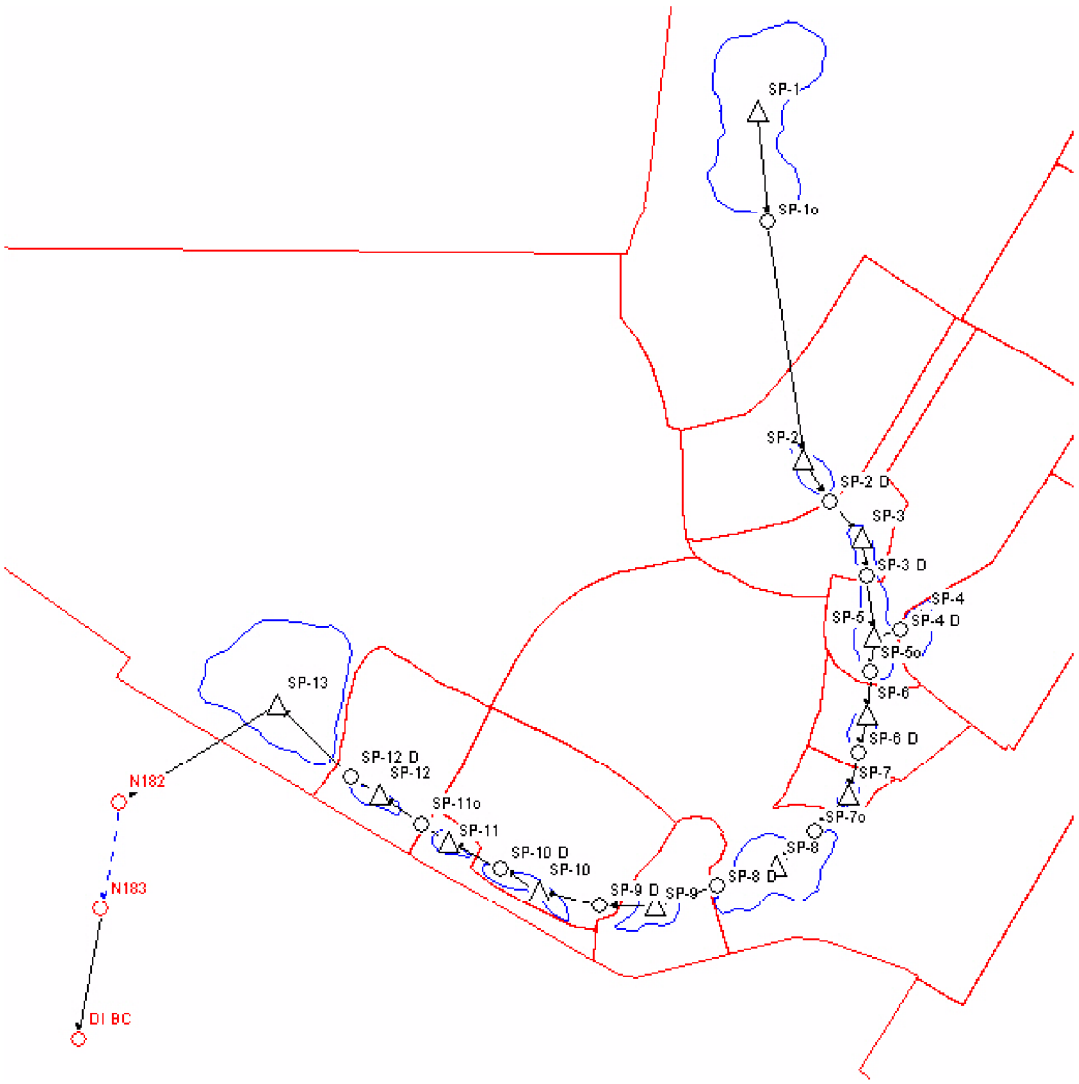
East Ravine Pre-Design
City of Cottage Grove

Figure 3



Neighborhood 2 South & Neighborhood 1 South XPSWMM Model Layout **02/25/05**

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Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.



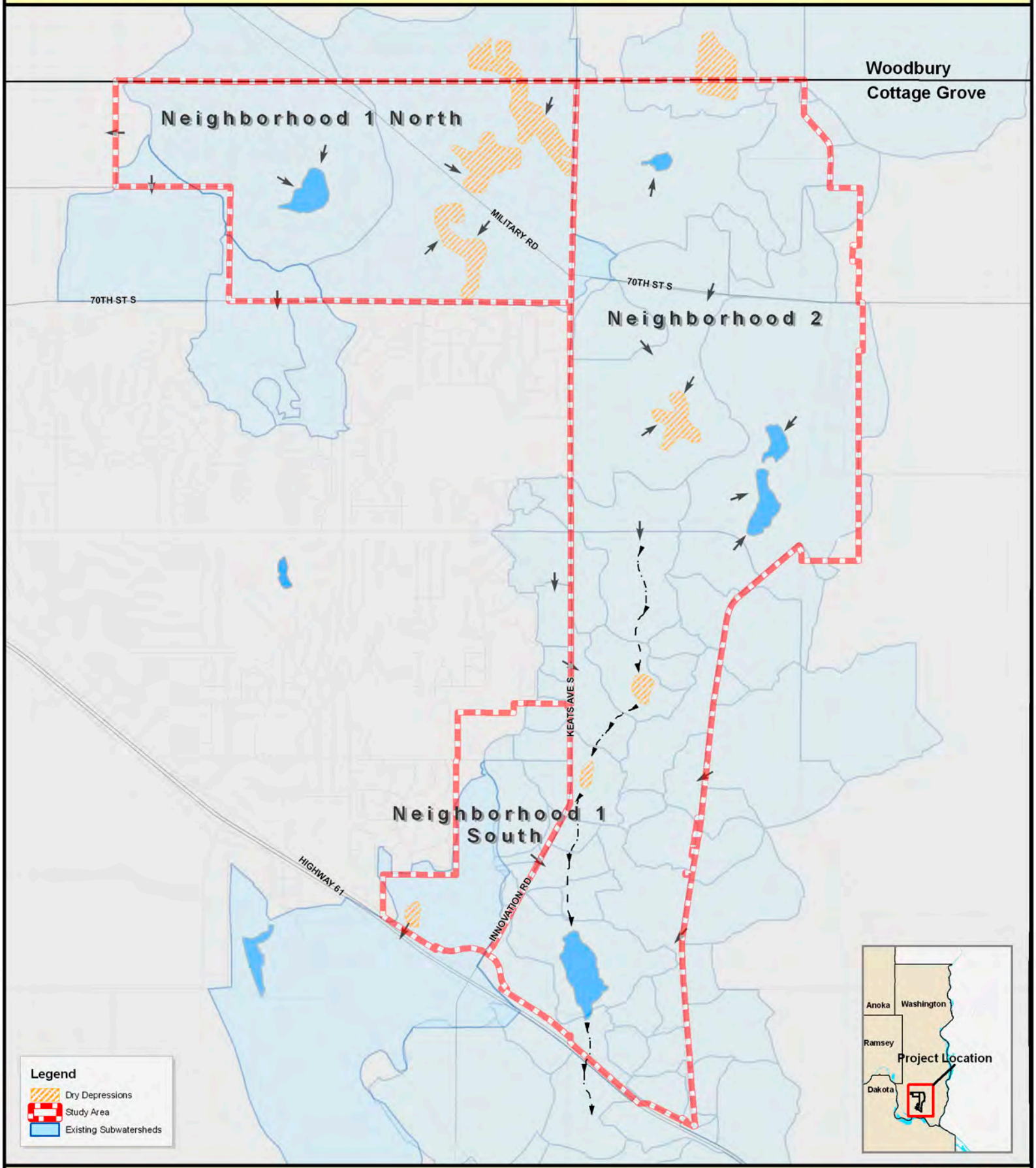
Neighborhood 1 South XPSWMM Model Layout

02/25/05

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

Figure 5



Existing Conditions

02/25/05

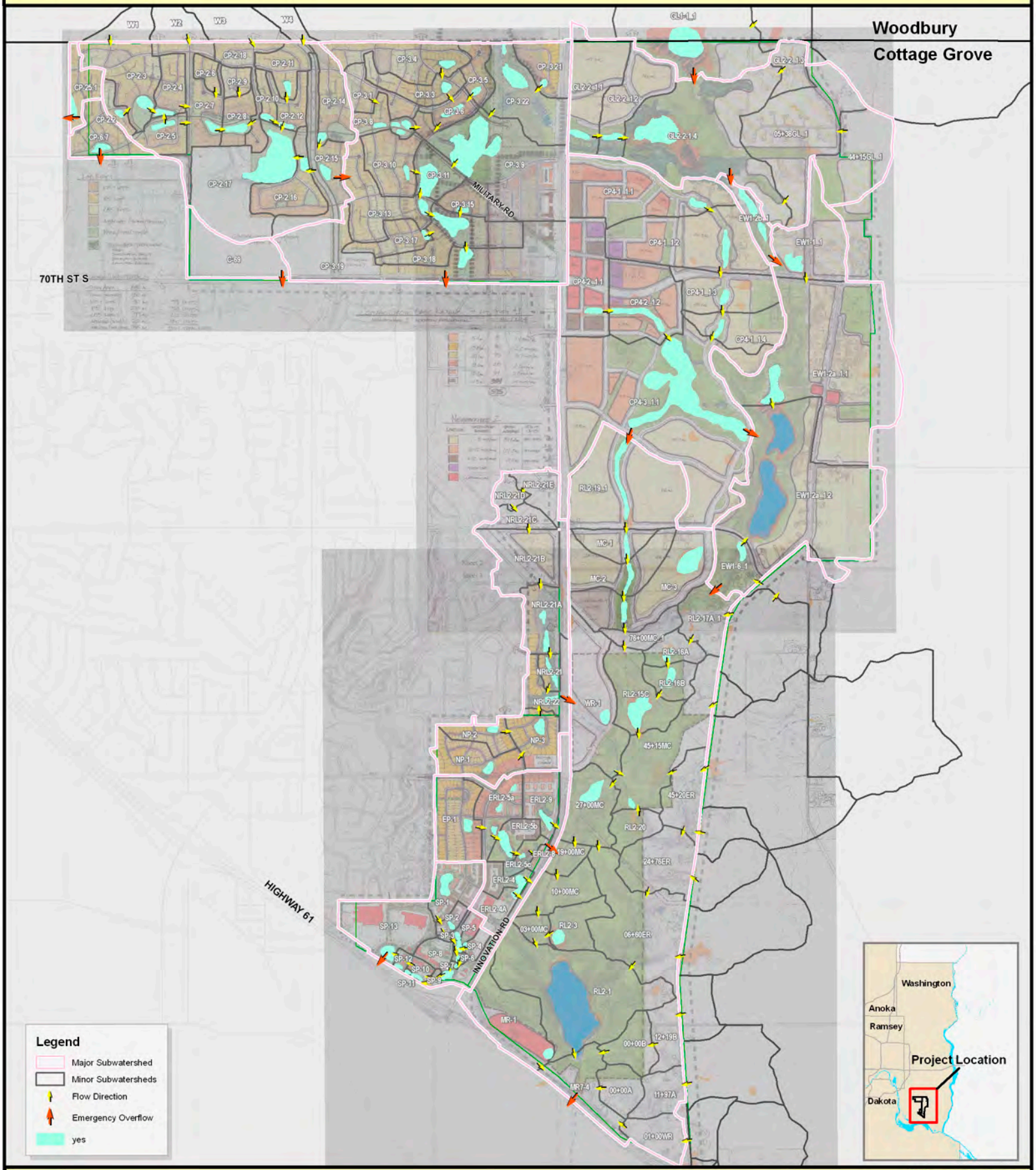
N

0 875 1,750 3,500 Feet

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

Figure 6



Proposed Conditions

02/25/05

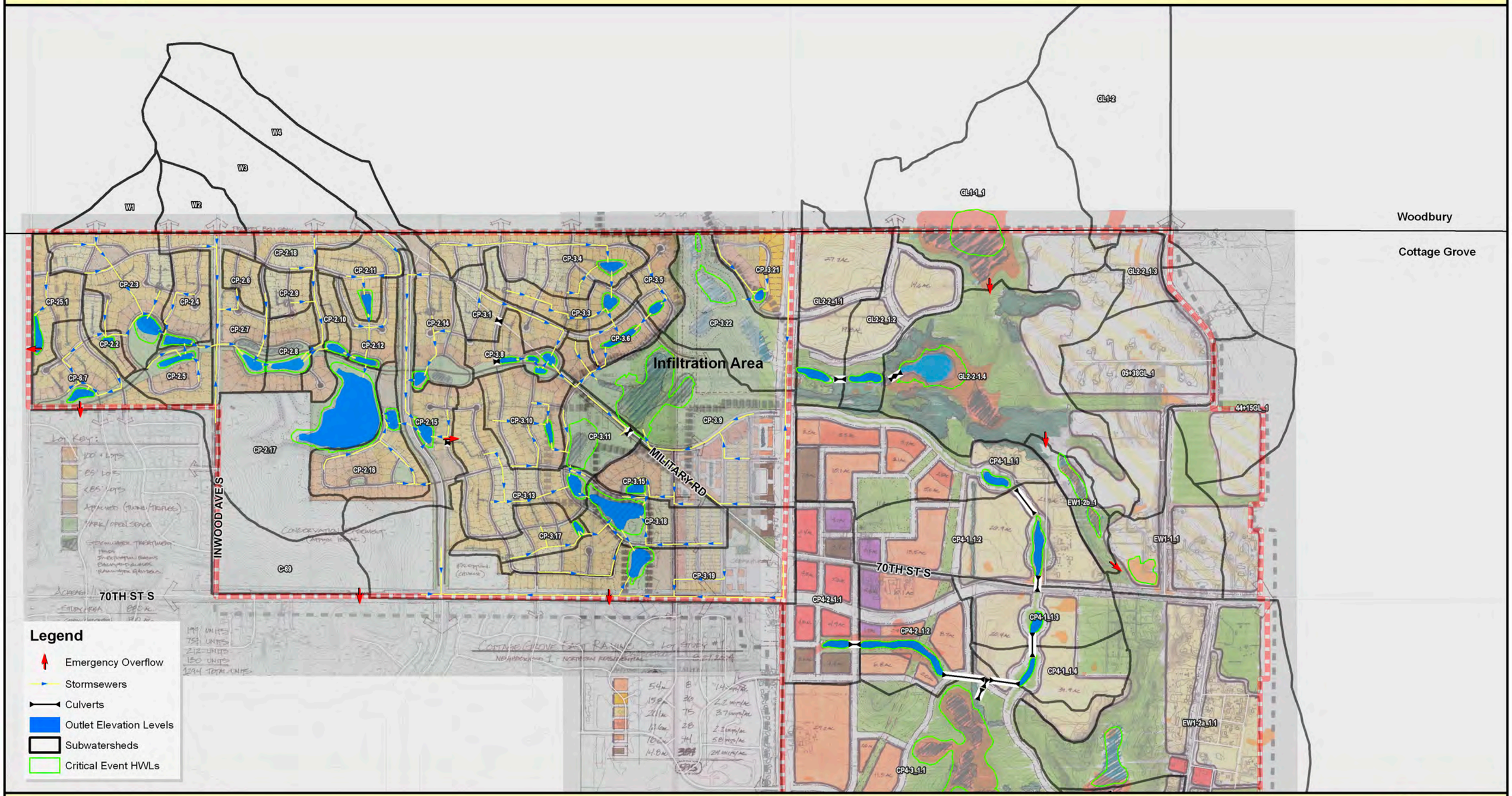
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Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd

East Ravine Pre-Design

City of Cottage Grove

Figure 7a



Stormwater Management Basins

02/25/05

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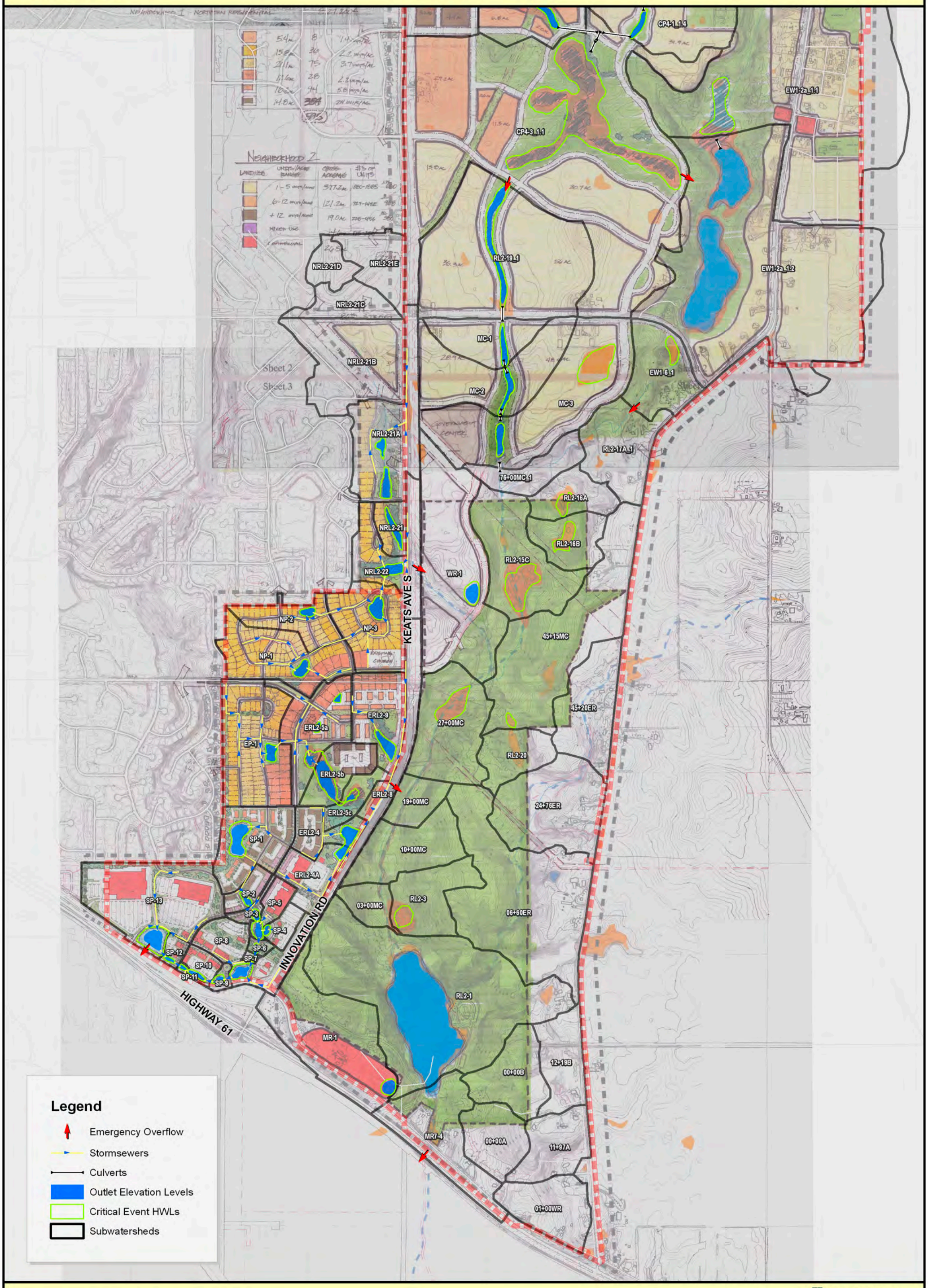
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Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design

City of Cottage Grove

Figure 7b



Stormwater Management Basins

02/25/05

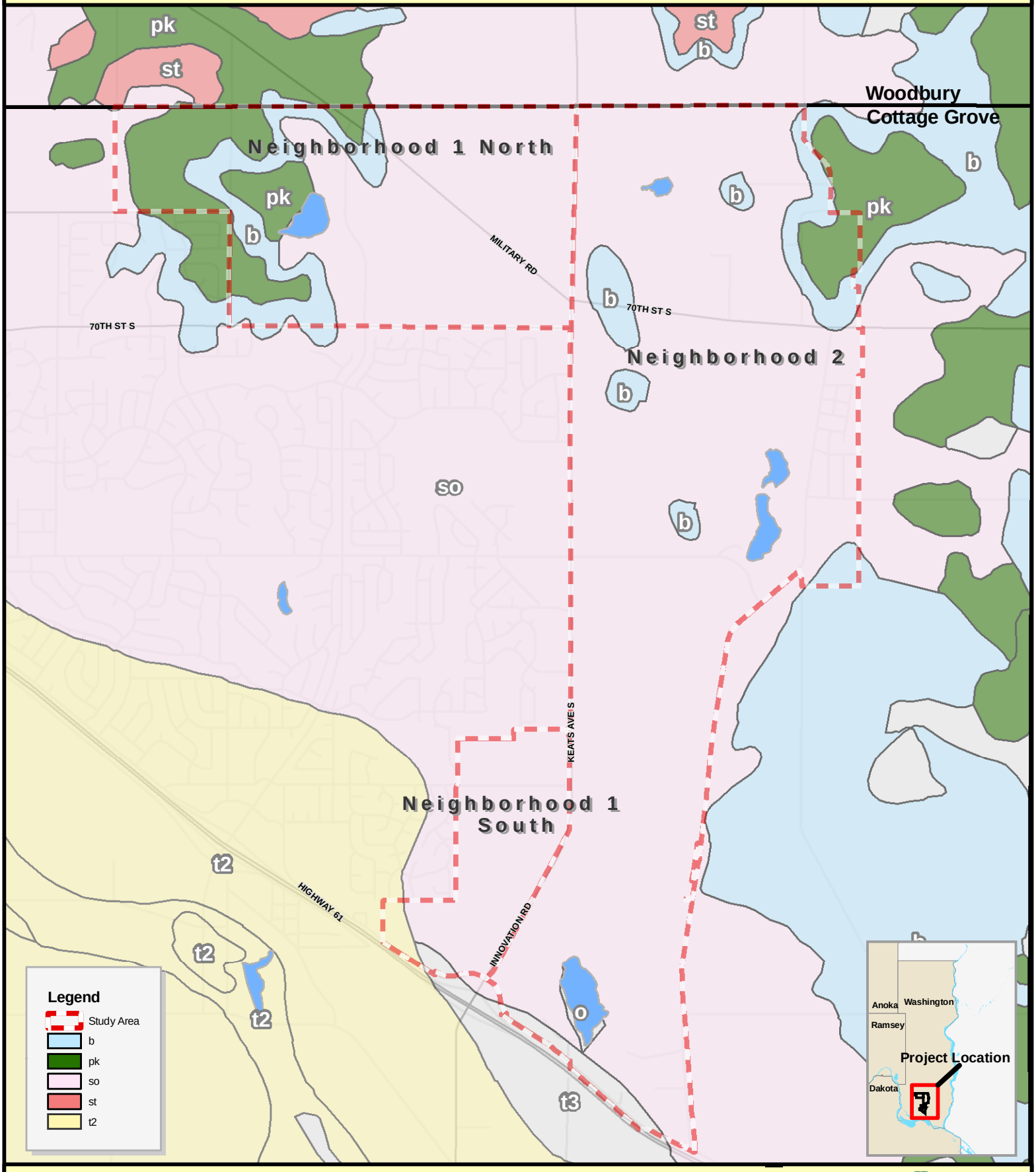
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0 400 800 1,600 Feet

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

Figure 9



Surficial Geology

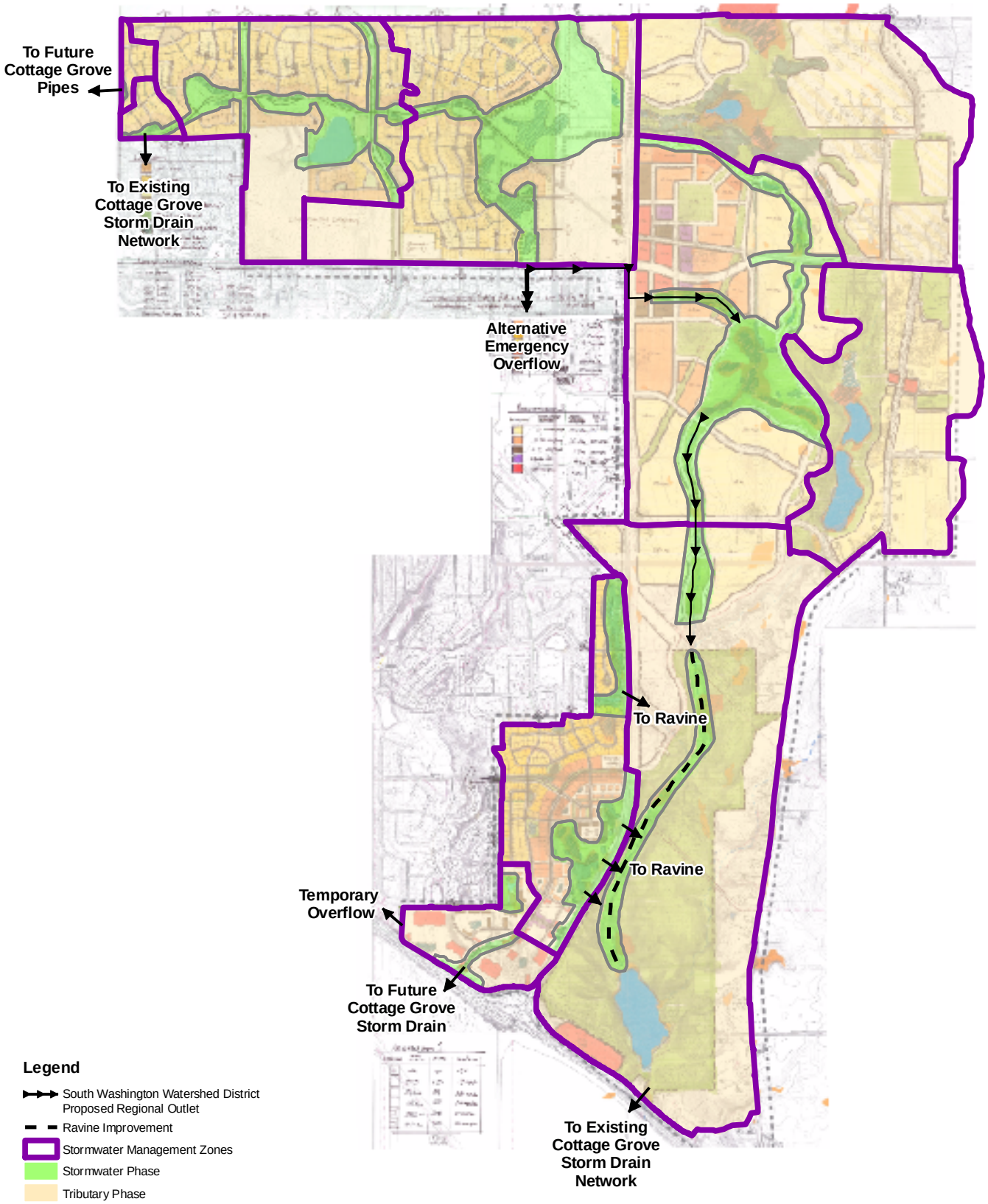
02/25/05

0 875 1,750 3,500
Feet

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

Figure 10



Phasing

02/25/05

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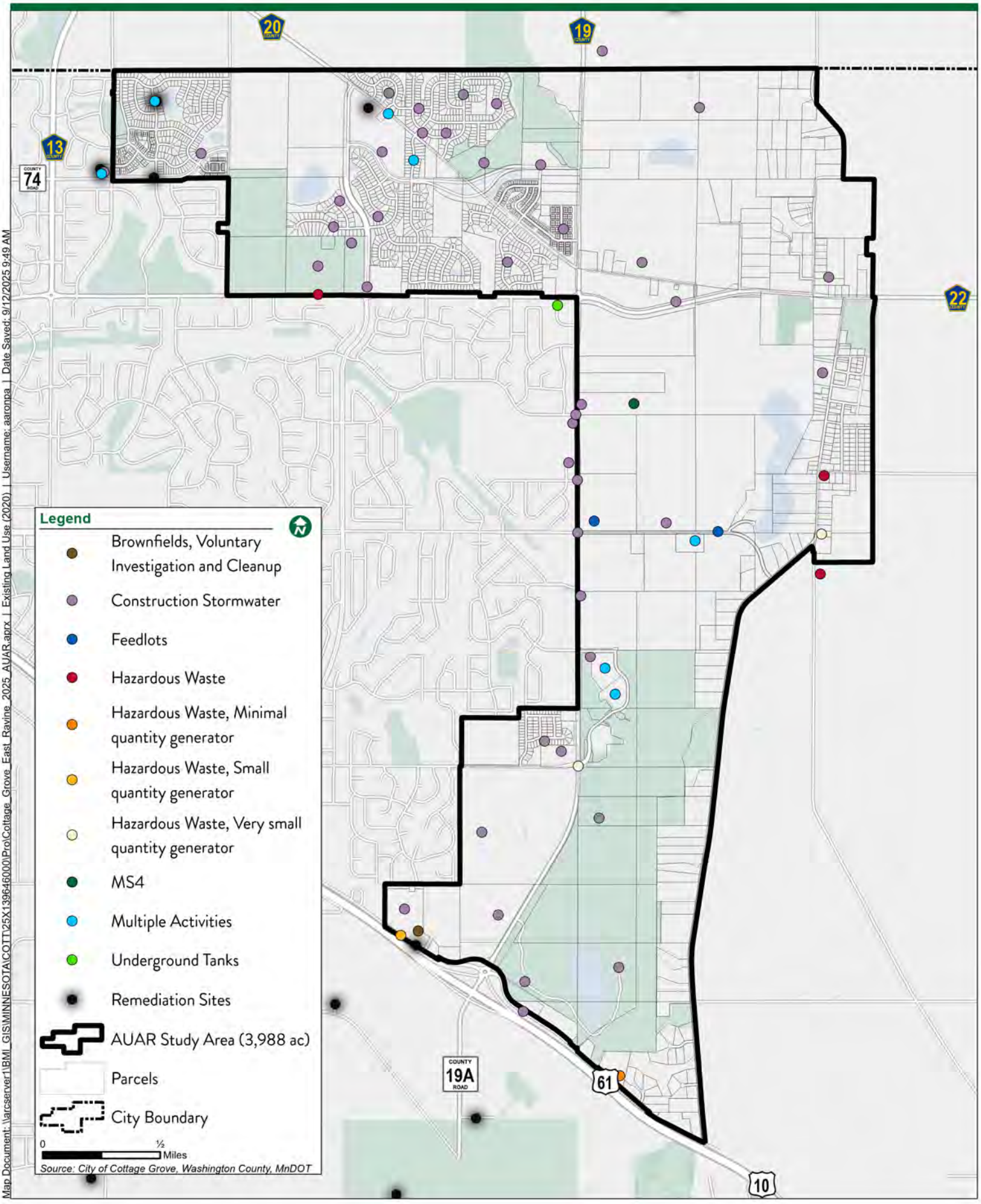
Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East River Ravine AUAR

City of Cottage Grove, Minnesota

MPCA What's In My Neighborhood

September 2025



Map Document: \\arcserver1\BMI_GIS\MINNESOTA\COTT\25X139646000\Pro\Cottage_Grove_East_Ravine_2025_AUAR.aprx | Existing Land Use (2020) | Username: aaronpa | Date Saved: 9/12/2025 9:49 AM

MINNESOTA POLLUTION CONTROL AGENCY

South Washington County Schools Transit

Site ID	LS0022421
Site type	Leak Site
Location	8587 W Point Douglas Rd S Cottage Grove, MN 55016 Washington County
Release discovered	05/13/2025
Release reported	05/16/2025
Site closure date	Active
Product released	Diesel
Regulatory designation	Federal
Project manager	Knox, Wesley



lat/long: 44.8191003,-92.94364165

Cleanup actions

There are no cleanup actions to display for this site.

Site contacts

Type	Name	Address	Start date	End date
has Responsible Party of	Kyle Uecker	7362 E Point Douglas Rd S Cottage Grove, Minnesota 550163025	05/16/2025	
has Responsible Party of	South Washington County School District ISD 833	7362 E Point Douglas Rd S Cottage Grove, Minnesota 550163025	05/16/2025	
has property owner of	South Washington County School District ISD 833	7362 E Point Douglas Rd S Cottage Grove, Minnesota 550163025	05/16/2025	

Treatments

There are no treatments to display for this site.

Reporting

Task	Start	End
Leak Discovered	05/13/2025	05/13/2025
Leak Reported	05/16/2025	05/16/2025

Task	Start	End
Responsible Party Determined	05/22/2025	05/22/2025
Standard Letter Issued	05/28/2025	05/28/2025

Field work

Notice received	Work date	Start time	Consultant	Contractor	Work type
07/02/2025	07/03/2025	08:30 AM	American Engineering Testing, Inc.	Traut Companies	Soil Borings

Release details

Tank type	UST
Tank material	Steel
Piping material	Unknown
Source of the release	Tank
Cause of the release	Unknown
Release detection method	Removal
Has the site ever had an E-85 tank?	No

MINNESOTA POLLUTION CONTROL AGENCY

Zieba and Morgan Residence

Site ID	LS0021190
Site type	Leak Site
Location	8251 River Acre Rd S Cottage Grove, MN 55016 Washington County
Release discovered	12/10/2019
Release reported	12/11/2019
Site closure date	Active
Product released	Fuel Oil #1 & #2
Regulatory designation	Non-regulated
Project manager	Allen, Luis
Hydrologist	Tusa, Rose



lat/long: 44.78199838,-92.93955463

Groundwater

Drinking water contamination	Free product observed at closure	Maximum free product thickness	Groundwater contamination	Regional groundwater flow direction
No	Unknown	Unknown	No	Unknown

Cleanup actions

Type	Quantity
Vapor Mitigation	

Site contacts

Type	Name	Address	Start date	End date
has Responsible Party of	River Country Cooperative	425 Clinton Ave South Saint Paul, Minnesota 550755910	12/11/2019	
has Responsible Party of	Jeffery Zieba and Morgan Bronwen c/o Jason Gamachel	6336 Oakgreen Ave S Denmark Township, Minnesota 550339469	12/11/2019	
has Responsible Party of	Mark Larsen	425 Clinton Ave South Saint Paul, Minnesota 550755910	12/11/2019	

Treatments

There are no treatments to display for this site.

Reporting

Task	Start	End
Leak Discovered	12/10/2019	12/10/2019
Leak Reported	12/11/2019	12/11/2019
Responsible Party Determined	12/18/2019	12/18/2019
Standard Letter Issued	12/20/2019	01/06/2020
Limited Site Investigation Reviewed	05/14/2021	06/21/2021
Technical Review of Limited Site Investigation Report Completed	05/14/2021	06/21/2021
Technical Review of Monitoring Report Completed	12/02/2022	01/13/2023
Monitoring Report Reviewed	12/02/2022	01/25/2023
More Work Requested	01/25/2023	01/25/2023
Technical Review of Letter Report Completed	01/22/2024	04/29/2024
Letter Report Reviewed	01/22/2024	04/30/2024

Field work

Notice received	Work date	Start time	Consultant	Contractor	Work type
02/01/2021	02/03/2021	09:00 AM	West Central Environmental Consultants	Dakota Technologies Inc.	Soil Borings Sub-Slab Soil Gas Sampling
04/07/2021	04/09/2021	10:00 AM	West Central Environmental Consultants		Sub-Slab Soil Gas Sampling
07/19/2022	07/20/2022	09:30 AM	West Central Environmental Consultants		Sub-Slab Soil Gas Sampling
08/10/2022	08/11/2022	09:30 AM	West Central Environmental Consultants		Indoor Air Sampling Sub-Slab Soil Gas Sampling
09/20/2022	09/21/2022	10:00 AM	West Central Environmental Consultants		Indoor Air Sampling Sub-Slab Soil Gas Sampling
03/15/2023	03/16/2023	10:00 AM	West Central Environmental Consultants		Indoor Air Sampling Sub-Slab Soil Gas Sampling

Release details

Tank type	UST

Tank material	Unknown
Piping material	Unknown
Source of the release	Delivery Problem
Cause of the release	Human Error
Release detection method	Visual/Olfactory
Has the site ever had an E-85 tank?	No

Formal Natural Heritage Review - Cover Page

See next page for results of review. A draft watermark means the project details have not been finalized and the results are not official.

Project Name: Cottage Grove East Ravine AUAR Update 2025 (25X.139646)

Project Proposer: City of Cottage Grove, MN

Project Type: Development, Mixed Use

Project Type Activities: Wetland impacts (e.g., dewatering, tiling, drainage, discharge, excavation, fill, runoff, sedimentation, changes in hydrology);Tree Removal;Grading;Other

TRS: T27 R21 S1, T27 R21 S10, T27 R21 S11, T27 R21 S12, T27 R21 S13, T27 R21 S14, T27 R21 S15, T27 R21 S2, T27 R21 S22, T27 R21 S23, T27 R21 S26, T27 R21 S27 +

County(s): Washington

DNR Admin Region(s): Central

Reason Requested: Other

Project Description: The city of Cottage Grove, MN is completing their 5-year AUAR update process. The project takes place in Cottage Grove, MN, Washington County, specifically ...

Existing Land Uses: Past and current land uses in the project area have primarily been agricultural. Some farmsteads exist which generally consist of residential structures ...

Landcover / Habitat Impacted: Mostly agricultural land will be converted to developed land. The proposed development pattern seeks to preserve a significant portion of the project area ...

Waterbodies Affected: Within the study area, there are four wetlands, two are named (Lake Robert and Gables) and two are unnamed. Additionally, there is an unnamed creek, kittle ...

Groundwater Resources Affected: Dust and sediment control will be used during construction to minimize and avoid permanent impacts on surrounding vegetation and waterbodies. A construction ...

Previous Natural Heritage Review: Yes, ERDB#: 20210043

Previous Habitat Assessments / Surveys: No

SUMMARY OF AUTOMATED RESULTS

Category	Results	Response By Category
Project Details	Comments	Tree Removal - Recommendations
Ecologically Significant Area	Comments	MBS Sites - Recommendations Potential Local Conservation Value Potential RNC under WCA NPCs - Recommendations
State-Listed Endangered or Threatened Species	Needs Further Review	State-protected Species - Needs Further Review

Category	Results	Response By Category
State-Listed Species of Special Concern	Comments	Recommendations
Federally Listed Species	Comments	Visit IPaC for Federal Review RPBB High Potential Zone

DEPARTMENT OF NATURAL RESOURCES

July 18, 2025

Project Name: Cottage Grove East Ravine AUAR Update 2025 (25X.139646)
Project Proposer: City of Cottage Grove, MN
Project Type: Development, Mixed Use
Project ID: MCE #2025-00621

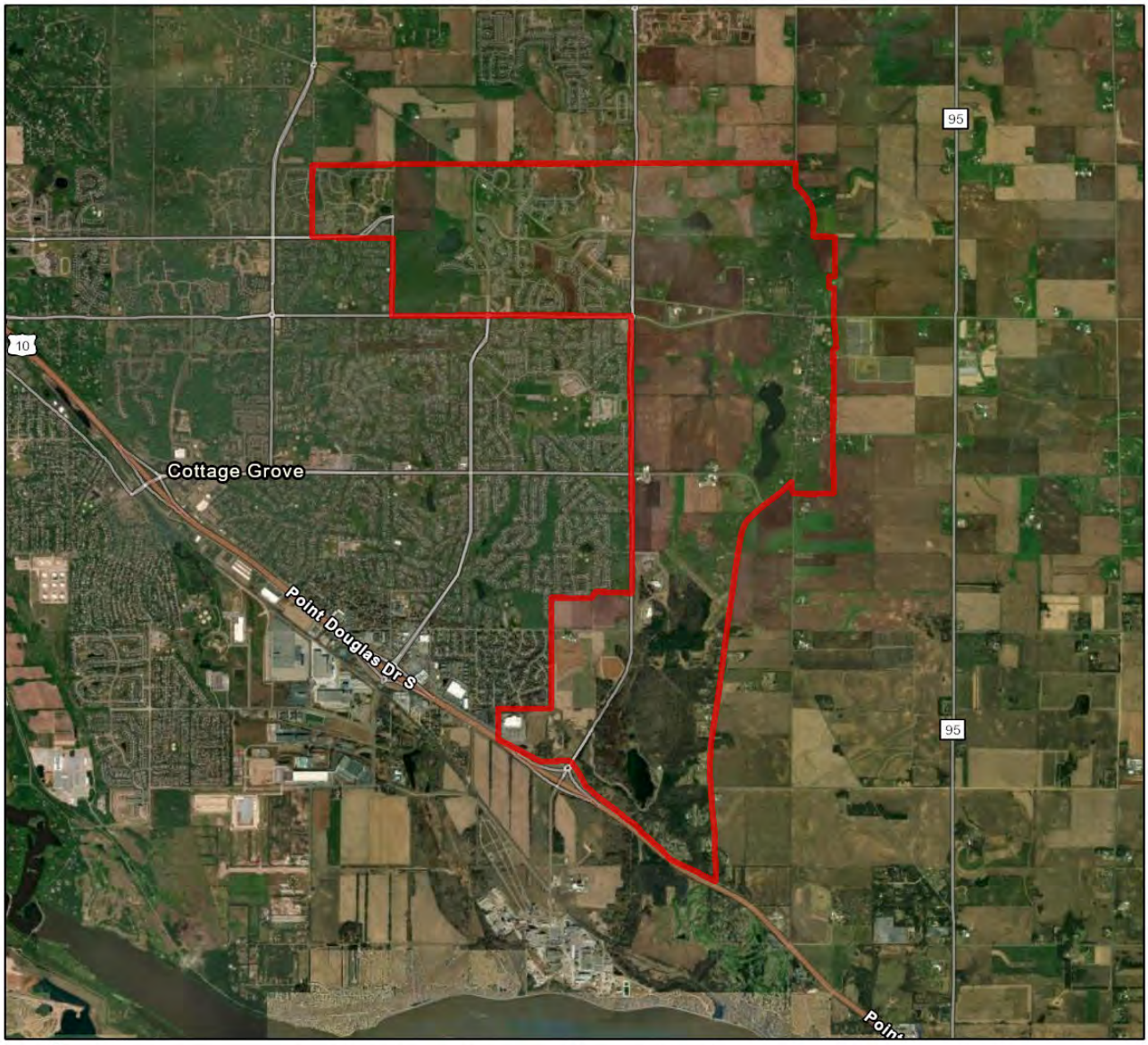
AUTOMATED RESULTS: FURTHER REVIEW IS NEEDED
As requested, the above project has undergone an automated review for potential impacts to rare features. Based on this review, one or more rare features may be impacted by the proposed project and further review by the Natural Heritage Review Team is needed. You will receive a separate notification email when the review process is complete and the Natural Heritage Review letter has been posted.

Please refer to the table on the cover page of this report for a summary of potential impacts to rare features. For additional information or planning purposes, use the Explore Page in Minnesota Conservation Explorer to view the potentially impacted rare features or to create a Conservation Planning Report for the proposed project.

If you have additional information to help resolve the potential impacts listed in the summary results, please attach related project documentation in the Edit Details tab of the Project page. Relevant information includes, but is not limited to, additional project details, completed habitat assessments, or survey results. This additional information will be considered during the project review.

ottage Grove East Ravine AUAR Update 2025 (25X.13964

Aerial Imagery With Locator Map



N
W E
S

0 0.4 0.8 1.6 2.4 3.2 Miles

Project Boundary

Project Type: Development, Mixed Use

Project Size (acres): 4,011.83

County(s): Washington

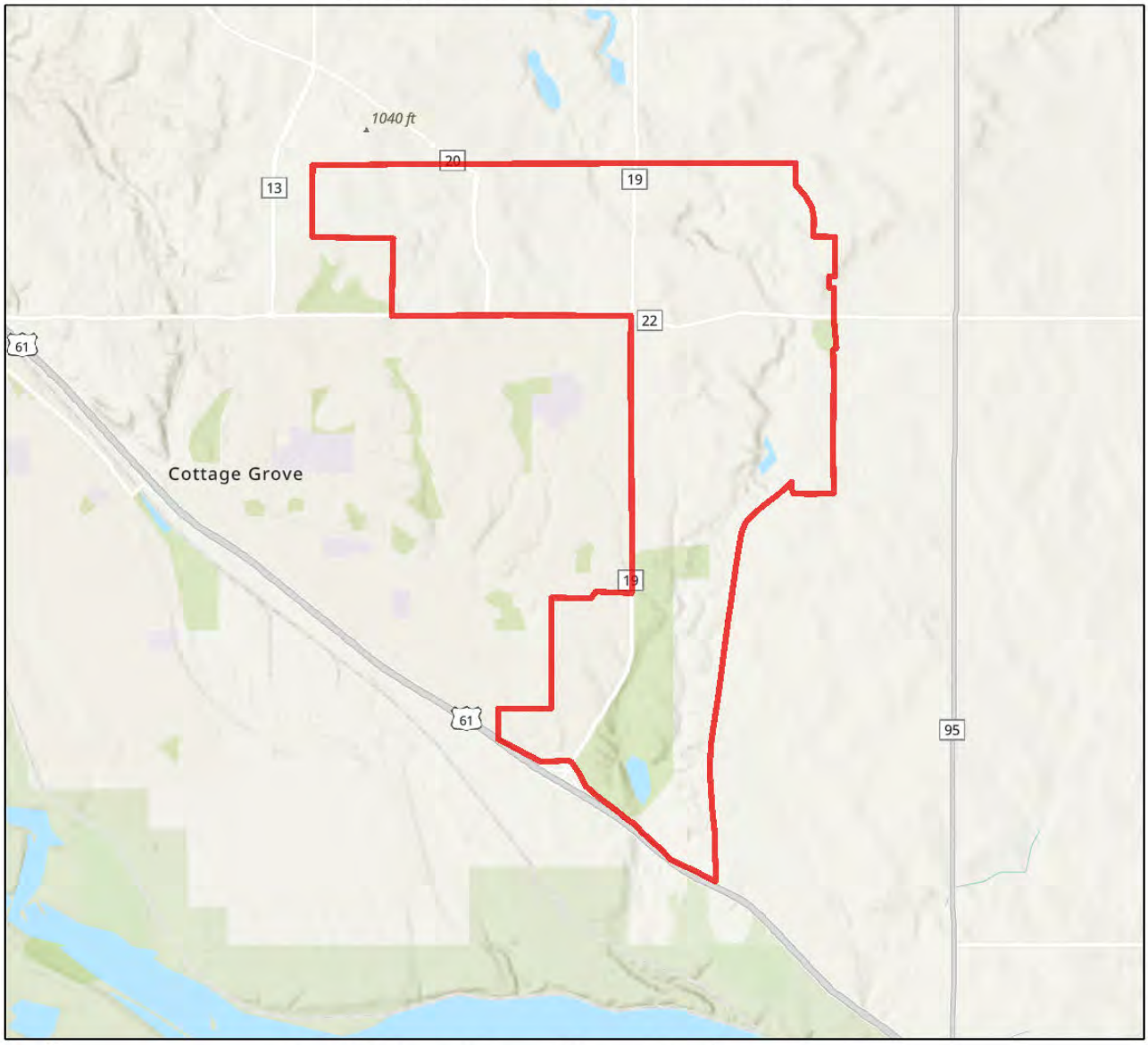
TRS: T27 R21 S1, T27 R21 S10, T27 R21 S11, T27 R21 S12, T27 R21 S13 +

Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
County of Dakota, Metropolitan Council, MetroGIS, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA,



ottage Grove East Ravine AUAR Update 2025 (25X.13964

USA Topo Basemap With Locator Map



N
W E
S

0 0.4 0.8 1.6 2.4 3.2 Miles

Project Boundary

Project Type: Development, Mixed Use

Project Size (acres): 4,011.83

County(s): Washington

TRS: T27 R21 S1, T27 R21 S10, T27 R21 S11, T27 R21 S12, T27 R21 S13 +

Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
County of Dakota, Metropolitan Council, MetroGIS, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA,



Conservation Planning Report: Cottage Grove East Ravine AUAR Update 2025 (25X.139646)

This document is intended for planning purposes only for the area of interest defined by the user. The report identifies ecologically significant areas documented within the defined area of interest plus any additional search distance indicated below. These ecologically significant areas can be viewed in the Explore Tab of the Minnesota Conservation Explorer. Please visit MN Geospatial Commons for downloadable GIS data.

This document does not meet the criteria for a Natural Heritage Review. If a Natural Heritage Review is needed, please define an Area of Interest in the Explore Tab and click on the Natural Heritage Review option.

This document does not include known occurrences of state-listed or federally listed species.

MBS Sites of Biodiversity Significance

Search distance = 330 feet

Minnesota Biological Survey (MBS) Sites of Biodiversity Significance are areas with varying levels of native biodiversity that may contain high quality native plant communities, rare plants, rare animals, and/or animal aggregations. A Biodiversity Significance Rank is assigned on the basis of the number of rare species, the quality of the native plant communities, size of the site, and context within the landscape. MBS Sites are ranked Outstanding, High, or Moderate. Areas ranked as Below were found to be disturbed and are retained in the layer as negative data. These areas do not meet the minimum biodiversity threshold for statewide significance but may have conservation value at the local level as habitat for native plants and animals, corridors for animal movements, buffers surrounding higher quality natural areas, or as areas with high potential for restoration of native habitat. The DNR recommends avoidance of MBS Sites of Biodiversity Significance ranked High or Outstanding.

Wetlands within MBS Sites of Outstanding or High Biodiversity Significance may be considered Rare Natural Communities under the Wetland Conservation Act. For technical guidance on Rare Natural Communities, please visit WCA Program Guidance and Information.

For more information please visit MBS Sites of Biodiversity Significance.

The following MBS Sites of Biodiversity Significance are within the search area:

MBS Site Name	Biodiversity Significance	Status
COTTAGE GROVE 4	Below	final
COTTAGE GROVE 22	Moderate	final
COTTAGE GROVE DRIVE-IN THEATER	Below	final
COTTAGE GROVE RAVINE REGIONAL PARK	Moderate	final

DNR Native Plant Communities

Search distance = 330 feet

A native plant community is a group of native plants that interact with each other and with their environment in ways not greatly altered by modern human activity or by introduced organisms. These groups of native plant species form recognizable units, such as oak savannas, pine forests, or marshes, that tend to repeat over space and time. Native plant communities are classified and described by considering vegetation, hydrology, landforms, soils, and natural disturbance regimes.

DNR Native Plant Community types and subtypes are given a Conservation Status Rank that reflects the relative rarity and endangerment of the community type in Minnesota. Conservation Status Ranks range from S1 (critically imperiled) to S5 (secure, common, widespread, and abundant). Native plant communities with a Conservation Status Rank of S1 through S3 are considered rare in the state. The DNR recommends avoidance of rare native plant communities.

Wetland native plant communities with a conservation status rank of S1 through S3 may also be considered Rare Natural Communities under the Wetland Conservation Act. For technical guidance on Rare Natural Communities, please visit WCA Program Guidance and Information.

DNR Native Plant Communities may be given a Condition Rank that reflects the degree of ecological integrity of a specific occurrence of a native plant community. The Condition Rank is based on species composition, vegetation structure, ecological processes and functions, level of human disturbance, presence of exotic species, and other factors. Condition Ranks range from A-rank (excellent ecological integrity) to D-rank (poor ecological integrity. A Condition Rank of NR means Not Ranked and a Condition Rank of MULTI mean multiple ranks are present because the record is a native plant community complex.

For more information please visit Minnesota's Native Plant Communities.

The following DNR Native Plant Communities are within the search area:

MBS Site Name	NPC Code	Native Plant Community Classification	Conservation Status Rank	Number of Communities
COTTAGE GROVE 4	FDs37a	Oak - (Red Maple) Woodland	S4	1
COTTAGE GROVE 22	UPs13b	Dry Sand - Gravel Prairie (Southern)	S2	1
COTTAGE GROVE DRIVE-IN THEATER	UPs13b	Dry Sand - Gravel Prairie (Southern)	S2	1
COTTAGE GROVE RAVINE REGIONAL PARK	FDs37a	Oak - (Red Maple) Woodland	S4	1
COTTAGE GROVE RAVINE REGIONAL PARK	MRn93	Northern Bulrush-Spikerush Marsh	(S2, S3)	1
COTTAGE GROVE RAVINE REGIONAL PARK	UPs13b	Dry Sand - Gravel Prairie (Southern)	S2	2

Calcareous Fens

Search distance = 5 miles

A calcareous fen is a rare and distinctive peat-accumulating wetland that is legally protected in Minnesota under the Wetland Conservation Act (*Minnesota Statutes*, section 103G.223). Many of the unique characteristics of calcareous fens result from the upwelling of groundwater through calcareous substrates. Because of this dependence on groundwater hydrology, calcareous fens can be affected by nearby activities or even those several miles away. For more information regarding calcareous fens, please see the Calcareous Fen Fact Sheet or review the List of Known Calcareous Fens.

SEARCH RESULTS: No features were found within the search area.

DNR Old Growth Stands

Search distance = 330 feet

Old-growth forests are natural forests that have developed over a long period of time, generally at least 120 years, without experiencing severe, stand-replacing disturbances such as fires, windstorms, or logging. Old-growth forests are a unique, nearly vanished piece of Minnesota's history and ecology; less than 4% of Minnesota's old-growth forests remain. The DNR recommends avoidance of all DNR Old Growth Stands. The following DNR Old Growth Stands have been documented within the search area.

SEARCH RESULTS: No features were found within the search area.

MN Prairie Conservation Plan

Search distance = 330 feet

The Minnesota Prairie Conservation Plan, a twenty-five year strategy for accelerating prairie conservation in the state, identifies Core Areas, Corridors, and Corridor Complexes as areas to focus conservation efforts. The Plan's strategies include protection, enhancement, and restoration of grassland and wetland habitat. To meet the Plan's goals, approaches within Core Areas will need to include restoration and approaches within Corridors will need to include conservation of grassland habitat which can provide stepping stones between larger Core Areas.

SEARCH RESULTS: No features were found within the search area.

Important Bird Areas

Search distance = 1 mile

Important Bird Areas, identified by Audubon Minnesota in partnership with the DNR, are part of an international conservation effort aimed at conserving globally important bird habitats. They are voluntary and non-regulatory, but the designation demonstrates the significant ecological value of the area.

The following Important Birds Areas are within the search area:

- Mississippi River Twin Cities Important Bird Area

Lakes of Biological Significance

Search distance = 330 feet

Lakes of Biological Significance are high quality lakes as determined by the aquatic plant, fish, bird, or amphibian communities present within the lake. To be included in this layer, a lake only needs to meet the criteria for one of these four community types. The lake is assigned a biological significance of Outstanding, High, or Moderate based on the community with the highest quality.

SEARCH RESULTS: No features were found within the search area.

USFWS Habitat Conservation Plans

A Habitat Conservation Plan (HCP) is a mechanism for compliance with the federal Endangered Species Act for a given set of activities and protected species. An HCP is required by the U.S. Fish and Wildlife Service (USFWS) as part of an application for an incidental take permit (ITP). The ITP allows the permit holder to proceed with activities covered in the HCP that could result in the unintentional take of federally listed species.

Lakes States Forest Management Bat Habitat Conservation Plan (Bat HCP): (search distance = 0; within area of interest only) This HCP was created to provide flexibility to the Minnesota Department of Natural Resources (DNR) to manage forests while addressing federal Endangered Species Act (ESA) regulations related to federally threatened and endangered bat species. The Bat HCP covers three bat species within Minnesota: northern long-eared bat, little brown bat, and tricolored bat. This report is intended to help non-federal, non-DNR landowners evaluate their potential eligibility for the Landowner Enrollment Program of the Bat HCP (For DNR-administered land, DNR staff should refer to the Bat HCP Implementation Policy).

Landowner Enrollment Program – DNR's incidental take permit may be extended through the Landowner Enrollment Program (LEP) to eligible non-federal landowners who conduct forest management activities. Landowners may be eligible to enroll in the LEP if they are a county land administrator, own more than 10,000 acres, or own land that overlaps a Bat HCP feature. The results below indicate if the defined area of interest overlaps a Bat HCP feature. For more information on how to enroll in the LEP, please visit the Landowner Enrollment Program (LEP).

SEARCH RESULTS: No Bat HCP features were found within the area of interest. Landowners are only eligible to apply for the Landowner Enrollment Program if they are a county land administrator or they own more than 10,000 acres.

USFWS Regulatory Layers

To ensure compliance with federal law, conduct a federal regulatory review using the U.S. Fish and Wildlife Service's (USFWS) online Information for Planning and Consultation (IPaC) tool. This report is not a substitution for a Section 7 review.

For informational purposes only, this tool currently checks the following USFWS Regulatory Layers:

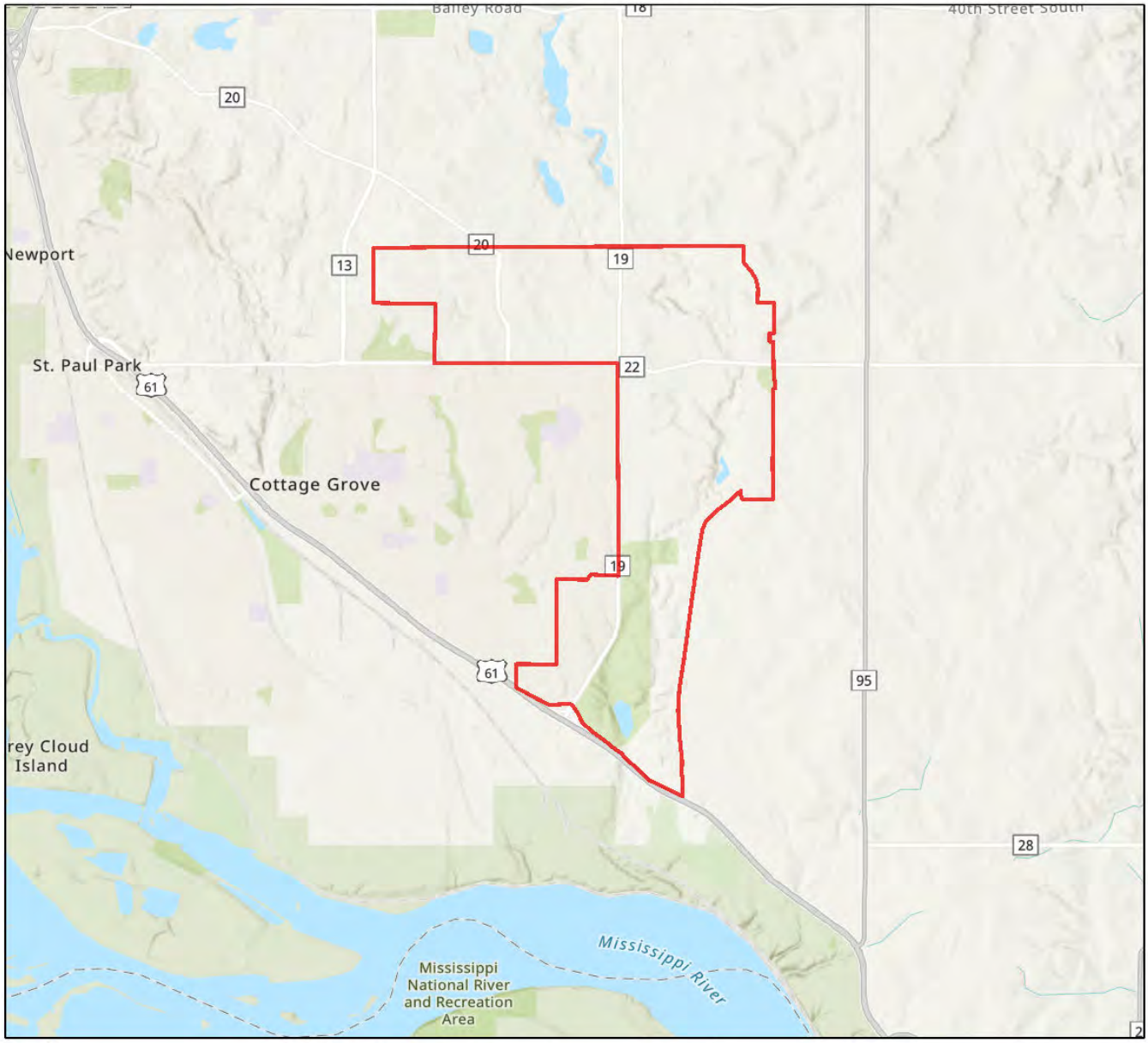
Rusty Patched Bumblebee High Potential Zones: (*search distance = 0; within area of interest only*) The rusty patched bumble bee (*Bombus affinis*), federally listed as endangered, is likely to be present in suitable habitat within the high potential zones. From April through October this species uses underground nests in upland grasslands, shrublands, and forest edges, and forages where nectar and pollen are available. From October through April the species overwinters under tree litter in upland forests and woodlands. The rusty patched bumble bee may be impacted by a variety of land management activities including, but not limited to, prescribed fire, tree-removal, haying, grazing, herbicide use, pesticide use, land-clearing, soil disturbance or compaction, or use of non-native bees. The USFWS RPBB guidance provides guidance on avoiding impacts to rusty patched bumble bee and a key for determining if actions are likely to affect the species; the determination key can be found in the appendix. Please visit the USFWS Rusty Patched Bumble Bee Map for the most current locations of High Potential Zones.

The following USFWS Regulatory Species are within the search area:

- Rusty Patched Bumble Bee High Potential Zone

ottage Grove East Ravine AUAR Update 2025 (25X.13964

Conservation Planning Map



Size (acres): 4,011.83

County(s): Washington



Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS
County of Dakota, Metropolitan Council, MetroGIS, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA,

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Minnesota-Wisconsin Ecological Services Field Office
3815 American Blvd East
Bloomington, MN 55425-1659
Phone: (952) 858-0793

In Reply Refer To: 07/18/2025 14:28:28 UTC
Project Code: 2025-0123566
Project Name: Cottage Grove East Ravine AUAR Update 2025 (25X.139646)

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

This response has been generated by the Information, Planning, and Conservation (IPaC) system to provide information on natural resources that could be affected by your project. The U.S. Fish and Wildlife Service (Service) provides this response under the authority of the Endangered Species Act of 1973 (16 U.S.C. 1531-1543), the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d), the Migratory Bird Treaty Act (16 U.S.C. 703-712), and the Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*).

Threatened and Endangered Species
The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and may be affected by your proposed project. The species list fulfills the requirement for obtaining a Technical Assistance Letter from the U.S. Fish and Wildlife Service under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. The Service recommends that verification be completed by visiting the IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the IPaC system by completing the same process used to receive the enclosed list.

Consultation Technical Assistance
Please refer to refer to our Section 7 website for guidance and technical assistance, including step-by-step instructions for making effects determinations for each species that might be present and for specific guidance on the following types of projects: projects in developed areas, HUD, CDBG, EDA, USDA Rural Development projects, pipelines, buried utilities, telecommunications, and requests for a Conditional Letter of Map Revision (CLOMR) from FEMA.

We recommend running the project (if it qualifies) through our **Minnesota-Wisconsin Federal Endangered Species Determination Key (Minnesota-Wisconsin ("D-key"))**. A demonstration video showing how-to access and use the determination key is available. Please note that the Minnesota-Wisconsin D-key is the third option of 3 available d-keys. D-keys are tools to help Federal agencies and other project proponents determine if their proposed action has the potential to adversely affect federally listed species and designated critical habitat. The Minnesota-Wisconsin D-key includes a structured set of questions that assists a project proponent in determining whether a proposed project qualifies for a certain predetermined consultation outcome for all federally listed species found in Minnesota and Wisconsin (except for the northern long-eared bat- see below), which includes determinations of “no effect” or “may affect, not likely to adversely affect." In each case, the Service has compiled and analyzed the best available information on the species’ biology and the impacts of certain activities to support these determinations.

If your completed d-key output letter shows a "No Effect" (NE) determination for all listed species, print your IPaC output letter for your files to document your compliance with the Endangered Species Act.

For Federal projects with a “Not Likely to Adversely Affect” (NLAA) determination, our concurrence becomes valid if you do not hear otherwise from us after a 30-day review period, as indicated in your letter.

If your d-key output letter indicates additional coordination with the Minnesota-Wisconsin Ecological Services Field Office is necessary (i.e., you get a “May Affect” determination), you will be provided additional guidance on contacting the Service to continue ESA coordination outside of the key; ESA compliance cannot be concluded using the key for “May Affect” determinations unless otherwise indicated in your output letter.

Note: Once you obtain your official species list, you are not required to continue in IPaC with d-keys, although in most cases these tools should expedite your review. If you choose to make an effects determination on your own, you may do so. If the project is a Federal Action, you may want to review our section 7 step-by-step instructions before making your determinations.

Using the IPaC Official Species List to Make No Effect and May Affect Determinations for Listed Species

1. If IPaC returns a result of “There are no listed species found within the vicinity of the project,” then project proponents can conclude the proposed activities will have **no effect** on any federally listed species under Service jurisdiction. Concurrence from the Service is not required for **no effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.
2. If IPaC returns one or more federally listed, proposed, or candidate species as potentially present in the action area of the proposed project – other than bats (see below) – then project proponents must determine if proposed activities will have **no effect** on or **may affect** those species. For assistance in determining if suitable habitat for listed, candidate, or proposed species occurs within your project area or if species may be affected by project activities, you can obtain Life History Information for Listed and Candidate Species on our office website. If no impacts will occur to a species on the IPaC species list (e.g., there is no habitat present in the project area), the appropriate determination is **no effect**. No further consultation or coordination is required. Attach this letter to the dated IPaC species list report for your records.

3. Should you determine that project activities **may affect** any federally listed, please contact our office for further coordination. Letters with requests for consultation or correspondence about your project should include the Consultation Tracking Number in the header. Electronic submission is preferred.

Northern Long-Eared Bats
Northern long-eared bats occur throughout Minnesota and Wisconsin and the information below may help in determining if your project may affect these species.

Suitable summer habitat for northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields and pastures. This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags ≥3 inches dbh for northern long-eared bat that have exfoliating bark, cracks, crevices, and/or hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet (305 meters) of forested/wooded habitat. Northern long-eared bats have also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore, these structures should also be considered potential summer habitat and evaluated for use by bats. If your project will impact caves or mines or will involve clearing forest or woodland habitat containing suitable roosting habitat, northern long-eared bats could be affected. For bat activity dates, please review Appendix L in the Range-wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines.

Examples of unsuitable habitat include:
- Individual trees that are greater than 1,000 feet from forested or wooded areas,
- Trees found in highly developed urban areas (e.g., street trees, downtown areas),
- A pure stand of less than 3-inch dbh trees that are not mixed with larger trees, and
- A monoculture stand of shrubby vegetation with no potential roost trees.

If IPaC returns a result that northern long-eared bats are potentially present in the action area of the proposed project, project proponents can conclude the proposed activities **may affect** this species **IF** one or more of the following activities are proposed:
- Clearing or disturbing suitable roosting habitat, as defined above, at any time of year,
- Any activity in or near the entrance to a cave or mine,
- Mining, deep excavation, or underground work within 0.25 miles of a cave or mine,
- Construction of one or more wind turbines, or
- Demolition or reconstruction of human-made structures that are known to be used by bats based on observations of roosting bats, bats emerging at dusk, or guano deposits or stains.

If none of the above activities are proposed, project proponents can conclude the proposed activities will have **no effect** on the northern long-eared bat. Concurrence from the Service is not required for **No Effect** determinations. No further consultation or coordination is required. Attach this letter to the dated IPaC

species list report for your records.

If any of the above activities are proposed, and the northern long-eared bat appears on the user's species list, the federal project user will be directed to either the northern long-eared bat and tricolored bat range-wide D-key or the Federal Highways Administration, Federal Railways Administration, and Federal Transit Administration Indiana bat/Northern long-eared bat D-key, depending on the type of project and federal agency involvement. Similar to the Minnesota-Wisconsin D-key, these d-keys helps to determine if prohibited take might occur and, if not, will generate an automated verification letter. Additional information about available tools can be found on the Service's northern long-eared bat website.

Whooping Crane
Whooping crane is designated as a non-essential experimental population in Wisconsin and consultation under Section 7(a)(2) of the Endangered Species Act is only required if project activities will occur within a National Wildlife Refuge or National Park. If project activities are proposed on lands outside of a National Wildlife Refuge or National Park, then you are not required to consult. For additional information on this designation and consultation requirements, please review "Establishment of a Nonessential Experimental Population of Whooping Cranes in the Eastern United States."

Other Trust Resources and Activities
Bald and Golden Eagles - Although the bald eagle has been removed from the endangered species list, this species and the golden eagle are protected by the Bald and Golden Eagle Act and the Migratory Bird Treaty Act. It is the responsibility of the project proponent to survey the area for any migratory bird nests. If there is an eagle nest on-site while work is on-going, eagles may be disturbed. We recommend avoiding and minimizing disturbance to eagles whenever practicable. If you cannot avoid eagle disturbance, you may seek a permit. A nest take permit is always required for removal, relocation, or obstruction of an eagle nest. For communication and wind energy projects, please refer to additional guidelines below.

Migratory Birds - The Migratory Bird Treaty Act (MBTA) prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Service. The Service has the responsibility under the MBTA to proactively prevent the mortality of migratory birds whenever possible and we encourage implementation of recommendations that minimize potential impacts to migratory birds. Such measures include clearing forested habitat outside the nesting season (generally March 1 to August 31) or conducting nest surveys prior to clearing to avoid injury to eggs or nestlings.

Communication Towers - Construction of new communications towers (including radio, television, cellular, and microwave) creates a potentially significant impact on migratory birds, especially some 350 species of night-migrating birds. However, the Service has developed voluntary guidelines for minimizing impacts.

Transmission Lines - Migratory birds, especially large species with long wingspans, heavy bodies, and poor maneuverability can also collide with power lines. In addition, mortality can occur when birds, particularly hawks, eagles, kites, falcons, and owls, attempt to perch on uninsulated or unguarded power poles. To minimize these risks, please refer to guidelines developed by the Avian Power Line Interaction Committee and the Service. Implementation of these measures is especially important along sections of lines adjacent to wetlands or other areas that support large numbers of raptors and migratory birds.

Wind Energy - To minimize impacts to migratory birds and bats, wind energy projects should follow the Service's Wind Energy Guidelines. In addition, please refer to the Service's Eagle Conservation Plan Guidance, which provides guidance for conserving bald and golden eagles in the course of siting, constructing, and operating wind energy facilities.

State Department of Natural Resources Coordination
While it is not required for your Federal section 7 consultation, please note that additional state endangered or threatened species may also have the potential to be impacted. **Please contact the Minnesota or Wisconsin Department of Natural Resources for information on state listed species that may be present in your proposed project area.**

Minnesota
Minnesota Department of Natural Resources - Endangered Resources Review Homepage
Email: Review.NHIS@state.mn.us

Wisconsin
Wisconsin Department of Natural Resources - Endangered Resources Review Homepage
Email: DNRERReview@wi.gov

We appreciate your concern for threatened and endangered species. Please feel free to contact our office with questions or for additional information.

Attachment(s):

- Official Species List
- Bald & Golden Eagles
- Migratory Birds

OFFICIAL SPECIES LIST

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Minnesota-Wisconsin Ecological Services Field Office
3815 American Blvd East
Bloomington, MN 55425-1659
(952) 858-0793

PROJECT SUMMARY

Project Code: 2025-0123566
Project Name: Cottage Grove East Ravine AUAR Update 2025 (25X.139646)
Project Type: Mixed-Use Construction
Project Description: The city of Cottage Grove, MN is completing their 5-year AUAR update process. The project takes place in Cottage Grove, MN, Washington County, specifically Section 27 West, Township 21 North, Ranges 1, 2, 3, 4, 11, 12, 13, 14, 15, 22, 23, 26, and 27. Typical development construction methods will be used. A No-Loss. Construction waste will be collected and disposed of at a permitted facility. Estimated construction is ongoing.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@44.829198500000004,-92.89626508873866,14z



Counties: Washington County, Minnesota

ENDANGERED SPECIES ACT SPECIES

There is a total of 6 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

BIRDS

NAME	STATUS
Whooping Crane *Grus americana* Population: U.S.A. (AL, AR, CO, FL, GA, ID, IL, IN, IA, KY, LA, MI, MN, MS, MO, NC, NM, OH, SC, TN, UT, VA, WI, WV, western half of WY) No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/758	Experimental Population, Non-Essential

CLAMS

NAME	STATUS
Higgins Eye (pearlymussel) *Lampsilis higginsii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5428	Endangered
Salamander Mussel *Simpsonaias ambigua* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6208	Proposed Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9743	Proposed Threatened
Rusty Patched Bumble Bee *Bombus affinis* There is **proposed** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/9383 General project design guidelines: https://ipac.ecosphere.fws.gov/project/S57X52YOINDJNACAWGNGUD54IM/documents/generated/9225.pdf	Endangered
Western Regal Fritillary *Argynnis idalia occidentalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/12017	Proposed Threatened

CRITICAL HABITATS

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Rusty Patched Bumble Bee *Bombus affinis* https://ecos.fws.gov/ecp/species/9383#crithab	Proposed

BALD & GOLDEN EAGLES

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act [2] and the Migratory Bird Treaty Act (MBTA) [1]. Any person or organization who plans or conducts activities that may result in impacts to Bald or Golden Eagles, or their habitats, should follow appropriate regulations and consider implementing appropriate avoidance and minimization measures, as described in the various links on this page.

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1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are Bald Eagles and/or Golden Eagles in your project area.

Measures for Proactively Minimizing Eagle Impacts
For information on how to best avoid and minimize disturbance to nesting bald eagles, please review the National Bald Eagle Management Guidelines. You may employ the timing and activity-specific distance recommendations in this document when designing your project/ activity to avoid and minimize eagle impacts. For bald eagle information specific to Alaska, please refer to Bald Eagle Nesting and Sensitivity to Human Activity.

The FWS does not currently have guidelines for avoiding and minimizing disturbance to nesting Golden Eagles. For site-specific recommendations regarding nesting Golden Eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

If disturbance or take of eagles cannot be avoided, an incidental take permit may be available to authorize any take that results from, but is not the purpose of, an otherwise lawful activity. For assistance making this determination for Bald Eagles, visit the Do I Need A Permit Tool. For assistance making this determination for golden eagles, please consult with the appropriate Regional Migratory Bird Office or Ecological Services Field Office.

Ensure Your Eagle List is Accurate and Complete
If your project area is in a poorly surveyed area in IPaC, your list may not be complete and you may need to rely on other resources to determine what species may be present (e.g. your local FWS field office, state surveys, your own surveys). Please review the Supplemental Information on Migratory Birds and Eagles, to help you properly interpret the report for your specified location, including determining if there is sufficient data to ensure your list is accurate.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to bald or golden eagles on your list, see the "Probability of Presence Summary" below to see when these bald or golden eagles are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

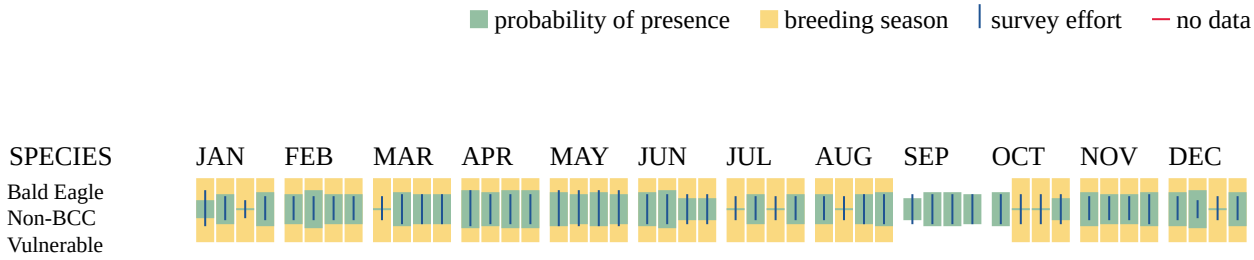
Probability of Presence (▪)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (▪)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds

- Nationwide avoidance and minimization measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

MIGRATORY BIRDS

The Migratory Bird Treaty Act (MBTA) [1] prohibits the take (including killing, capturing, selling, trading, and transport) of protected migratory bird species without prior authorization by the Department of Interior U.S. Fish and Wildlife Service (Service).

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the "Probability of Presence Summary" below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Oct 15 to Aug 31
Black-billed Cuckoo *Coccyzus erythropthalmus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9399	Breeds May 15 to Oct 10
Bobolink *Dolichonyx oryzivorus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9454	Breeds May 20 to Jul 31
Canada Warbler *Cardellina canadensis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9643	Breeds May 20 to Aug 10

NAME	BREEDING SEASON
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10678	Breeds May 1 to Aug 20
Golden-winged Warbler *Vermivora chrysoptera* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8745	Breeds May 1 to Jul 20
Grasshopper Sparrow *Ammodramus savannarum perpallidus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/8329	Breeds Jun 1 to Aug 20
Henslow's Sparrow *Centronyx henslowii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3941	Breeds May 1 to Aug 31
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Long-eared Owl *asio otus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3631	Breeds Mar 1 to Jul 15
Pectoral Sandpiper *Calidris melanotos* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9561	Breeds elsewhere
Prairie Loggerhead Shrike *Lanius ludovicianus excubitorides* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/8833	Breeds Feb 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9439	Breeds Apr 1 to Jul 31

NAME	BREEDING SEASON
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	Breeds May 10 to Sep 10
Ruddy Turnstone *Arenaria interpres morinella* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/10633	Breeds elsewhere
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9478	Breeds elsewhere
Semipalmated Sandpiper *Calidris pusilla* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9603	Breeds elsewhere
Upland Sandpiper *Bartramia longicauda* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9294	Breeds May 1 to Aug 31
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	Breeds May 10 to Aug 31

PROBABILITY OF PRESENCE SUMMARY

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (▪)

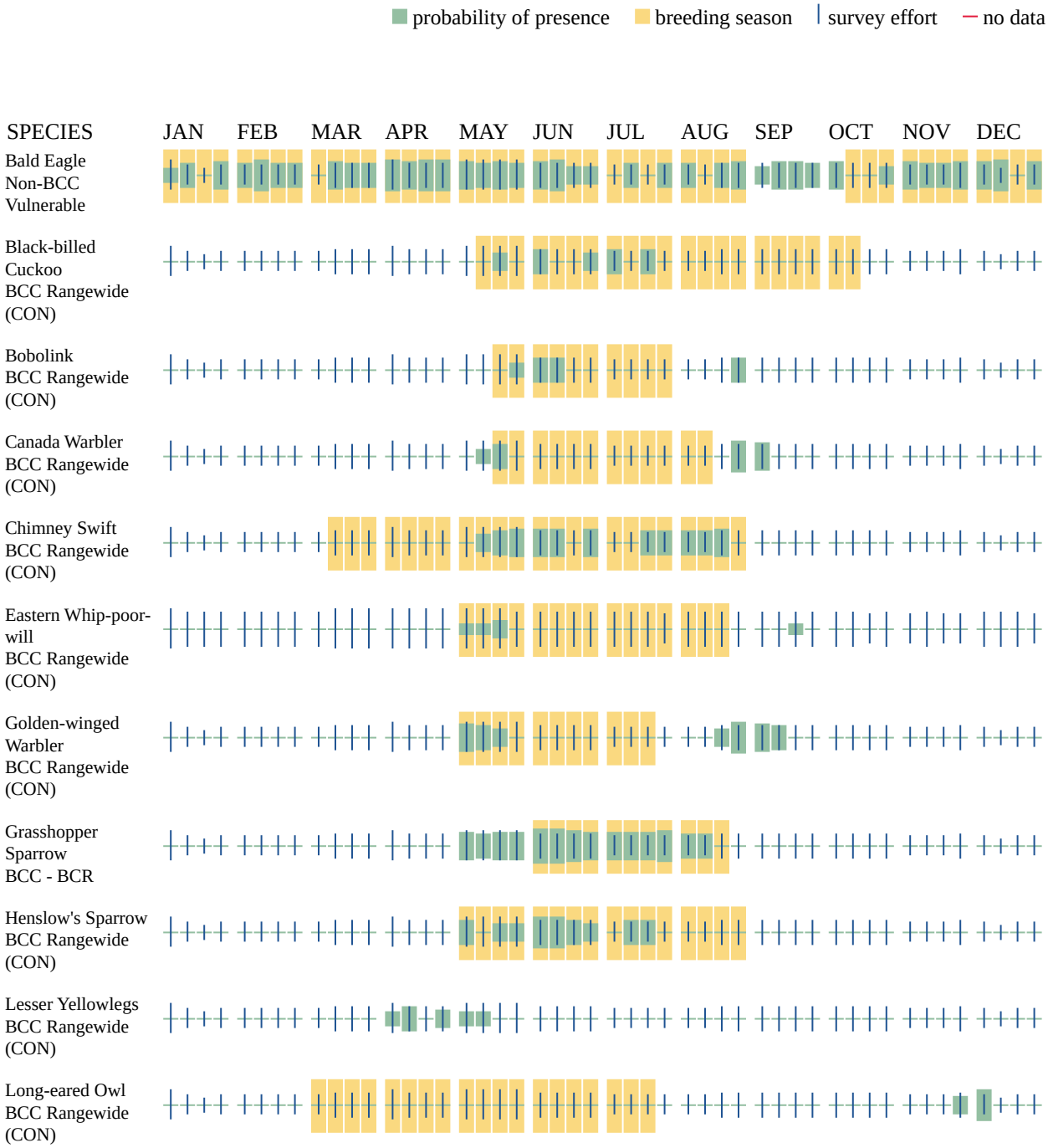
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (▪)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)

Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.





Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide avoidance and minimization measures for birds
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Minnesota-Wisconsin Ecological Services Field Office
3815 American Blvd East
Bloomington, MN 55425-1659
Phone: (952) 858-0793

In Reply Refer To: 07/18/2025 14:37:50 UTC
Project code: 2025-0123566
Project Name: Cottage Grove East Ravine AUAR Update 2025 (25X.139646)

Subject: Technical Assistance letter for 'Cottage Grove East Ravine AUAR Update 2025 (25X.139646)' for specified threatened and endangered species that may occur in your proposed project location consistent with the Minnesota-Wisconsin Endangered Species Determination Key (Minnesota-Wisconsin DKey).

Dear Heather Mullenbach:

The U.S. Fish and Wildlife Service (Service) received on **July 18, 2025** your effect determination(s) for the 'Cottage Grove East Ravine AUAR Update 2025 (25X.139646)' (Action) using the Minnesota-Wisconsin DKey within the Information for Planning and Consultation (IPaC) system. You have submitted this key to satisfy requirements under Section 7(a)(2). The Service developed this system in accordance of with the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C 1531 et seq.).

Based on your answers and the assistance of the Service's Minnesota-Wisconsin DKey, you made the following effect determination(s) for the proposed Action:

Species	Listing Status	Determination
Higgins Eye (pearlymussel) (*Lampsilis higginsii*)	Endangered	No effect
Monarch Butterfly (*Danaus plexippus*)	Proposed Threatened	No effect
Salamander Mussel (*Simpsonaias ambigua*)	Proposed Endangered	No effect
Whooping Crane (*Grus americana*)	Experimental Population, Non-Essential	No effect

Determination Information

Thank you for informing the Service of your "No Effect" determination(s). No further coordination is necessary for the species you determined will not be affected by the Action.

Additional Information

Sufficient project details: Please provide sufficient project details on your project homepage in IPaC (Define Project, Project Description) to support your conclusions. Failure to disclose important aspects of your project that would influence the outcome of your effects determinations may negate your determinations and invalidate this letter. If you have site-specific information that leads you to believe a different determination is more appropriate for your project than what the Dkey concludes, you can and should proceed based on the best available information.

Future project changes: The Service recommends that you contact the Minnesota-Wisconsin Ecological Services Field Office or re-evaluate the project in IPaC if: 1) the scope or location of the proposed Action is changed; 2) new information reveals that the action may affect listed species or designated critical habitat in a manner or to an extent not previously considered; 3) the Action is modified in a manner that causes effects to listed species or designated critical habitat; or 4) a new species is listed or critical habitat designated. If any of the above conditions occurs, additional consultation with the Service should take place before project changes are final or resources committed.

Species-specific information

Freshwater Mussels: Freshwater mussels are one of the most critically imperiled groups of organisms in the world. In North America, 65% of the remaining 300 species are vulnerable to extinction (Haag and Williams 2014). Implementing measures to conserve and restore freshwater mussel populations directly improves water quality in lakes, rivers, and streams throughout Minnesota and Wisconsin. An adult freshwater mussel filters anywhere from 1 to 38 gallons of water per day (Baker and Levinton 2003, Barnhart pers. comm. 2019). A 2015 survey found that in some areas, mussels can reduce the bacterial populations by more than 85% (Othman et al. 2015 in Vaughn 2017). Mussels are also considered to be ecosystem engineers by stabilizing substrate and providing habitat for other aquatic organisms (Vaughn 2017). In addition to ecosystem services, mussels play an important role in the food web, contributing critical nutrients to both terrestrial and aquatic habitats, including those that support sport fish (Vaughn 2017). Taking proactive measures to conserve and restore freshwater mussels will improve water quality, which has the potential to positively impact human health and recreation in the States of Minnesota and Wisconsin.

You have indicated that your Action will have no effect (NE) on Federally listed mussel species. However, state-listed mussels may occur in your Action area. Contact the Minnesota or Wisconsin Department of Natural Resources to determine effects to state-listed mussels.

Bald and Golden Eagles: Bald eagles, golden eagles, and their nests are protected under the Bald and Golden Eagle Protection Act (54 Stat. 250, as amended, 16 U.S.C. 668a-d) (Eagle Act). The Eagle Act prohibits, except when authorized by an Eagle Act permit, the “taking” of bald and golden eagles and defines “take” as “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.” The Eagle Act’s implementing regulations define disturb as “… to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.”

The following species and/or critical habitats may also occur in your project area and **are not** covered by this conclusion:

- Rusty Patched Bumble Bee *Bombus affinis* Endangered
- Western Regal Fritillary *Argynnis idalia occidentalis* Proposed Threatened

Coordination with the Service is not complete if additional coordination is advised above for any species.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Cottage Grove East Ravine AUAR Update 2025 (25X.139646)

2. Description

The following description was provided for the project 'Cottage Grove East Ravine AUAR Update 2025 (25X.139646)':

> The city of Cottage Grove, MN is completing their 5-year AUAR update process. The project takes place in Cottage Grove, MN, Washington County, specifically Section 27 West, Township 21 North, Ranges 1, 2, 3, 4, 11, 12, 13, 14, 15, 22, 23, 26, and 27. Typical development construction methods will be used. A No-Loss. Construction waste will be collected and disposed of at a permitted facility. Estimated construction is ongoing.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@44.829198500000004,-92.89626508873866,14z



QUALIFICATION INTERVIEW

1. This determination key is intended to assist the user in evaluating the effects of their actions on Federally listed species in Minnesota and Wisconsin. It does not cover other prohibited activities under the Endangered Species Act (e.g., for wildlife: import/export, Interstate or foreign commerce, possession of illegally taken wildlife, etc.; for plants: import/export, reduce to possession, malicious destruction on Federal lands, commercial sale, etc.) or other statutes. Additionally, this key DOES NOT cover wind development, purposeful take (e.g., for research or surveys), communication towers that have guy wires or are over 450 feet in height, aerial or other large-scale application of any chemical (such as insecticide or herbicide), and approval of long-term permits or plans (e.g., FERC licenses, HCP's).

   Click **YES** to acknowledge that you must consider other prohibitions of the ESA or other statutes outside of this determination key.

   Yes
2. Is the action being funded, authorized, or carried out by a Federal agency?

   No
3. Are you the Federal agency or designated non-federal representative?

   Yes
4. Does the proposed action involve **wind or solar energy**?

   No
5. Does the action involve purposeful take of a listed animal?

   No
6. Does the action involve a new communications tower?

   No
7. Does the activity involve aerial or other large-scale application of ANY chemical, including pesticides (insecticide, herbicide, fungicide, rodenticide, etc)?

   No
8. Will your action permanently affect local hydrology?

   No
9. Will your action temporarily affect local hydrology?

   Yes
10. Will your project have any direct impacts to a stream or river (e.g., Horizontal Directional Drilling (HDD), hydrostatic testing, stream/road crossings, new stormwater outfall discharge, dams, other in-stream work, etc.)?

    No

11. Does your project have the potential to impact the riparian zone or indirectly impact a stream/river (e.g., cut and fill; horizontal directional drilling; construction; vegetation removal; pesticide or fertilizer application; discharge; runoff of sediment or pollutants; increase in erosion, etc.)?

    Note: Consider all potential effects of the action, including those that may happen later in time and outside and downstream of the immediate area involved in the action.

    Endangered Species Act regulation defines "effects of the action" to include all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action. (50 CFR 402.02).

    No

12. Will your action disturb the ground or existing vegetation?

    Note: This includes any off-road vehicle access, soil compaction (enough to collapse a rodent burrow), digging, seismic survey, directional drilling, heavy equipment, grading, trenching, placement of fill, pesticide application (herbicide, fungicide), vegetation management (including removal or maintenance using equipment or prescribed fire), cultivation, development, etc.

    Yes

13. Will your action include spraying insecticides?

    No

14. Does your action area occur entirely within an already developed area?

    Note: Already developed areas are already paved, covered by existing structures, manicured lawns, industrial sites, or cultivated cropland, AND do not contain trees that could be roosting habitat. Be aware that listed species may occur in areas with natural, or semi-natural, vegetation immediately adjacent to existing utilities (e.g. roadways, railways) or within utility rights-of-way such as overhead transmission line corridors, and can utilize suitable trees, bridges, or culverts for roosting even in urban dominated landscapes (so these are not considered "already developed areas" for the purposes of this question). If unsure, select NO..

    No

15. [Semantic] Does the project intersect the Salamander mussel AOI?

    Automatically answered

    Yes

16. [Hidden Semantic] Does the action area intersect the monarch butterfly species list area?

    Automatically answered

    Yes

17. Under the ESA, monarchs remain warranted but precluded by listing actions of higher priority. The monarch is a candidate for listing at this time. The Endangered Species Act does not establish protections or consultation requirements for candidate species. Some Federal and State agencies may have policy requirements to consider candidate species in planning. We encourage implementing measures that will remove or reduce threats to these species and possibly make listing unnecessary.

    If your project will have no effect on monarch butterflies (for example, if your project won't affect their habitat or individuals), then you can make a "no effect" determination for this project.

    Are you making a "no effect" determination for monarch?

    No

IPAC USER CONTACT INFORMATION

Agency: Private Entity
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Zip: 56001
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Phone: 5079957387

United States Department of the Interior

FISH AND WILDLIFE SERVICE
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3815 American Blvd East
Bloomington, MN 55425-1659
Phone: (952) 858-0793

In Reply Refer To: 07/18/2025 15:18:00 UTC
Project code: 2025-0123566
Project Name: Cottage Grove East Ravine AUAR Update 2025 (25X.139646)

Federal Nexus: no

Federal Action Agency (if applicable):

Subject: Technical Assistance letter for 'Cottage Grove East Ravine AUAR Update 2025 (25X.139646)' for rusty patched bumble bee that may occur in your proposed project location consistent with the Rusty Patched Bumble Bee Range Wide Determination Key (RPBB DKey).

Dear Heather Mullenbach:

This letter records your determination using the RPBB DKey within the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (USFWS) on **July 18, 2025**, for 'Cottage Grove East Ravine AUAR Update 2025 (25X.139646)' (here forward, Project). This project has been assigned Project Code ‘2025-0123566’ and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements are not complete.**

Ensuring Accurate Determinations When Using IPaC Determination Keys

The USFWS developed the IPaC system and associated species’ determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.). All information submitted by the Project proponent into the IPaC must accurately represent the full scope and details of the Project. **Failure to accurately represent or implement the Project as detailed in IPaC or the RPBB DKey, invalidates this letter.**

Determination for the Rusty Patched Bumble Bee

Based on your answers and the assistance of the USFWS’ RPBB DKey, you made the following effect determination for the proposed Action:

Species	Listing Status	Determination
Rusty Patched Bumble Bee (*Bombus affinis*)	Endangered	May affect

Coordination with the USFWS is not complete. Further coordination with the USFWS is recommended for the rusty patched bumble bee. Please email the local USFWS Ecological Services Field Office and attach a copy of this letter, so we can discuss methods to avoid or minimize potential adverse impacts.

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination key for the rusty patched bumble bee **does not** apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- Higgins Eye (pearlymussel) *Lampsilis higginsii* Endangered
- Monarch Butterfly *Danaus plexippus* Proposed Threatened
- Salamander Mussel *Simpsonaias ambigua* Proposed Endangered
- Western Regal Fritillary *Argynnis idalia occidentalis* Proposed Threatened
- Whooping Crane *Grus americana* Experimental Population, Non-Essential

Critical Habitats:

- Rusty Patched Bumble Bee Bombus affinis Endangered

Coordination with the USFWS is advised for any species and/or critical habitat listed above.

You should coordinate with our Office to determine whether the Action may affect the species and/or critical habitat listed above and if further consultation is required. Note that reinitiation of consultation would be necessary if a new species is listed or critical habitat designated that may be affected by the identified action before it is complete.

If you have any questions regarding this letter or need further assistance, please contact the local Ecological Services Field Office and reference Project Code ‘2025-0123566’ associated with this Project. See the top of this letter for the Project Code.

Additional Information

Sufficient project details: Please provide sufficient project details on your project homepage in IPaC (Define Project, Project Description) to support your conclusions. Failure to disclose important aspects of your project that would influence the outcome of your effects determinations may negate your determinations and invalidate this letter. If you have site-specific information that leads you to believe a different determination is more appropriate for your project than what the Dkey concludes, you can and should proceed based on the best available information.

Future project changes: The Service recommends that you contact the local Ecological Services Field Office or re-evaluate the project in IPaC if: 1) the scope or location of the proposed Action is changed; 2) new information reveals that the action may affect rusty patched bumble bee in a manner or to an extent not previously considered; 3) the Action is modified in a manner that causes effects to rusty patched bumble bee; or 4) or critical habitat is designated. If any of the

above conditions occur, additional consultation with the Service should take place before project changes are final or resources are committed.

Species-specific information

Bald and Golden Eagles: Bald eagles, golden eagles, and their nests are protected under the Bald and Golden Eagle Protection Act (54 Stat. 250, as amended, 16 U.S.C. 668a-d) (Eagle Act). The Eagle Act prohibits, except when authorized by an Eagle Act permit, the "taking" of bald and golden eagles and defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." The Eagle Act's implementing regulations define disturb as "… to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

If you observe a bald eagle nest in the vicinity of your proposed project, you should follow the National Bald Eagle Management Guidelines (May 2007). For more information on eagles and conducting activities in the vicinity of an eagle nest, please visit our regional eagle website or contact the local Ecological Services Field Office. If the Action may affect bald or golden eagles, additional coordination with the Service under the Eagle Act may be required.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Cottage Grove East Ravine AUAR Update 2025 (25X.139646)

2. Description

The following description was provided for the project 'Cottage Grove East Ravine AUAR Update 2025 (25X.139646)':

> The city of Cottage Grove, MN is completing their 5-year AUAR update process. The project takes place in Cottage Grove, MN, Washington County, specifically Section 27 West, Township 21 North, Ranges 1, 2, 3, 4, 11, 12, 13, 14, 15, 22, 23, 26, and 27. Typical development construction methods will be used. A No-Loss. Construction waste will be collected and disposed of at a permitted facility. Estimated construction is ongoing.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@44.829198500000004,-92.89626508873866,14z



QUALIFICATION INTERVIEW

1. Is the action authorized, funded, or being carried out by a Federal agency?

   No

2. Does the action area overlap with a rusty patched bumble bee high potential zone?

   Automatically answered
   Yes

3. Does the action include - or is it reasonably certain to cause - intentional take of rusty patched bumble bee (rusty patched bumble bee) that is not covered under a scientific recovery permit under section 10(A)1(a) of the Endangered Species Act or under a cooperative agreement with a state agency?

   Note: This could include, for example, surveys or studies that include handling or capture of the species. Whether "Project Review" surveys using USFWS protocols were conducted as part of the action is addressed later in this key.

   No

4. Does the action include – or is it reasonably certain to result in – construction of one or more new roads or rail lines that will increase vehicle traffic in a rusty patched bumble bee HPZ?

   Yes

IPAC USER CONTACT INFORMATION

Agency: Private Entity
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IPAC USER CONTACT INFORMATION

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Minnesota Department of Natural Resources
Division of Ecological & Water Resources
500 Lafayette Road, Box 25
St. Paul, MN 55155-4025

September 9, 2020
Correspondence # ERDB 20210043

Mr. John Burbank
City of Cottage Grove
12800 Ravine Parkway South
Cottage Grove, MN 55016

RE: Natural Heritage Review of the proposed Cottage Grove East Ravine AUAR Update,
T27N R21W Sections 1-4, 11-15, 22, 23, 26, and 27; Washington County

Dear Mr. Burbank,

As requested, the Minnesota Natural Heritage Information System has been queried to determine if any rare species or other significant natural features are known to occur within an approximate one-mile radius of the proposed project. Based on this query, rare features have been documented within the search area (for details, please visit the Rare Species Guide Website for more information on the biology, habitat use, and conservation measures of these rare species). Please note that the following rare features may be adversely affected by the proposed project:

Ecologically Significant Areas

- The Minnesota Biological Survey (MBS) has identified a Site of *Moderate* Biodiversity Significance within T27N R21W Sections 22, 23, 26, and 27. Sites of Biodiversity Significance have varying levels of native biodiversity and are ranked based on the relative significance of this biodiversity at a statewide level. Sites ranked as *Moderate* contain occurrences of rare species and/or moderately disturbed native plant communities, and/or landscapes that have a strong potential for recovery.

  There are also areas ranked as *Below* within T27N R21W Sections 4 and 22 that the Minnesota Biological Survey considered for Sites of Biodiversity Significance, but were determined to be below the minimum biodiversity threshold for statewide significance. These areas, however, have conservation value at the local level as habitat for native plants and animals, corridors for

animal movements, buffers surrounding higher quality natural areas, or as areas with high potential for restoration of native habitat.

These ecologically significant areas contain the following high-quality native plant communities listed with their conservation status:

- Dry Sand – Gravel Prairie (Southern) – *imperiled*
- Northern Bulrush-Spikerush Marsh – *imperiled* or *vulnerable to extirpation*
- Southern Dry-Mesic Oak (Maple) Woodland – *apparently secure*

A native plant community is a group of native plants that interact with each other and with their environment in ways not greatly altered by modern human activity or by introduced organisms. Native plant communities are classified and described by considering vegetation, hydrology, landforms, soils, and natural disturbance regimes. Please note, based on aerial photography a majority of the Dry-Sand – Gravel Prairie (Southern) community appears to have been altered since it was delineated. GIS shapefiles of MBS Sites of Biodiversity Significance and DNR Native Plant Communities can be downloaded from the MN Geospatial Commons. Please contact me if you do not have access to the appropriate mapping services.

We encourage you to consider project alternatives that would avoid or minimize disturbance to these ecologically significant areas. Actions to minimize disturbance may include, but are not limited to, the following recommendations:

- Minimize vehicular disturbance in the MBS Site (allow only vehicles/equipment necessary for construction activities);
- Do not park equipment or stockpile supplies in the MBS Site;
- Do not place spoil within MBS Site or other sensitive areas;
- Retain a buffer between proposed activities and the MBS Site;
- If possible, conduct the work under frozen ground conditions;
- Use effective erosion prevention and sediment control measures;
- Inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of invasive species;
- As much as possible, operate within already-disturbed areas;
- Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible; and
- Use only weed-free mulches, topsoils, and seed mixes. Of particular concern are birdsfoot trefoil (*Lotus corniculatus*) and crown vetch (*Coronilla varia*), two invasive species that are sold commercially and are problematic in prairies and disturbed open areas.

State-listed Species

- The Loggerhead Shrike (*Lanius ludovicianus*), a state-listed endangered bird, Lark Sparrow (*Chondestes grammacus*) and Bell's Vireo, (*Vireo bellii*), both state-listed bird species of special

concern, have been documented in the vicinity of the AUAR area. Loggerhead Shrikes use grasslands that contain short grass and scattered perching sites such as hedgerows, shrubs, or small trees. They can be found in native prairie, pastures, shelterbelts, old fields or orchards, cemeteries, grassy roadsides, and farmyards. Bell's vireo prefers shrub thickets within or bordering open habitats such as grasslands or wetlands. This bird suspends its nests from forks of low branches of small trees or shrubs. Lark Sparrow is found in open, grassland areas with scattered trees and shrubs. They build their nest on the ground, in a shrub or a small tree.

Given the potential for these species to found in the AUAR area, avoid tree and shrub removal during the breeding season, typically April through July. Contact me if any tree or shrub removal will occur during the breeding season, as the DNR may request that a survey for active nests be conducted prior to construction. Please report any Loggerhead Shrike sightings to the Regional Nongame Specialist, Erica Hoaglund (Erica.Hoaglund@state.mn.us).

- Kitten-tails (*Besseya bullii*), a state-listed threatened plant, has been documented in the AUAR area. This species is found in savannas, prairies, and oak woodlands. Minnesota's Endangered Species Statute (Minnesota Statutes, section 84.0895) and associated Rules (Minnesota Rules, part 6212.1800 to 6212.2300 and 6134) prohibit the take of threatened or endangered species without a permit. Given the protected status of this species, a qualified surveyor is required to conduct a botanical survey in any suitable habitat that will be impacted within T27N R21W Sections 11 and 22. We also recommend conducting surveys within suitable habitat in the surrounding areas that will be impacted. Surveys must follow the standards contained in the attached Rare Species Survey Process and Rare Plant Guidance. Project planning should take into account that any botanical survey needs to be conducted during the appropriate time of the year, which may be limited. Please consult with the Endangered Species Environmental Review Coordinator, Lisa Joyal (lisa.joyal@state.mn.us), regarding this process.

- Blanding's turtles (*Emydoidea blandingii*), a state-listed threatened species, have been documented within the AUAR area. Blanding's turtles use upland areas up to and over a mile distant from wetlands, waterbodies, and watercourses. Uplands are used for nesting, basking, periods of dormancy, and traveling between wetlands. Factors believed to contribute to the decline of this species include collisions with vehicles, wetland drainage and degradation, and the development of upland habitat. Any added mortality can be detrimental to populations of Blanding's turtles, as these turtles have a low reproduction rate that depends upon a high survival rate to maintain population levels.

  Projects in the AUAR area have the potential to impact this rare turtle through direct fatalities and habitat disturbance/destruction due to excavation, fill, and other construction activities associated with the project. Minnesota's Endangered Species Statute (*Minnesota Statutes*, section 84.0895) and associated Rules (*Minnesota Rules*, part 6212.1800 to 6212.2300 and 6134)

prohibit the take of threatened or endangered species without a permit. As such, **the following avoidance measures are required**:

- Avoid wetland and stream impacts during hibernation season, between October 15th and April 15th, unless the area is unsuitable for hibernation:
  - less than 14 inches deep,
  - anoxic conditions, or
  - not suitable substrate.
- The Blanding's turtle flyer must be given to all contractors working in the area.
- The use of erosion control blanket shall be limited to 'bio-netting' or 'naturalnetting' types, and specifically not products containing plastic mesh netting or other plastic components.
  - Also, be aware that hydro-mulch products may contain small synthetic (plastic) fibers to aid in its matrix strength. These loose fibers could potentially re-suspend and make their way into Public Waters. As such, please review mulch products and not allow any materials with synthetic (plastic) fiber additives in areas that drain to Public Waters.
- Monitor for turtles during construction and report any sightings to the DNR Nongame Specialist, Erica Hoaglund (Erica.Hoaglund@state.mn.us).
- If turtles are in imminent danger they must be moved by hand out of harm's way, otherwise they are to be left undisturbed.

If the above avoidance measures are not possible, please contact me as further action may be needed.

For additional information, see the Blanding's turtle fact sheet, which describes the habitat use and life history of this species. The fact sheet also provides two lists of recommendations for avoiding and minimizing impacts to this rare turtle. **Please refer to both lists of recommendations for projects in the AUAR area.** For further assistance regarding the Blanding's turtle, please contact the DNR Regional Nongame Specialist, Erica Hoaglund.

Federally Protected Species

- The rusty patched bumble bee (*Bombus affinis*), a federally-listed endangered species, was documented in the vicinity of the proposed project. The rusty patched bumble bee typically occurs in grasslands and urban gardens with flowering plants from April through October. This species nests underground in abandoned rodent cavities or in clumps of grasses. Please reference the guidance at the USFWS rusty patched bumble bee website to determine if the project has the potential to impact this protected species.

Environmental Review and Permitting

- Please include a copy of this letter in any state or local license or permit application. Please note that measures to avoid or minimize disturbance to the above rare features may be included as restrictions or conditions in any required permits or licenses.

The Natural Heritage Information System (NHIS), a collection of databases that contains information about Minnesota's rare natural features, is maintained by the Division of Ecological and Water Resources, Department of Natural Resources. The NHIS is continually updated as new information becomes available, and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. However, the NHIS is not an exhaustive inventory and thus does not represent all of the occurrences of rare features within the state. Therefore, ecologically significant features for which we have no records may exist within the project area. If additional information becomes available regarding rare features in the vicinity of the project, further review may be necessary.

For environmental review purposes, the results of this Natural Heritage Review are valid for one year; the results are only valid for the project location (noted above) and the project description provided on the NHIS Data Request Form. Please contact me if project details change or for an updated review if construction has not occurred within one year.

The Natural Heritage Review does not constitute review or approval by the Department of Natural Resources as a whole. Instead, it identifies issues regarding known occurrences of rare features and potential effects to these rare features. If needed, please contact your DNR Regional Environmental Assessment Ecologist to determine whether there are other natural resource concerns associated with the proposed project. Please be aware that additional site assessments or review may be required.

Thank you for consulting us on this matter, and for your interest in preserving Minnesota's rare natural resources. An invoice will be mailed to you under separate cover.

Sincerely,



Samantha Bump
Natural Heritage Review Specialist
Samantha.Bump@state.mn.us

Enc. Rare Species Survey Protocol

Links: Rare Species Guide
http://www.dnr.state.mn.us/rsg/index.html
DNR Regional Environmental Assessment Ecologist Contact Info
http://www.dnr.state.mn.us/eco/ereview/erp_regioncontacts.html

USFWS Rusty Patched Bumble Bee
https://www.fws.gov/midwest/endangered/insects/rpbb/guidance.html
Blanding's Turtle Fact Sheet
http://files.dnr.state.mn.us/natural_resources/animals/reptiles_amphibians/turtles/blandings_turtle/factsheet.pdf
Blanding's Turtle Flyer
http://files.dnr.state.mn.us/natural_resources/animals/reptiles_amphibians/turtles/blandings_turtle/flyer.pdf
Wildlife Friendly Erosion Control
http://files.dnr.state.mn.us/eco/nongame/wildlife-friendly-erosion-control.pdf

Cc: Mellissa Collins, Leslie Parris, and Erica Hoglund

GHG TOTALS

Project Lifetime (years):	50

High Density – Sports Complex		MT CO2e
Construction	Passenger Vehicles	516.01935
	Construction Vehicles	3961.9459
	Total Annualized	89.559306
Land Use Change	Cropland Removal	140.30
	Total	140.30
Operations	Home Energy Use	53,900.8
	Electricty	52,711
	Natural Gas	16,094.50
	Passenger Vehicles	82663.43
	Total	205,369

Grand Total	205,599.14	MT CO2e

CONSTRUCTION EMISSIONS			
Seasons of Construction	20	seasons	"The construction will be initiated in 2025 to complete the mass grading and to prepare the site for development. The duration of mass grading and installation of the roadways will take approximately 6 months. Individual lots are expected to be developed over a five-year period."
Days of construction (120 per season)	2400	days	
Hours of Construction (960 per season)	19200	hours	
			Per EPA GHG Equivalencies Calculator
Large Diesel Vehicle Count	20	vehicles	10,180 grams of CO2/gallon of diesel = 10.180 × 10-3 metric tons CO2/gallon of diesel
Days Worked	2400	days	0.01018
Miles Traveled to and from the site daily (avg.)	60	miles	
Total Miles	2880000	miles	https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator-calculations-and-references
Avg. Miles per gallon per desiel vehicle (EPA GHG Calculator tool)	7.4	mpg	
Total Gallons	389189.1892	gallons	https://www.fhwa.dot.gov/policyinformation/statistics/2022/pdf/vm1.pdf
Emissions from Diesel Vehicles	3961.945946	MTCO2e	The average vehicle miles traveled (VMT) in 2022 was 23,111 miles per year (FHWA 2024). 23,111/365 = ~60
Passenger Work Vehicle Count	20	cars	
Days Worked	2400	days	
Miles traveled to and from site daily (avg.)	30	miles	The average vehicle miles traveled (VMT) in 2022 was 10,917 miles per year (FHWA 2024). 10,917/365 = ~30
Total Miles	1440000	miles	Per EPA GHG Equivalencies Calculator
Avg. Miles per gallon passenger vehicles (EPA GHG Calculator tool)	24.8	mpg	8,887 grams of CO2/gallon of gasoline = 8.887 × 10-3 metric tons CO2/gallon of gasoline
Total Gallons	58,064.52	gallons	0.008887
Emissions from passenger vehicles	516.02	MTCO2e	https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator-calculations-and-references
			https://www.epa.gov/climateleadership/simplified-ghg-emissions-calculator
Annualized Construction Vehicles			
Total Vehicle Emissions	4,477.97	MTCO2e	The total emissions from these activities (passenger + work trucks) are considered one-time emissions, however the industry standard for determining long-term impacts of construction-related GHG output is to annualize the total emissions over a project's lifetime, which is defined as a X-year period.
Project Lifetime (Years)	50	years	
Annualized MTCO2e/Years	89.56	MTCO2e	

Average mpg values from the U.S. Department of Transportation, Federal Highway Administration, Highway Statistics 2022 (Updated February 2024), Table VM-1.

LAND CONVERSION

Total Acres	MT CO2e sequestered annually/acre	Total metric tons CO2
1,403	0.10	140.30

Various studies of the potential for tallgrass prairie carbon storage have shown that the **storage rates vary between .30 and 1.7 metric tons per acre per year**. (Geotimes - January 2002 - Carbon in Soil, Garcia_Alvarez_MA_Thesis.pdf)

The USDA Natural Resource Conservation Service (NRCS) COMET-Planner tool reports expected carbon sequestration of 0.31 MT/acre/year for no-till and **0.20** MT/acre/year for reduced tillage for most regions in the United States (USDA NRCS, 2021). Opportunities and Challenges Associated with "Carbon Farming" for U.S. Row-Crop Producers - Center for Commercial Agriculture

The USDA NRCS COMET- Planner tool reports expected carbon sequestration of 0.37 MT/acre/year for cover crops for most regions in the United States (USDA NRCS, 2021). Opportunities and Challenges Associated with "Carbon Farming" for U.S. Row-Crop Producers - Center for Commercial Agriculture

Assume no practice: 0.10 MT CO2E/acre & Assume reduced tillage 0.20 MT CO2e/acre

HOME ENERGY USE			
Detached Single Family Homes Count	7,205		Total CO2 emissions for energy use per home: 4.798 metric tons CO2 for electricity + 2.16 metric tons CO2 for natural gas + 0.24 metric tons CO2 for propane + 0.25 metric tons CO2 for fuel oil = 7.45 metric tons CO2 per home per year. https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator-calculations-and-references
Emissions per unit	7.45	MTCO2e	
Total Emissions/year	53677.3	MTCO2e/year	
Attached Apartments	60		According to the Energy Information Agency's Residential Energy Consumption Survey 2020 single family attached homes use about 2/3 of the energy of a detached home. Per household BTU of 67.1 (attached) vs 94.6 (detached). https://www.eia.gov/consumption/residential/data/2020/index.php?view=consumption#summary https://www.eia.gov/consumption/residential/data/2020/c&e/pdf/ce1.1.p
Emissions per unit (1/2 of Single family detached)	3.73	MTCO2e	
Total Emissions/year	223.5	MTCO2e/year	
Total Emissions per year for all housing types	53900.8	MTCO2e/year	According to the U.S. Energy Information Administration, Residential Energy Consumption Survey. June 18, 2013, Households living in apartment buildings with five or more units use about half as much energy as other types of homes. https://www.eia.gov/todayinenergy/detail.php?id=11731

ELECTRICITY					
Category	Floor Space	kWh	total kWh	Multiplier for MT CO2e	Total MT CO2e
Commercial	5,880,600.00	18.3 kWh per square foot (annual)	107614980	EPA GHG Calculator	46,047.20
Public County Space	1,089,000.00	14.3 kWh per square foot (annual)	15572700	EPA GHG Calculator	6,663.40
				Total	52,710.60

Electricity (homes not included)

U.S. Energy Information Administration. Table PBA4. Electricity consumption totals and conditional intensities by building activity subcategories, 2012.
https://www.eia.gov/consumption/commercial/data/2012/c&e/cfm/pba4.php

Per Square foot (kWh) for Mercantile category = **18.3 kWh** per square foot

Government Office = **14.3 kWh** per sq ft

NATURAL GAS						
Category	Sq ft	cubic feet natural gas per sq ft	mmBtu per square foot	Total mmBtu	Multiplier	Total MT CO2e
Commercial	5,880,600.00	35.7	0.037	217,582.20	EPA GHG Calculator	14,446.00
Public County S	1,089,000.00	22	0.0228	24,829.20	EPA GHG Calculator	1,648.50
					Total	16,094.50

Natural Gas (homes not included)
https://www.eia.gov/consumption/commercial/data/2018/ce/pdf/c32.pdf

U.S. Energy Information Administration, Forms EIA-871A and C of the 2018 Commercial Buildings Energy Consumption Survey

Mercantile = **35.7** cubic feet natural gas per sq ft

Office/Government = **22.0** cubic feet natural gas per sq ft

PERSONAL VEHICLES

Total Vehicles 2045	31600	Vehicles
Miles Driven Averge Daily	20	miles
Avg. Miles per gallon passenger vehicles (EPA GHG Equivalencies + FHWA 2024)	24.8	mpg
Gallons/day per 1 car	0.81	gallons
Gallons/year per 1 car	294.35	gallons
Total Gallons/year for all x cars	9,301,612.90	gallons
Total Emissions/year	82,663.43	MTCO2e/year

Per EPA GHG Equivalencies Calculator - 8,887 grams of CO2/gallon of gasoline = 8.887 × 10-3 metric tons CO2/gallon of gasoline

0.008887 MTCO2e

https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator-calculations-and-references
https://www.epa.gov/climateleadership/simplified-ghg-emissions-calculator

2024 estimate and the 20-year, 2040 estimate. *(numbers rounded to the nearest hundred)*
Estimates:
2024: 26,700
2040: 31,600

The average vehicle miles traveled (VMT) in 2022 was 10,917 miles per year (FHWA 2024).
10,917/365 = ~30
https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator-calculations-and-references

Perimeter = 16.59 miles 20 miles

WASTE

Project Development Type	Waste Generation Factor	Sq ft or Units	Annual Waste (tons/year)	
Commercial	0.005 lb/sq ft /day	5,880,600	13.34/day	4,866.6/year
Residential	12.23 lb/household/day	7,265	40.32/day	14,717.6/year
Public County Facilities	0.006 lb/sq ft /day	1,089,000	2.96/day	1,082.1/year
Total daily Waste: 56.35 mt			20,666.3 metric tons per year	
Total Annual Emissions (WARM tool MSW)			1,491.46 MT CO2 E	

Waste Management - https://www2.calrecycle.ca.gov/WasteCharacterization/General/Rates

USE US EPA WARM Model warm_v16.xls, Mixed Solid Waste (MSW) to get MTCO2e

Office = 0.006lb/sq ft/day - Dec. 1991Draft EIR for North Hills Development (Santa Clarita)
Notes: EIR cites City of LA Bureau of Solid Waste, 1989, as source

Cottage Grove = Washington County
21% landfill
79% Combust

Source: MPCA, Select Committee on Recycling and the Environment (SCORE), https://data.pca.state.mn.us/views/SCOREreport2022/2022SCOREreport?%3Aembed=y&%3AisGuestRedirectFromVizportal=y

21%	4339.923
79%	16326.377

Waste Generation Source	Gen. Rate	Units of Measure	Source Date	Source/Notes
Commercial	5	lb/1000 sq ft /day	Aug. 1992	Co. of Los Angeles Dept. of Regional Planning, Vesting Tentative Tract No. 47905, etc. Notes: EIR cites City of LA Dept. of City Planning doc "EIR Manual for Private Projects" as source
Residential	12.23	lb/household/day	2006	City of Los Angeles CEQA Thresholds Guide: Your Resource for Preparing CEQA Analyses in Los Angeles (DRAFT) Notes: Does not include generation of construction debris
Industrial	0.006	lb/sq ft/day	Dec. 1991	Draft EIR for North Hills Development (Santa Clarita) Notes: EIR cites City of LA Bureau of Solid Waste, 1989, as source
Other Services in Service Industry - Sports Complex	0.0312	lb/sq ft/day	May 1997	Guide to Solid Waste and Recycling Plans for Development Projects (Santa Barbara County Public Works Department)

EarthTech
A Tyco International Ltd. Company

M E M O

March 3, 2005

To: Mr. Brad Scheib

From: Nathan Lipinski

Subject: **Traffic Noise and Air Quality Study for East Ravine Community, MN AUAR**

Thank you for the opportunity to assist you in preparing the Alternative Urban Areawide Review (AUAR) for the East Ravine Community in Cottage Grove, Minnesota. The following are the results of the traffic noise and air quality analyses performed for this project.

NOISE ANALYSIS

Introduction

Earth Tech measured existing noise levels at two locations in the project area. Monitoring locations represent undeveloped lands expected to experience commercial and residential development or impacts from commercial and residential development. Earth Tech modeled the future Build alternative and associated traffic volumes expected in the year 2020 using the Minnesota Department of Transportation traffic noise model, MINNOISE. Monitoring data and modeling results were compared with the Minnesota Pollution Control Agency (MPCA) Noise Rules to evaluate traffic noise impacts and recommend mitigation measures. Modeling results were used to create noise contours showing the location of the residential daytime and nighttime L10 and L50 noise contour lines. L10 and L50 are sound levels in decibels (dBA) that are exceeded in 10 percent or 50 percent, respectively, of the time for a one-hour survey. A Project Location Map is included in Figure 1-1. Daytime and Nighttime Noise Contours are included in Figure 2 and Figure 3.

Existing Noise Levels

On March 3, 2005, Earth Tech performed noise monitoring at two locations in the project area. The purpose of the noise monitoring was to document existing noise levels. Noise measurements were conducted in accordance with Minnesota Rules Chapter 7030, Noise Pollution Control. The meteorological conditions were as follows:

Temperature - +2°
Humidity – 76%
Wind – Calm
Barometric Pressure – 30.27” Hg

Table 1 summarizes the equipment Earth Tech staff used to collect monitoring data for this noise analysis.

Table 1
Noise Analysis Instrumentation Summary

Instrument	Make	Model	Calibration Date	Serial Number
Dosimeter 1	Quest	Q-300	2/28/05 at 114.0 dBA	QC6030052
Dosimeter 2	Quest	Q-30	2/28/05 at 114.0 dBA	QC2921212

The monitoring sites were selected at locations where existing noise levels could not be modeled with MINNOISE or to compare measured noise levels to modeled noise levels to confirm the validity of the model. The results of the noise measurements at the monitoring locations are listed in Table 2 and the locations of the sites are indicated on Figures 2 and 3. MPCA maximum allowable daytime noise levels are 65 dBA for L10 and 60 dBA for L50. The maximum nighttime noise levels are 55 dBA (L10) and 50 dBA (L50).

Table 2
Nighttime Noise Monitoring Summary

Site	Date Sampled	Time Sampled	Distance from CL	L10 (dBA)	L50 (dBA)	MPCA Nighttime		Exceeding (Yes/No)
						L10 (dBA)	L50 (dBA)	
Gordon and Bonnie Tank Property	March 3, 2005	6:00 am to 7:00 am	150 feet	56	46	55	50	Yes
Washington County Property	March 3, 2005	6:00 am to 7:00 am	600 feet	51	54	55	50	Yes

Future Noise Levels

The traffic noise model analyzed the existing roadway network and proposed East Ravine Parkway. The Howard R. Green Company supplied the existing traffic levels in 2003 and the predicted traffic levels in 2020. Earth Tech adjusted the 2003 traffic data to 2005 conditions. The Washington County Department of Transportation provided information regarding truck percentages, speed limits, and nighttime peak hour volumes. Earth Tech used aerial orthographic mapping to determine roadway alignments and digitized the existing and proposed roadway alignments for use in the MINNOISE noise model. Keats Avenue, Kimbro/Lamar Avenue, Jamaica Avenue, 80th Street, 70th Street, and Military Road were modeled in the for year 2005 and 2020 peak hour traffic. The proposed East Ravine Parkway was modeled only for year 2020 peak hour traffic. The highest peak hour traffic volume (PHV) for each modeled roadway is shown in Table 3.

The traffic stream in the MINNOISE model was determined to be 95% cars, 2% medium trucks, and 3% heavy trucks for all roadways except Keats Avenue. The traffic stream for Keats Avenue was determined to be 93% cars, 3% medium trucks, and 4% heavy trucks. Roadway speeds were modeled as follows:

- Keats Avenue – 55 mph
- Kimbro/Lamar Avenue – 55 mph
- Jamaica Avenue – 45 mph
- 80th Street – 45 mph
- 70th Street – 45 mph
- Military Road – 55 mph
- East Ravine Parkway – 45 mph

Table 3
Peak Hour Traffic Volumes

Location	Existing (2005)		Predicted (2020)	
	Daytime*	Nighttime*	Daytime*	Nighttime*
Keats Avenue				
70th Street to Military Road	1000	750	1680	1260
Kimbo/Lamar Avenue				
US 61 to Lamar Avenue	740	555	480	360
Jamaica Avenue				
70th Street to Military Road	560	420	1510	1135
80th Street				
Jamaica Avenue to Keats Avenue	760	570	980	735
70th Street				
Jamaica Avenue to Keats Avenue	590	445	1520	1140
Military Road				
Ideal Avenue to Jamaica Avenue	750	565	1090	820
East Ravine Parkway				
80th Street to 70th Street	N/A	N/A	1190	850

*Daytime is defined to mean those hours from 7:00 am to 10:00 pm. Nighttime is defined to mean those hours from 10:00 pm to 7:00 am.

Results
Modeling results are shown as contours on Figures 2 and 3. Traffic noise levels between the roadway centerline and the contour line are predicted to exceed the corresponding MPCA Daytime L10 and L50 noise levels. Table 4 shows the distances from roadway centerline to the noise contour.

Table 4
Distance to Contours

Location	Approximate Distance from CL in Feet			
	2005 MPCA Daytime		2020 MPCA Daytime	
	L10 (65 dBA)	L50 (60 dBA)	L10 (65 dBA)	L50 (60 dBA)
Keats Avenue (70th Street to Military Road)	197	164	262	262
Kimbro Avenue (US 61 to Lamar Avenue)	131	82	115	33
Jamaica Avenue (70th Street to Military Road)	262	203	197	190
80th Street (Jamaica Avenue to Keats Avenue)	108	69	135	85
70th Street (Jamaica Avenue to Keats Avenue)	115	59	152	150
Military Road (Ideal Avenue to Jamaica Avenue)	161	121	205	164
East Ravine Parkway (80th Street to 70th Street)	N/A	N/A	118	80

Residences located within the distances above, as measured from the roadway centerline, are predicted to experience roadway noise levels that exceed MPCA's maximum allowable noise levels.

The Nighttime peak hourly volumes are approximately 75% of the Daytime peaks. Due to the nominal reduction in traffic and the substantial reduction (10 dBA) of the allowable L10 and L50, the distance from the roadway centerline to the nighttime noise contour is approximately 700 feet. At the present time, existing noise levels at monitored locations exceed MPCA Nighttime criteria. The Tank monitoring site is located 150 feet north of 80th Street and exceeds the L10 during the 6:00 am to 7:00 am time period. The Washington County monitoring site is located 600 feet east of Keats Avenue (CSAH 19) and exceeds the L50 during the 6:00 am to 7:00 am time period.

Mitigation
Results of these analyses suggest that future traffic noise levels will exceed MPCA's maximum allowable noise levels near roadways in the project area. The City of Cottage Grove is required to comply with Minnesota Rules 7030.0030. This statute requires municipalities to ensure that existing noise levels comply with state noise limits prior to occupants moving into residences in the proposed development. Barriers such as earthen berms or noise walls can reduce traffic noise levels. Increasing the distance between the source and the receiver also reduces traffic noise levels. A more detailed noise analysis should be performed before mitigation measures are pursued.

AIR QUALITY

For roadway projects, the two pollutants of concern are carbon monoxide (CO) and PM_{10}. The EPA and the Minnesota Pollution Control Agency (MPCA) do not require PM_{10} analysis. To assure that a project is not in violation of the National Ambient Air Quality Standards (NAAQS), the need for an air quality analysis to address emissions of CO must be determined.

The East Ravine project is in Washington County, one of the Twin Cities seven-county metropolitan areas considered a CO maintenance area. To determine the need for a hot-spot analysis, the Twin Cities has a screening method to compare project locations to a set of the Twin Cities "worst" intersections. If the project has better conditions and does not affect one of these intersections, then it is presumed it will not cause any violations. There are three MPCA monitored locations and seven top intersections. See Table 5 below. The East Ravine project area does not include any of these locations.

Table 5
Top Ten Intersections
Twin Cities CO Maintenance Area

ID	DESCRIPTION	1998 AADT*
Top 7 Intersections		
1	TH 169 at CSAH 81	77,200
2	TH 101 at TH 7	65,000
3	TH 100 at CSAH 81	71,150
4	TH 10 at University Avenue	63,600
5	TH 252 at 85th Avenue	61,700
6	TH 252 at 66th Avenue	64,500
7	TH 252 at Brookdale Drive	58,550
3 MPCA Monitored Locations		
8	University and Lexington Avenue	54,500
9	Snelling at University Avenue	57,750
10	Hennepin Avenue at Lake Street	35,800

The final screening criteria is whether the project roadways will have traffic levels in excess of the benchmark AADT level of 77,200. The East Ravine project is not forecasted to have traffic levels this high. See Table 6 on the following page. The results of the screening procedure show that the East Ravine development project does not require a hot-spot analysis.

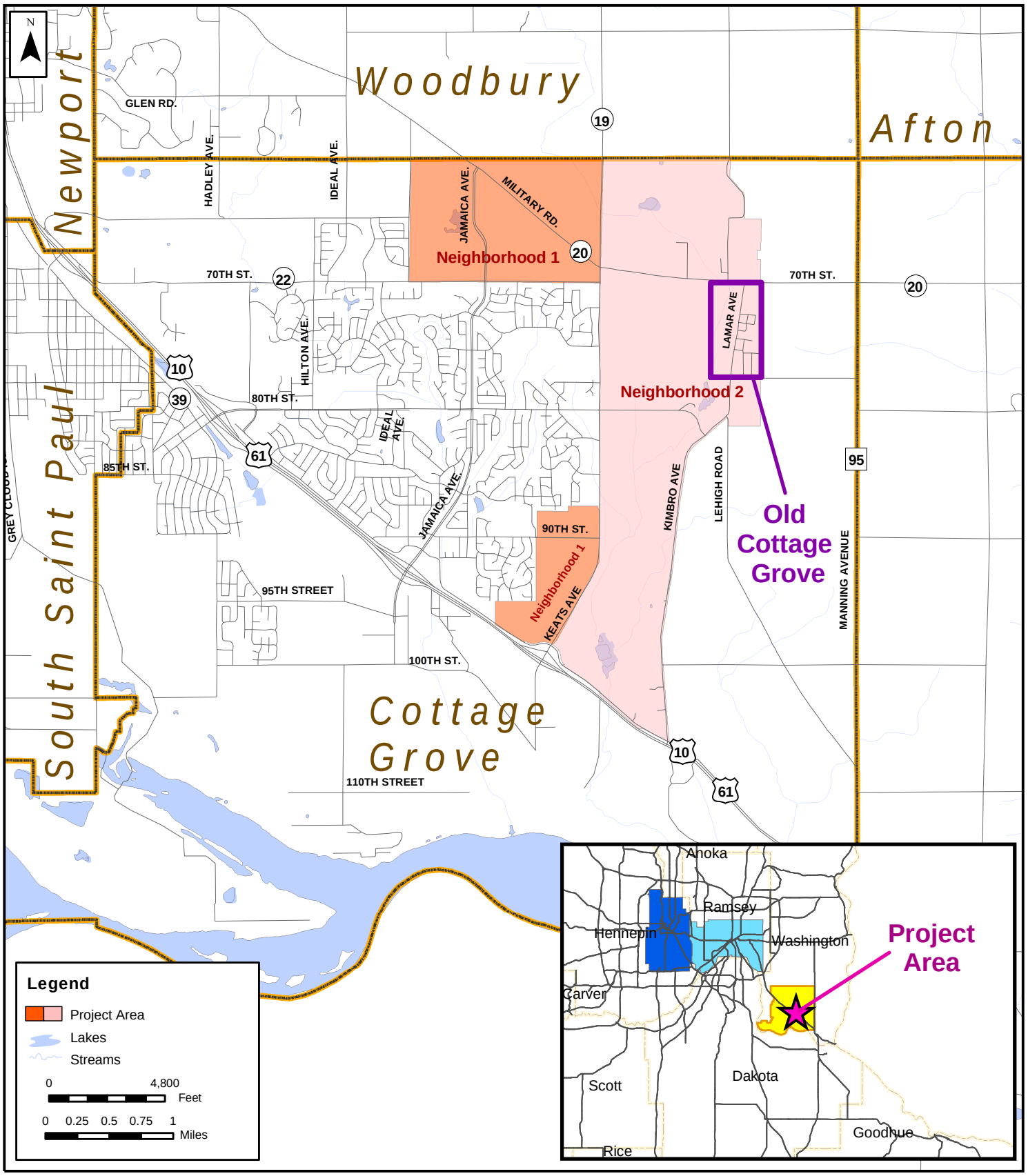
Table 6
Future (2020) Average Daily Traffic

Location		2002 AADT Counts	2020 ADT
US 61	North of 70th Street	53,000	69,300
US 61	Between 70th Street and 80th Street	42,000	51,100
US 61	Between 80th Street and Keats Avenue	31,000	42,800
US 61	Between Keats Avenue and Kimbro Avenue	26,000	32,700
70th Street	Between US 61 and Jamaica Avenue	6,400	10,400
70th Street	Between Jamaica Avenue and Keats Avenue	2,200	10,100
80th Street	Between US 61 and Hinton Avenue	22,300	28,000
80th Street	Hinton Avenue and Ideal Avenue	12,600	16,100
80th Street	Ideal Avenue and Jamaica Avenue	10,100	12,700
80th Street	Between Jamaica Avenue and Keats Avenue	7,400	9,300
80th Street	Keats Avenue to Kimbro Avenue	1,200	6,600
Jamaica Avenue	Between Military Road and 70th Street	4,200	15,900
Jamaica Avenue	Between 70th Street and 80th Street	7,400	10,500
Jamaica Avenue	Between 80th Street and US 61	11,200	17,700
Keats Avenue	North of Military Road	5,600	12,600
Keats Avenue	Between 70th Street and Military Road	7,600	12,600
Keats Avenue	Between 70th and 80th Street	6,200	13,000
Keats Avenue	Between 80th Street and 90th Street	6,200	11,000
Keats Avenue	Between 90th Street and US 61	6,200	12,000
Kimbro Avenue	Between Lamar Avenue and US 61	500	4,000
Military Road	Between Ideal Avenue and Jamaica Avenue	5,000	14,100
Military Road	Between Jamaica Avenue and Keats Avenue	1,450	-
Military Road	Keats Avenue to Lamar Avenue	3,000	6,000
Lamar Avenue	70th Street to Kimbro Avenue	1,200	2,000

Source: Mn/DOT Year 2002 ADT Flow Maps and Howard R Green Company

East Ravine Pre-Design

City of Cottage Grove



Project Location

Figure 1-1

February 4, 2005

Hoisington Koegler Group Inc.
Earth Tech
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Lemar Ave

Lehigh Rd

Kimbro Ave

80th Street

Kenosha Ave

Military Rd

70th Street

Jamaica Ave

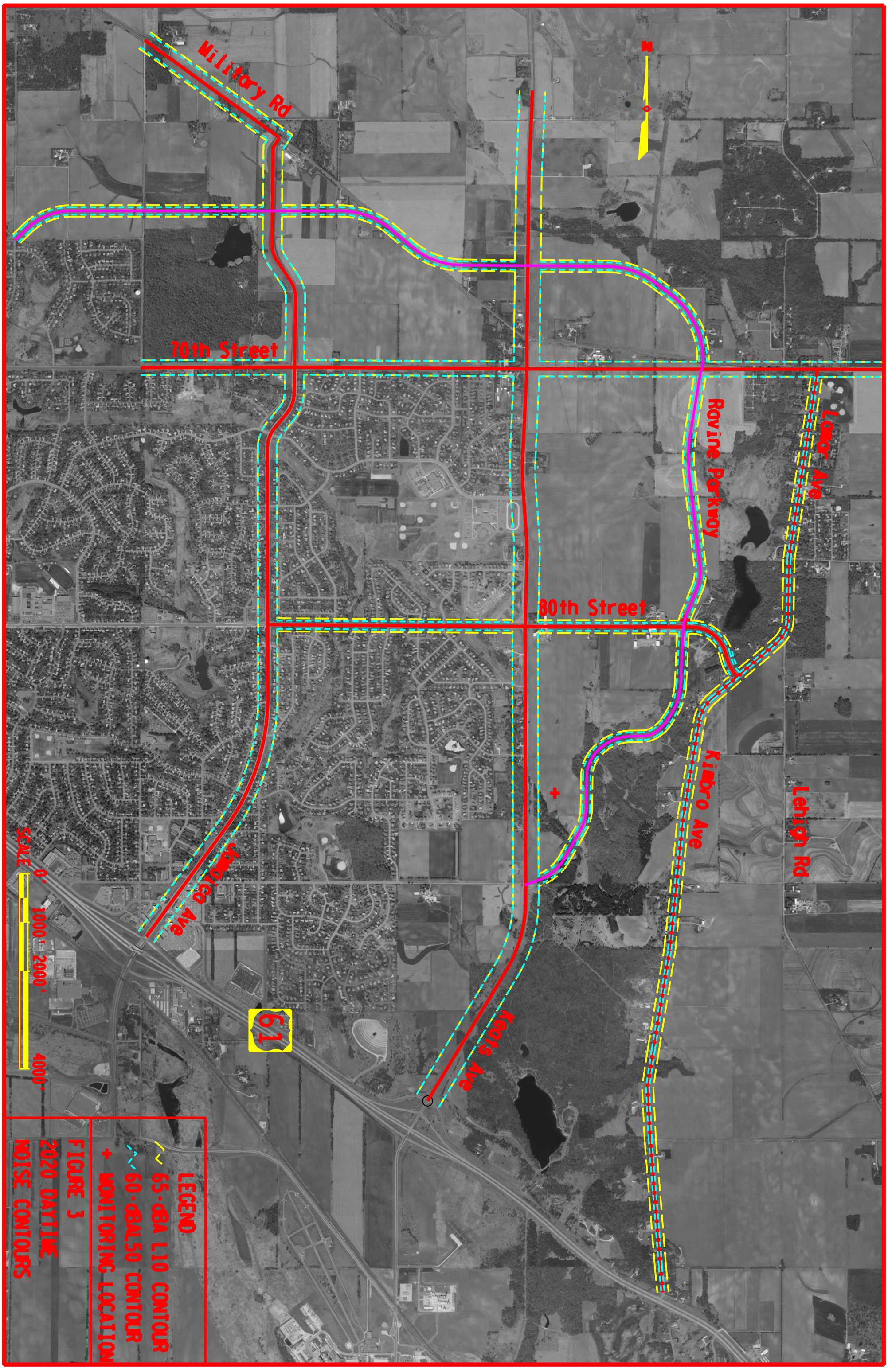
61

LEGEND
65-dBA L10 CONTOUR
60-dBAL50 CONTOUR
+ MONITORING LOCATION

FIGURE 2
2005 DAYTIME
NOISE CONTOURS

SCALE 0' 1000' 2000' 4000'

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Military Rd
70th Street
Ravinia Parkway
Lehigh Ave
80th Street
Kilbro Ave
Lehigh Rd
Joliet Ave
Joliet Ave
61
N
SCALE 0' 1000' 2000' 4000'
LEGEND
65-dBA L10 CONTOUR
60-dBA L50 CONTOUR
+ MONITORING LOCATION
FIGURE 3
2020 DAYTIME
NOISE CONTOURS

Technical Memorandum

SECONDARY TRAFFIC IMPACTS
EAST RAVINE COMMUNITY

COTTAGE GROVE, MN

June 2005

Prepared by:



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1.0 INTRODUCTION

The City of Cottage Grove is in the process of planning the development of the East Ravine area. To initiate this process, the City is required by *Minnesota State Rule 4410.3610, Subpart 1* to complete an Alternative Urban Areawide Review (AUAR). The AUAR will include the evaluation of potential environmental, water resources, water quality, and traffic impacts. Additionally, a mitigation plan will be established which will prevent or limit the level of impacts resulting from anticipated development.

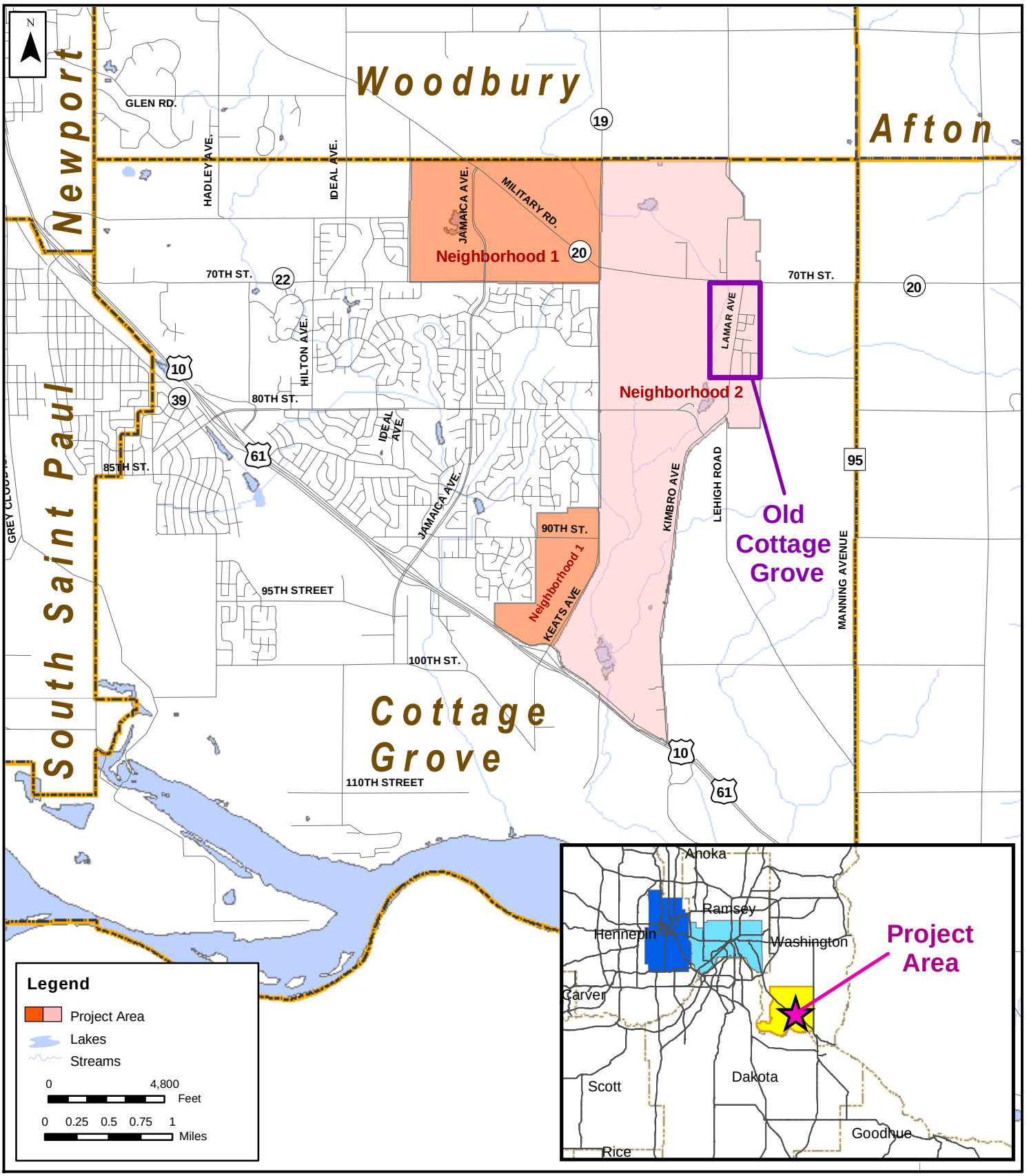
The East Ravine project area is illustrated on **Figure 1-1**. As shown, the developable area was split into two neighborhoods based upon when the areas are expected to urbanize. Neighborhood 1 incorporates about 1,185 acres, located in two sections of the city. The first section is located north US 61 and west of CSAH 19 (Keats Avenue). The other section is located between the Cottage Grove northern city limits and CSAH 22 (70th Street) and Inwood Avenue to the west and CSAH 19 (Keats Avenue) to the east. Neighborhood 2 is bounded by US 61 and the northern Cottage Grove city limits to the north and south and CSAH 19 (Keats Avenue) and Old Cottage Grove to the east and west. This area includes approximately 560 acres of developable land and 450 acres of park land.

As part of this AUAR document, a traffic impact study was completed to analyze and document the expected traffic impacts of potential future land development in the sewer and water extension area. This report documents the result of the traffic study and provides information necessary to complete the AUAR document. The analysis within this study area consists of the following elements:

- Identification of existing roadway and intersection characteristics.
- Estimation of future traffic volumes.
- Assessment of existing and future traffic operations.
- Recommendation of strategies to mitigate deficiencies.

East Ravine Pre-Design

City of Cottage Grove



Project Location

Figure 1-1

June 10, 2005

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2.0 EXISTING CONDITIONS

The traffic impacts of the existing and anticipated development were evaluated at key roadways and intersections. These key locations were selected because they provide primary access to the regional road system and will likely be the primary roadways when the area develops. This section identifies these roadways and intersections, documents their existing transportation characteristics, and quantifies the traffic operations at these locations. Traffic data included roadway geometry, traffic volumes, and roadway functional classifications.

2.1 Key Roadways

The key roadways analyzed for future traffic impacts **(Figure 2-1)** include:

1. US 61 between Glen Road and Kimbro Avenue
2. CSAH 20 (Military Road) between Ideal Avenue and Lamar Avenue
3. CSAH 22 (70th Street) between US 61 and CSAH 19 (Keats Avenue)
4. 80th Street between US 61 and Kimbro Avenue
5. Jamaica Avenue between CSAH 20 (Military Road) and US 61
6. CSAH 19 (Keats Avenue) between Dale Road and US 61
7. Lamar Avenue/Kimbro Avenue between 70th Street to US 61

Associated transportation characteristics are displayed on **Table 2-1**. In the table, the roadways are broken down into segments to provide a more accurate and detailed description. The existing roadway cross-sections are documented, along with the existing annual average daily traffic (AADT) and functional classifications. The AADT volumes on state and county roadways were obtained from *Year 2002 Mn/DOT Traffic Flow Maps*. These traffic volumes are also illustrated in **Figure 2-2**. Existing functional classification was taken from *Metropolitan Council Functional Class Metadata*, as illustrated in **Figure 2-3**.

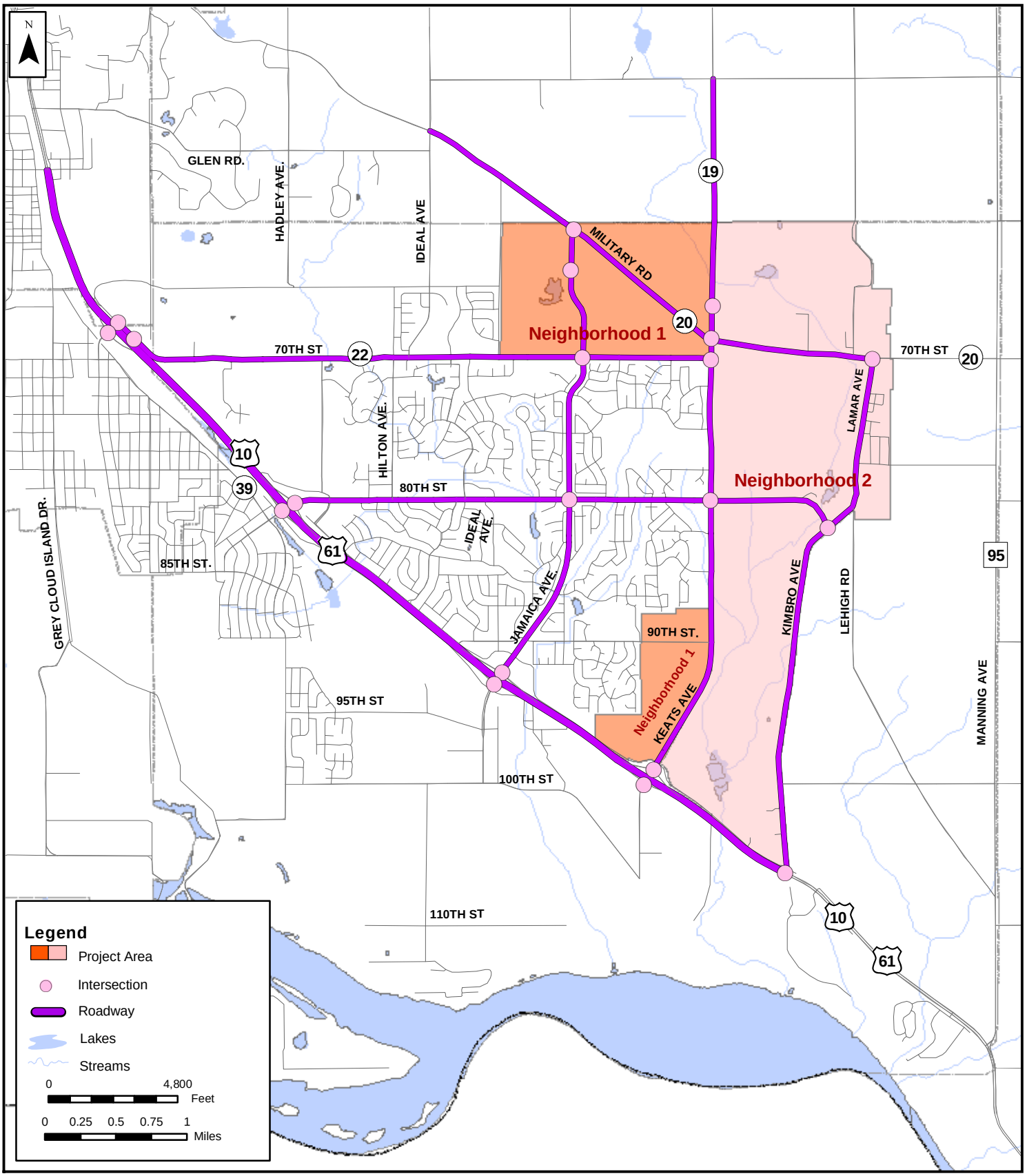
The US 61 Corridor is a principal arterial, running northwest-southeast through the study area with the primary purpose of mobility. North of CSAH 19 (Keats Avenue), the corridor acts as an interstate with limited access. Interchanges exist at about one-mile spacing. South of CSAH 19 (Keats Avenue), US 61 connects to intersections at-grade. The four-lane divided facility has ADT volumes from 53,000 vehicles per day (vpd) north of CSAH 22 (70th Street) to 26,000 vpd south of CSAH 19 (Keats Avenue). Land use to the north of US 61 is retail and residential. To the south, land use consists of mostly industrial with small clusters of residential and retail.

CSAH 20 (Military Road) is a minor arterial with the primary function of mobility. However, the roadway currently also provides access to a number of homesteads. The cross-section is a 2-lane undivided facility, surrounded by rural residential and agricultural. The roadway segment between Ideal Avenue and Jamaica Avenue CSAH 20 (Military Road) carries about 5,000 vpd. Between Jamaica Avenue and CSAH 19 (Keats Avenue) carries about 1,450 vpd, while the volume increased to 3,000 vpd to the east.

CSAH 22 (70th Street) is a two-lane facility, running east-west through the study area from US 61 to CSAH 19 (Keats Avenue). As a minor arterial, the corridor provides mobility and access is limited. Traffic volumes along CSAH 22 (70th Street) range from 6,400 vpd between US 61 and Jamaica Avenue to 2,200 vpd between Jamaica Avenue and CSAH 19 (Keats Avenue). Land use surrounding the corridor consists primarily of single-family residential along with small portions of medium density residential and commercial.

East Ravine Pre-Design

City of Cottage Grove



Key Roadways and Intersections

Figure 2-1

June 10, 2005

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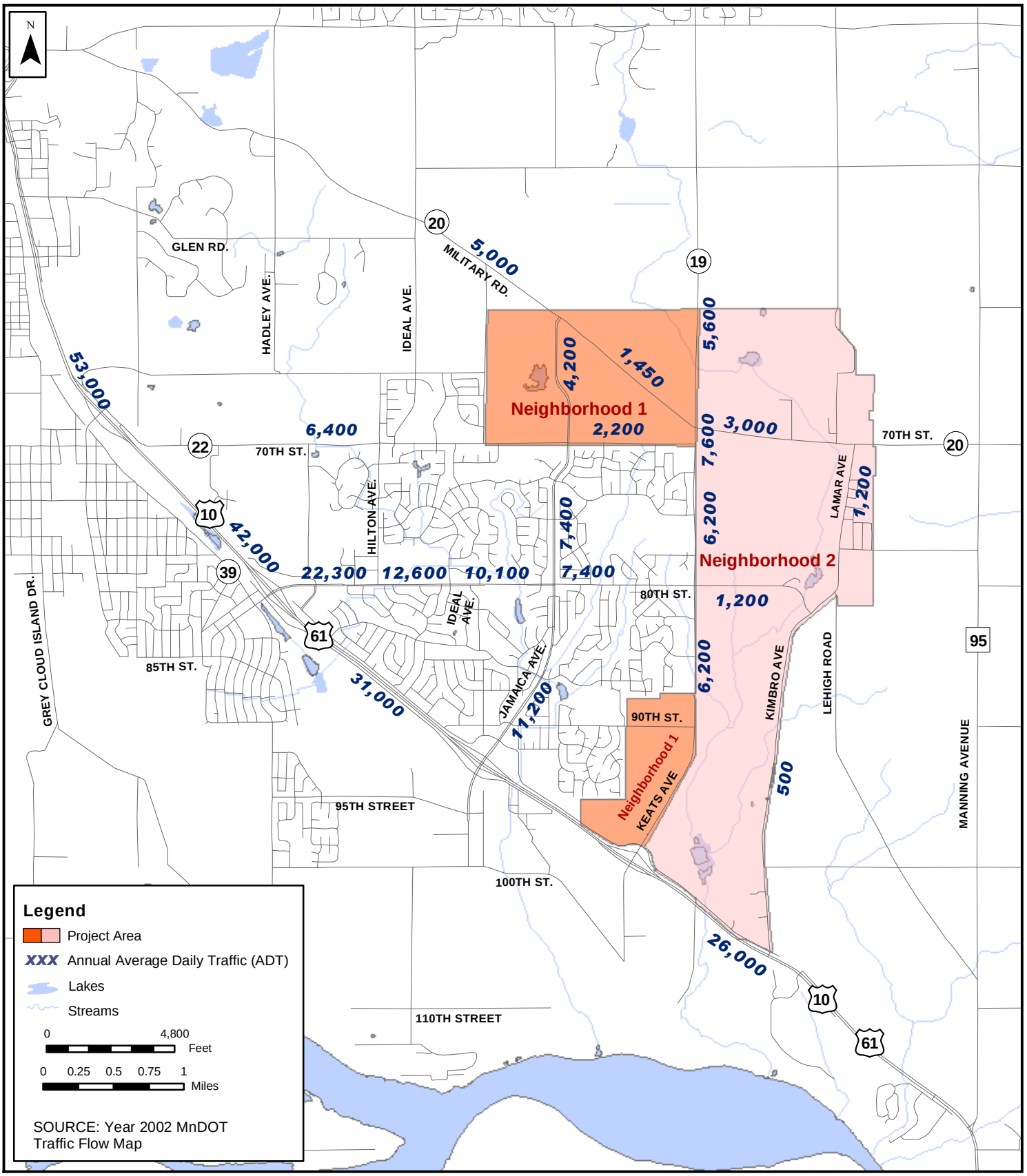
Table 2-1
Existing Roadway Segment Characteristics

Location		Roadway Section	Functional Classification	Year 2002 AADT Counts
US 61	North of 70th Street	4-Lane Freeway	Principal Arterial	53,000
US 61	Between 70th Street and 80th Street	4-Lane Freeway	Principal Arterial	42,000
US 61	Between 80th Street and CSAH 19	4-Lane Freeway	Principal Arterial	31,000
US 61	Between CSAH 19 and Kimbro Avenue	4-Lane Expressway with R/L Turn Lanes	Principal Arterial	26,000
CSAH 20 (Military Road)	Between Ideal Avenue and Jamaica Avenue	2-Lane Undivided with R Turn Lanes	Minor Arterial	5,000
CSAH 20 (Military Road)	Between Jamaica Avenue and CSAH 19	2-Lane Undivided with R Turn Lanes	Minor Arterial	1,450
CSAH 20 (Military Road)	CSAH 19 to Lamar Avenue	2-Lane Undivided	Minor Arterial	3,000
CSAH 22 (70th Street)	Between US 61 and Jamaica Avenue	2-Lane Undivided with R Turn Lanes	Minor Arterial	6,400
CSAH 22 (70th Street)	Between Jamaica Avenue and CSAH 19	2-Lane Undivided with R Turn Lanes	Minor Arterial	2,200
80th Street	Between US 61 and Hinton Avenue	4-Lane Divided with L/R Turn Lanes	Collector	22,300
80th Street	Hinton Avenue and Ideal Avenue	4-Lane Divided with L/R Turn Lanes	Collector	12,600
80th Street	Ideal Avenue and Jamaica Avenue	4-Lane Divided with L/R Turn Lanes	Collector	10,100
80th Street	Between Jamaica Avenue and CSAH 19	4-Lane Undivided with L Turn Lanes	Collector	7,400
80th Street	CSAH 19 to Kimbro Avenue	2-Lane Undivided with R Turn Lanes	Collector	1,200
Jamaica Avenue	Between Military Road and 70th Street	4-Lane Divided w/o Turn Lanes	Minor Arterial	4,200
Jamaica Avenue	Between 70th Street and 80th Street	4-Lane Divided with L Turn Lanes	Minor Arterial	7,400
Jamaica Avenue	Between 80th Street and US 61	4-Lane Divided with L Turn Lanes	Minor Arterial	11,200
CSAH 19 (Keats Avenue)	North of CSAH 20	2-Lane Undivided with R Turn Lanes	Minor Arterial	5,600
CSAH 19 (Keats Avenue)	Between CSAH 20 and CSAH 22	2-Lane Undivided with R Turn Lanes	Minor Arterial	7,600
CSAH 19 (Keats Avenue)	Between CSAH 22 and 80th Street	2-Lane Undivided with R Turn Lanes	Minor Arterial	6,200
CSAH 19 (Keats Avenue)	Between 80th Street and 90th Street	2-Lane Undivided with R Turn Lanes	Minor Arterial	6,200
CSAH 19 (Keats Avenue)	Between 90th Street and US 61	2-Lane Undivided with R Turn Lanes	Local Road	6,200
Kimbro Avenue	Between Lamar Avenue and US 61	2-Lane Undivided with R Turn Lanes	Minor Arterial	500
Lamar Avenue	70th Street to Kimbro Avenue	2-Lane Undivided	Collector	1,200

Source: Year 2002 Mn/DOT Traffic Flow Maps

East Ravine Pre-Design

City of Cottage Grove



Existing (2002) AADT Volumes

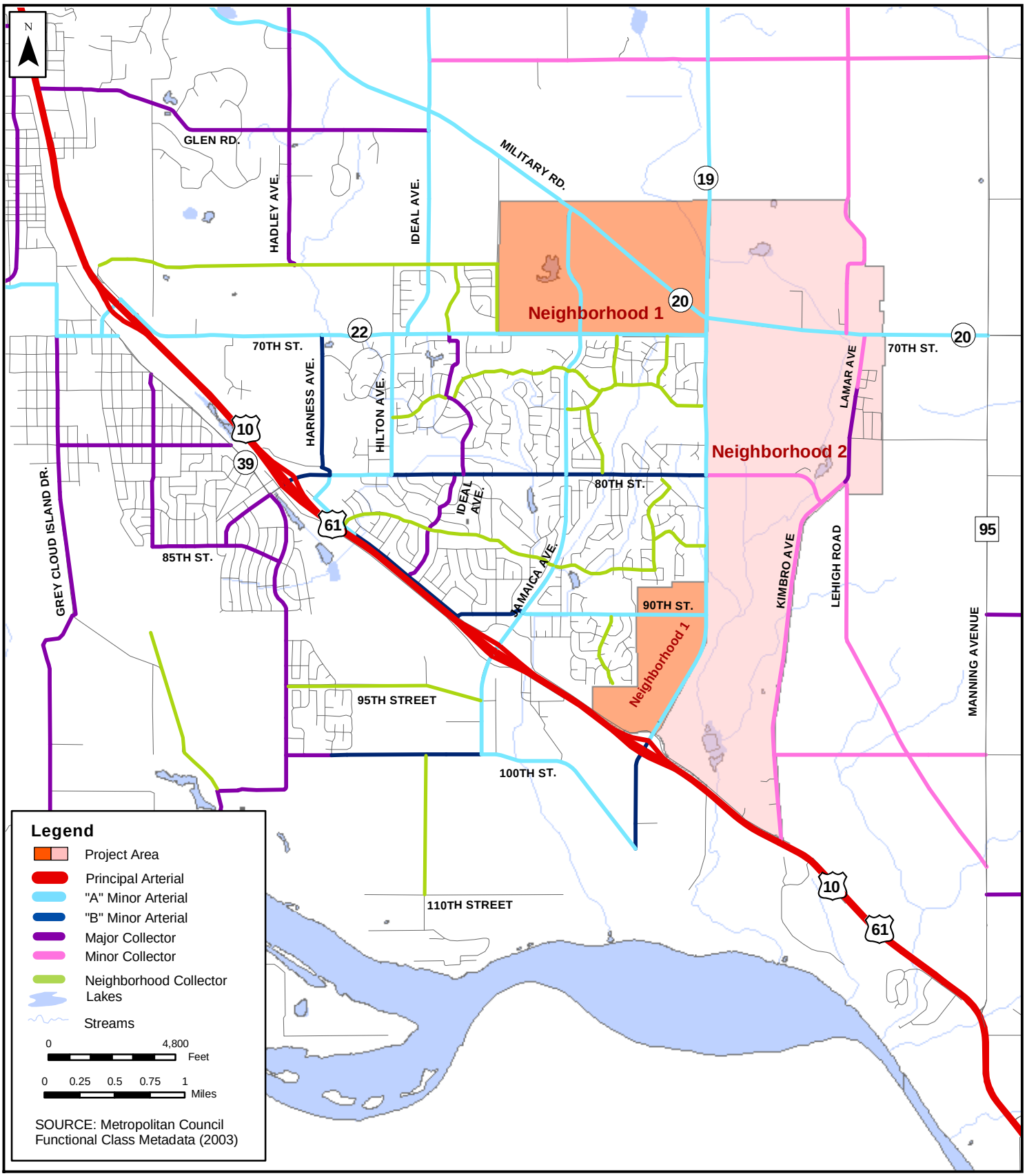
Figure 2-2

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City of Cottage Grove



Existing (2003) Functional Classification

Figure 2-3

June 10, 2005

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80th Street runs east-west from Hadley Avenue (just west of US 61) to CSAH 19 (Keats Avenue). As a minor arterial, the corridor provides mobility, and access is limited. The roadway is a four-lane facility with turn lanes from US 61 to CSAH 19 (Keats Avenue), where it continues to the west as a two-lane facility. Traffic volumes are 22,300 vpd near US 61, 7,400 vpd between Jamaica Avenue and CSAH 19 (Keats Avenue), and 1,200 vpd east of CSAH 19 (Keats Avenue). Near US 61, land use surrounding 80th Street is primarily commercial. To the east, land use is single-family residential.

Jamaica Avenue is a minor arterial, running north-south from CSAH 20 (Military Road) to US 61. The corridor is a four-lane undivided roadway with traffic volumes varying from 11,200 vpd near US 61 to 4,200 vpd south of CSAH 22 (70th Street). North of CSAH 22 (70th Street), land use on both sides of Jamaica is rural residential and agricultural. Single-family residential is located south of CSAH 22 (70th Street) until it nears US 61, where commercial property exists.

CSAH 19 (Keats Avenue) is a two-lane undivided with right turn lanes. The roadway functions as a minor arterial with volumes ranging from 7,600 vpd between CSAH 20 (Military Road) and CSAH 22 (70th Street) and 6,200 vpd south of CSAH 22 (70th Street). Land use near CSAH 19 (Keats Avenue) includes single-family residential, rural residential, and agricultural land.

Lamar Avenue is a two-lane facility, running north-south through the Old Cottage Grove. The roadway extends from CSAH 22 (70th Street) to State Highway 95 as a collector. Within Old Cottage Grove, traffic volumes are 1,200 vpd with multiple accesses exist for commercial and single-family homes. To the south, land use consists of rural residential and agricultural land.

Kimbro Avenue connects Old Cottage Grove to US 61. The roadway is a two-lane facility with right turn lanes. Currently classified as a local roadway, traffic volumes are around 500 vpd. The land around Kimbro Avenue consists of rural residential and agricultural.

2.2 Key Intersections

Eighteen intersections were selected because they connect two roadways that provide the primary access to the regional road system and will likely be major intersections when the area develops. The vast majority of traffic exiting and entering the project area would have to use at least one of these intersections. The location of these key intersections is shown on **Figure 2-1**. The key intersections selected to evaluate as part of this traffic study include:

1. US 61/70th Street Ramps (3 intersections)
2. US 61/80th Street Ramps (2 intersections)
3. US 61/Jamaica Ave Ramps (2 intersections)
4. US 61/CSAH 19 (Keats Avenue) Ramps (2 intersections)
5. US 61/Kimbro Avenue
6. 80th Street/Jamaica Avenue
7. 80th Street/CSAH 19 (Keats Avenue)
8. 80th Street/Kimbro Avenue
9. CSAH 20 (Military Road)/Lamar Avenue
10. CSAH 22 (70th Street)/CSAH 19 (Keats Avenue)
11. CSAH 22 (70th Street)/Jamaica Avenue
12. CSAH 20 (Military Road)/Jamaica Avenue
13. CSAH 20 (Military Road)/CSAH 19 (Keats Avenue)

The existing lane geometry and traffic control for each intersection is shown on **Table 2-2**. Two intersections, the US 61 north and southbound ramps and 80th Street are signalized. The remaining intersections are controlled by STOP signs, including Thru-STOP and All-Way STOP control.

Table 2-2
Existing Intersection Geometry and Traffic Control

Intersection	West Approach	East Approach	South Approach	North Approach
US 61 SB Ramp/CSAH 22 (70th Street)	 STOP	 STOP	n.a.	 STOP
US 61 NB Off Ramp/CSAH 22 (70th Street)	 STOP	n.a.		
US 61 NB On Ramp/CSAH 22 (70th Street)	 STOP	n.a.	 STOP	 STOP
US 61 SB Ramp/80th Street		 Traffic Signal - Protected and Permitted		n.a.
US 61 NB Ramp/80th Street		 Traffic Signal - Protected and Permitted	n.a.	
US 61 SB Ramp/Jamaica Avenue	 STOP	n.a.	 Thru	 Thru
US 61 NB Ramp/Jamaica Avenue	n.a.	 STOP	 Thru	 Thru
US 61 SB Ramp/CSAH 19 (Keats Avenue)	 STOP	n.a.	 Thru	 Thru
US 61 NB Ramp/CSAH 19 (Keats Avenue)	n.a.	 STOP	 Thru	 Thru
US 61/Kimbro Avenue			n.a.	
80th Street/Jamaica Avenue	 STOP	 STOP	 STOP	 STOP
80th Street/CSAH 19 (Keats Avenue)	 STOP	 STOP	 STOP	 STOP
80th Street/Kimbro Avenue	 STOP	n.a.	 Thru	 Thru
CSAH 22 (70th Street)/Lamar Avenue	 Thru	 Thru	 STOP	n.a.
CSAH 22 (70th Street)/CSAH 19 (Keats Avenue)	 STOP	n.a.	 Thru	 Thru
CSAH 22 (70th Street)/Jamaica Avenue	 STOP	 STOP	 STOP	 STOP
CSAH 20 (Military Road)/Jamaica Avenue	 Thru	 Thru	 STOP	n.a.
CSAH 20 (Military Road)/CSAH 19 (Keats Avenue)	 STOP	 STOP	 STOP	 STOP

Source: Howard R. Green Company

PM peak hour turning movement counts were collected at the eighteen key intersections in July 2003. This count data is displayed on **Table 2-3** and **Figure 2-4**. It should be noted that counts near CSAH 20 (Military Road) were completed after construction in this area was completed. Additionally, Ideal Avenue was under construction north of CSAH 22 (70th Street).

2.3 Existing Land Use

Currently, the project area is largely undeveloped, consisting mostly of grasslands, agricultural land and farmsteads. Neighborhood 1 has already experienced some urbanized growth. Between CSAH 20 and CSAH 22, limited commercial and single family residential exists. Commercial properties include Cedarhurst, a long-term event center and the Light of Way Church. Near US 61, current commercial properties include the Cottage Grove Drive Inn Movie Theatre and Cottage Grove VFW Post 8752. The southern portion of Neighborhood 2 is made up of the Cottage Grove Ravine Regional Park. The park consists of approximately 450 acres. Old Cottage Grove is located on the east side of the study area, and consists of a mix of commercial and single family residential. The rest of Neighborhood 2 is made up of rural residential and farmsteads.

2.4 Existing Operations Analysis

2.4.1 Analysis Methodology

The approach to the traffic operations analysis is derived from the established methodologies documented in the *Highway Capacity Manual* (TRB, 2000). *The Highway Capacity Manual* (HCM) contains a series of analysis techniques that are used to evaluate the operation of transportation facilities under specific conditions.

The results of an HCM analysis are typically presented in the form of a letter grade (A-F) that provides a qualitative estimate of the operational efficiency or effectiveness. The letter grade determined by the HCM analysis is referred to as level of service (LOS). By definition, LOS A conditions represent high-quality operations (i.e., motorists experience very little delay or interference) and LOS F conditions represent very poor operations (i.e., extreme delay or severe congestion). The LOS of an intersection or road segment is based on three main elements:

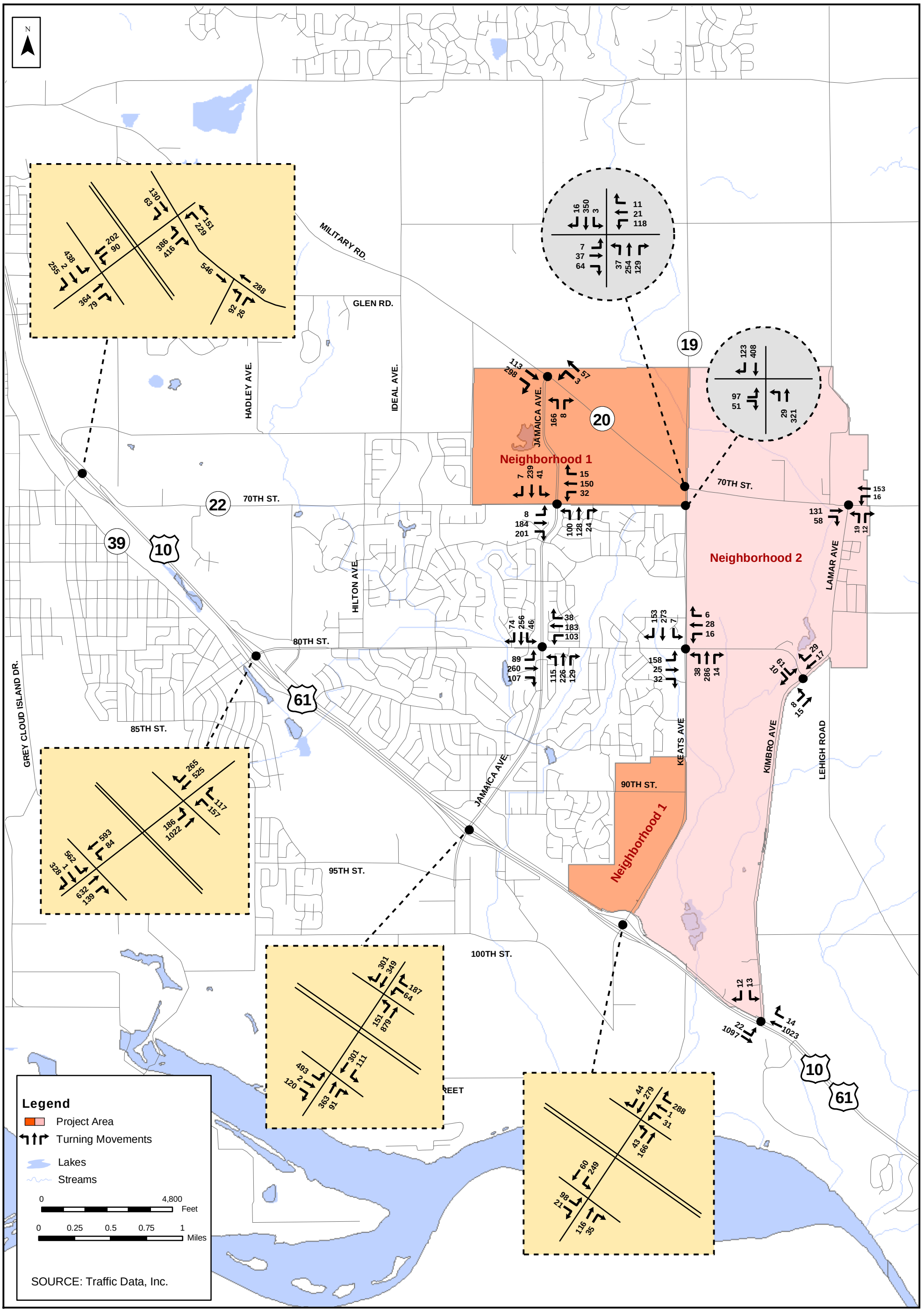
- Roadway Geometry (i.e. How many lanes are there?)
- Traffic Control (i.e. Is there a signal or stop sign?)
- Traffic Volume (i.e. How many vehicles are using this intersection/road segment?)

It is important to note that LOS is defined differently for the two HCM analysis techniques applied in this study. The arterial roadway analysis focuses on the average daily volume to capacity ratio along a roadway segment, and the intersection analysis focuses on delay caused by the PM peak hour critical movements. It is therefore possible to have an efficient intersection located along a poorly operating roadway segment, or a poorly operating intersection along an otherwise free-flowing arterial.

The arterial roadway LOS was determined by conducting a planning level analysis. This analysis consists of comparing the average daily flow rates on a roadway segment to the LOS breakdown of ADT volumes for that facility type. **Figure 2-5** and **2-6** provides a breakdown of roadway LOS by peak hourly directional flow for the different facility types analyzed as part of this study. The figure was based on capacity information found in the HCM 2000.

East Ravine Pre-Design

City of Cottage Grove



Existing (2003) Turning Movement Volumes

Figure 2-4

June 10, 2005

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Table 2-3
Existing PM Peak Hour Traffic Turning Movement Counts at Key Intersections

Intersection	West Approach			East Approach			South Approach			North Approach		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
US 61 SB Ramp/CSAH 22 (70th Street)	0	364	79	90	202	0	0	0	0	438	2	255
US 61 NB Off Ramp/CSAH 22 (70th Street)	92	0	26	0	0	0	0	288	0	0	546	0
US 61 NB On Ramp/CSAH 22 (70th Street)	386	0	416	0	0	0	229	151	0	0	130	63
US 61 SB Ramp/80th Street	0	632	139	84	593	0	0	0	0	562	1	328
US 61 NB Ramp/80th Street	186	1022	0	0	525	265	157	0	117	0	0	0
US 61 SB Ramp/Jamaica Avenue	493	2	120	0	0	0	0	363	91	111	301	0
US 61 NB Ramp/Jamaica Avenue	0	0	0	64	0	187	151	879	0	0	349	301
US 61 SB Ramp/CSAH 19 (Keats Avenue)	98	0	21	0	0	0	0	116	35	249	60	0
US 61 NB Ramp/CSAH 19 (Keats Avenue)	0	0	0	31	1	288	43	166	0	0	279	44
US 61/Kimbro Avenue	22	1097	0	0	1023	14	0	0	0	13	0	12
80th Street/Jamaica Avenue	89	260	107	103	183	38	115	266	129	46	256	74
80th Street/CSAH 19 (Keats Avenue)	158	25	32	16	28	6	38	286	14	7	273	153
80th Street/Kimbro Avenue	61	0	10	0	0	0	8	15	0	0	17	29
CSAH 22 (70th Street)/Lamar Avenue	0	131	58	16	153	0	19	0	12	0	0	0
CSAH 22 (70th Street)/CSAH 19 (Keats Avenue)	97	0	51	0	0	0	29	321	0	0	408	123
CSAH 22 (70th Street)/Jamaica Avenue	8	184	201	32	150	15	100	128	24	41	239	7
CSAH 20 (Military Road)/Jamaica Avenue	0	113	298	3	57	0	166	0	8	0	0	0
CSAH 20 (Military Road)/CSAH 19 (Keats Avenue)	7	37	64	118	21	11	37	254	129	16	350	3

Source: Traffic Data Inc., 2003 Turning Movement Counts

Figure 2-5
Estimated Arterial and Collector Segment Level of Service

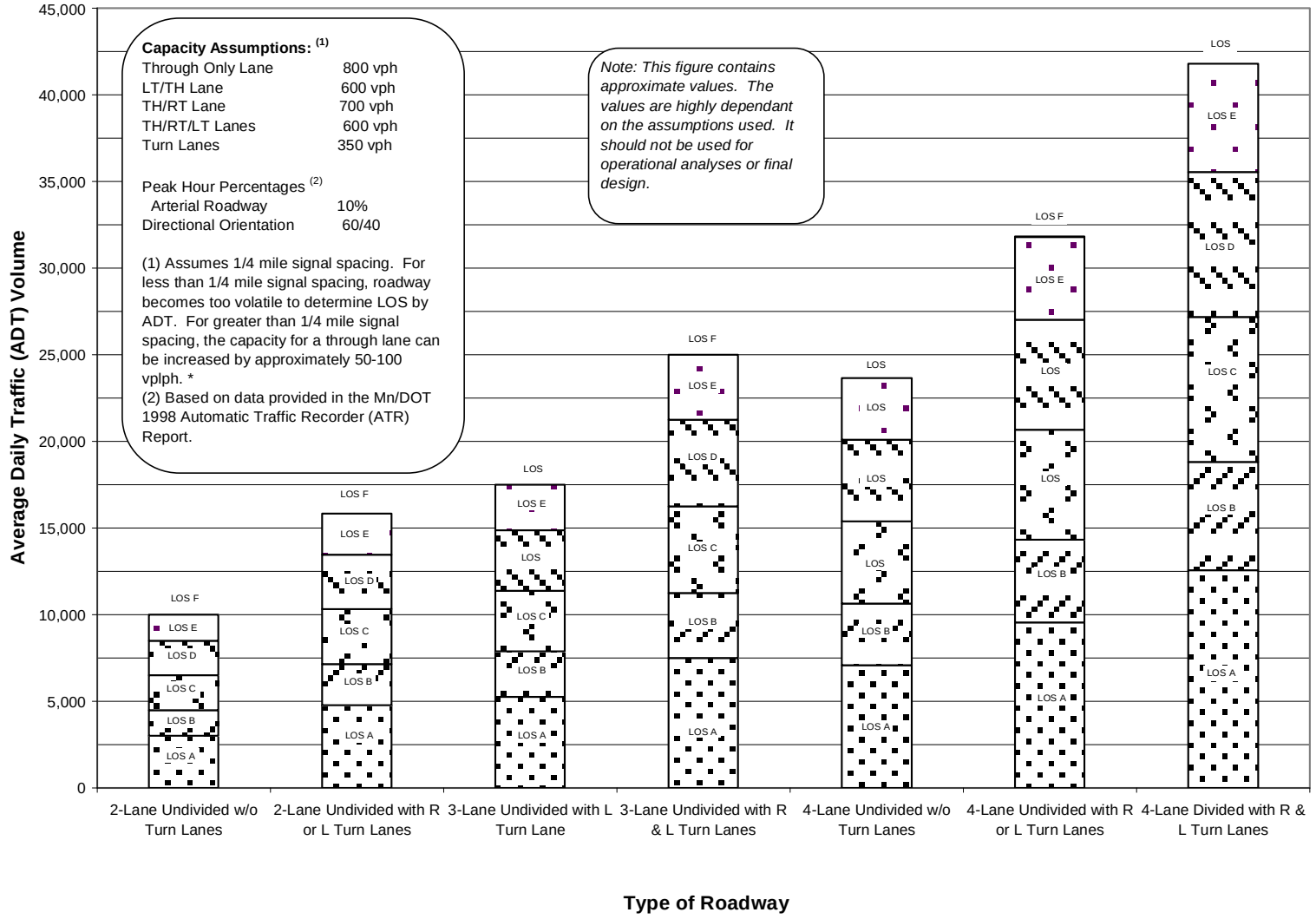
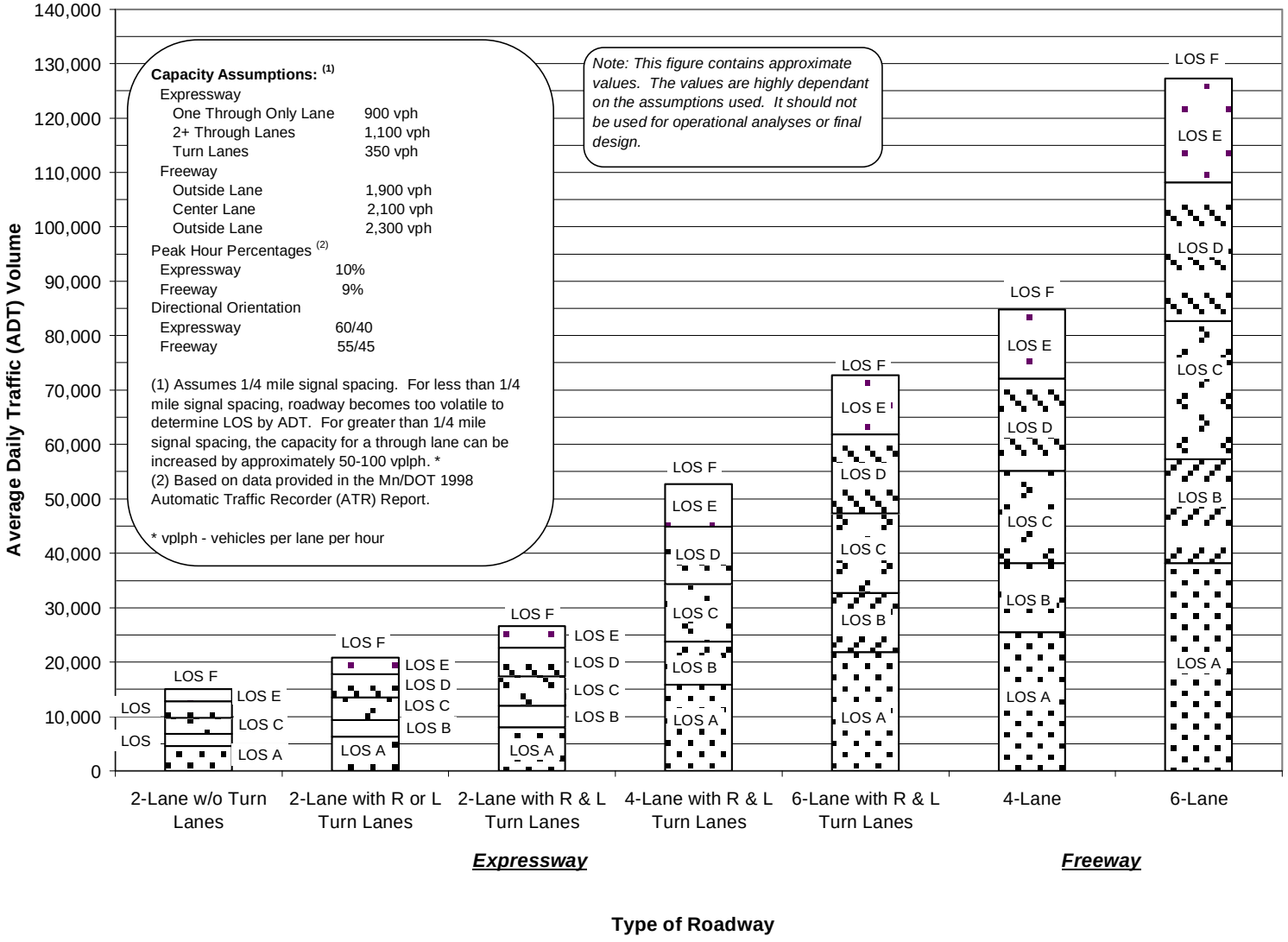


Figure 2-6
Estimated Expressway and Freeway Segment Level of Service



For intersections, LOS is primarily a function of peak hour turning movement volumes, intersection land configuration, and traffic control. The intersection analysis was completed using average control delay as defined by the HCM. The LOS for signalized and unsignalized intersections is shown on **Table 2-4**.

Table 2-4
Intersection Level of Service Measures

LOS	Delay (seconds)	
	Signalized Intersection	Unsignalized Intersection
A	≤ 10	≤ 10
B	10 - 20	10 - 15
C	20 - 35	15 - 25
D	35 - 55	25 - 35
E	55 - 80	35 - 50
F	> 80	>50

Source: Tables 16-2 and 17-2, Highway Capacity Manual (2000)

The threshold values for unsignalized intersections are slightly less than for signalized intersections because driver expectation of the intersection performance varies for different types of traffic control. Also, for the purposes of this study, the level of service reported for unsignalized intersection is based on at least one of the movements at the intersection operating at a LOS D or greater and does not necessarily mean that the operations of the entire intersection is over the LOS D threshold value. For a Thru-STOP controlled intersection, the movements that most often experience significant delays include: minor street through, minor street left turn onto major street, and major street left turn onto the minor street. Typical mitigative strategies to address long minor street delays could involve installing a traffic signal at the intersection or prohibiting some of the minor street movements as part of a comprehensive access management plan for the corridor.

Although LOS A conditions represent the best possible level of traffic flow, it is not feasible to build urban roadways and intersections to such high standards. Therefore in the Twin Cities region, the index of congestion is at the LOS D/E boundary.

2.4.2 Existing Level of Service Summary

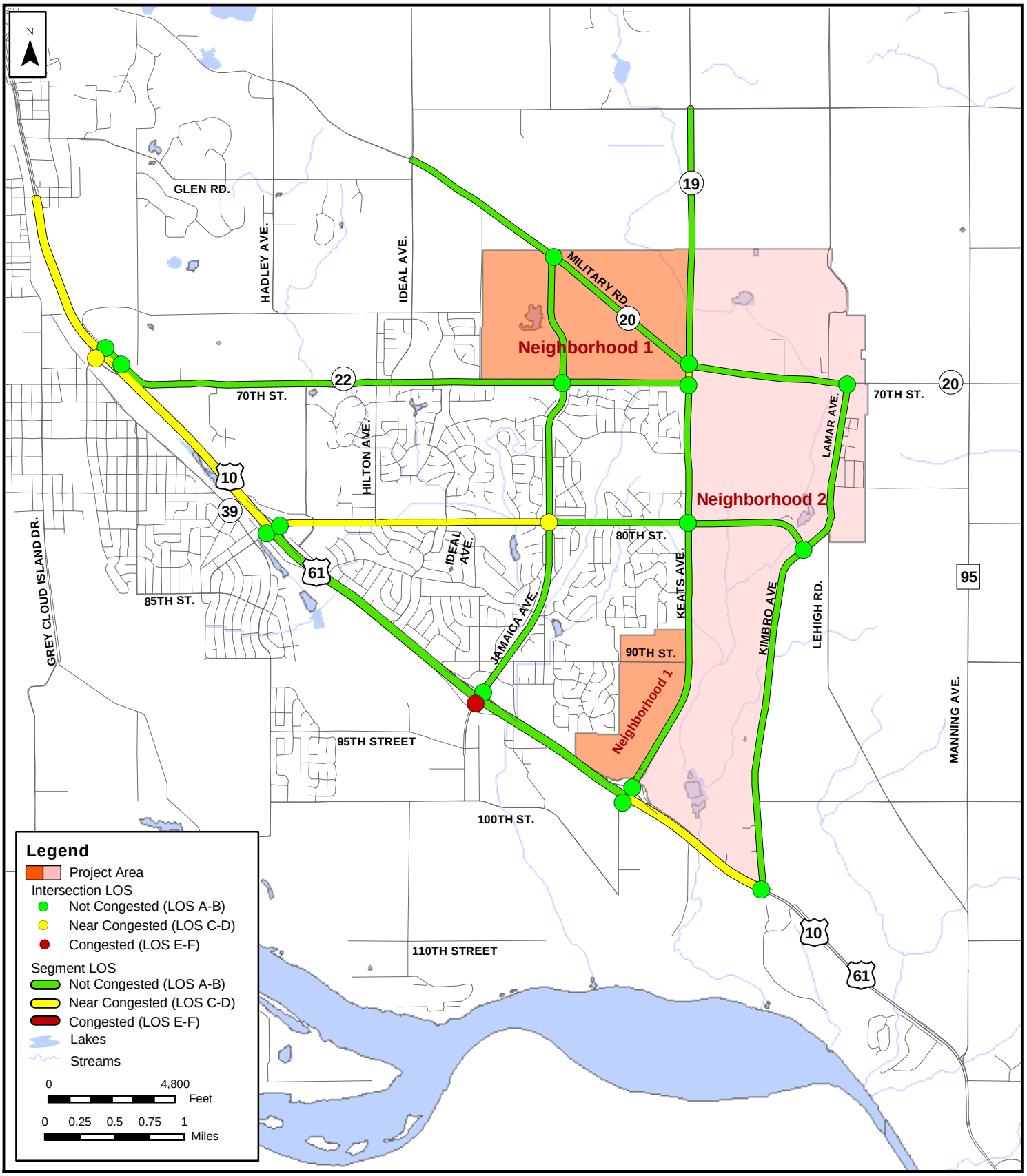
A summary of the existing segment and intersection traffic operations is displayed on **Figure 2-7**. For purposes of this study, the roadways and selected intersections are classified as either uncongested, approaching congestion, or congested based on the estimated LOS. As can be seen on the figure, roadways and intersections were identified as congested if they exceeded an LOS D condition.

The segment operations are also displayed on **Table 2-5**. As shown, no deficiencies currently exist. Portions of US 61, 80th Street and CSAH 19 (Keats Avenue) are approaching congestion at LOS C, while the remaining roadways are uncongested at LOS A and B.

The PM peak hour intersection operations are documented on **Table 2-6**. The US 61 Southbound off-ramp at Jamaica Avenue is operating at LOS F during the PM peak hour due to congestion on the off-ramp. This intersection is has Thru-STOP traffic control with free flow on Jamaica Avenue. Motorists have difficulty finding gaps on Jamaica Avenue in order to make a left turn towards the development on the north side of

East Ravine Pre-Design

City of Cottage Grove



Existing (2002) Roadway and Intersection LOS

Figure 2-7

June 10, 2005

Hoisington Koegler Group Inc.
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IBI Group
McComb Group, Ltd.

Table 2-5
Existing (2002) Segment Level of Service

Location		LOS
US 61	North of 70th Street	C
US 61	Between 70th Street and 80th Street	C
US 61	Between 80th Street and CSAH 19	B
US 61	Between CSAH 19 and Kimbro Avenue	C
CSAH 20 (Military Road)	Between Ideal Avenue and Jamaica Avenue	B
CSAH 20 (Military Road)	Between Jamaica Avenue and CSAH 19	A
CSAH 20 (Military Road)	CSAH 19 to Lamar Avenue	A
CSAH 22 (70th Street)	Between US 61 and Jamaica Avenue	B
CSAH 22 (70th Street)	Between Jamaica Avenue and CSAH 19	A
80th Street	Between US 61 and Hinton Avenue	C
80th Street	Hinton Avenue and Ideal Avenue	B
80th Street	Ideal Avenue and Jamaica Avenue	A
80th Street	Between Jamaica Avenue and CSAH 19	A
80th Street	CSAH 19 to Kimbro Avenue	A
Jamaica Avenue	Between Military Road and 70th Street	A
Jamaica Avenue	Between 70th Street and 80th Street	A
Jamaica Avenue	Between 80th Street and US 61	B
CSAH 19 (Keats Avenue)	North of CSAH 20	B
CSAH 19 (Keats Avenue)	Between CSAH 20 and CSAH 22	C
CSAH 19 (Keats Avenue)	Between CSAH 22 and 80th Street	B
CSAH 19 (Keats Avenue)	Between 80th Street and 90th Street	B
CSAH 19 (Keats Avenue)	Between 90th Street and US 61	B
Kimbro Avenue	Between Lamar Avenue and US 61	A
Lamar Avenue	70th Street to Kimbro Avenue	A

Source: Howard R. Green Company

US 61. US 61 Southbound Ramp/CSAH 22 (70th Street) and 80th Street/Jamaica Avenue are approaching congestion at LOS C. The remaining intersections are uncongested at LOS A or B.

Table 2-6
Existing (2003) PM Peak Hour Intersection Level of Service

Intersection	Level of Service				
	West Approach	East Approach	South Approach	North Approach	Intersection
US 61 SB Ramp/CSAH 22 (70th Street)	C	B	- -	B	C
US 61 NB Off Ramp/CSAH 22 (70th Street)	C	- -	A	A	A
US 61 NB On Ramp/CSAH 22 (70th Street)	B	- -	B	B	B
US 61 SB Ramp/80th Street	B	A	- -	C	B
US 61 NB Ramp/80th Street	A	A	C	- -	B
US 61 SB Ramp/Jamaica Avenue	F	- -	A	A	F
US 61 NB Ramp/Jamaica Avenue	- -	F	A	A	A
US 61 SB Ramp/CSAH 19 (Keats Avenue)	C	- -	A	A	A
US 61 NB Ramp/CSAH 19 (Keats Avenue)	- -	B	A	A	A
US 61/Kimbro Avenue	A	A	- -	E	A
80th Street/Jamaica Avenue	C	C	C	A	C
80th Street/CSAH 19 (Keats Avenue)	B	B	C	B	B
80th Street/Kimbro Avenue	A	- -	A	A	A
CSAH 22 (70th Street)/Lamar Avenue	A	A	B	- -	A
CSAH 22 (70th Street)/CSAH 19 (Keats Avenue)	A	- -	A	A	A
CSAH 22 (70th Street)/Jamaica Avenue	B	B	B	B	B
CSAH 20 (Military Road)/Jamaica Avenue	A	A	B	- -	A
CSAH 20 (Military Road)/CSAH 19 (Keats Avenue)	A	A	B	C	B

Source: Howard R. Green Company

3.0 FUTURE CONDITIONS

The purpose of this section is to identify traffic impacts associated with future development within the project area. For the purposes of completing the East Ravine development, a future land use scenario was established using the highest intensity of land use expected at full build-out. It should be noted that the Washington County travel demand model (TDM), used to develop future traffic volumes, was based upon 2020 land use projections outside of the study area.

3.1 Year 2020 Land Development Scenario

In order to analyze the traffic impacts for the full build-out of the East Ravine area, land uses were defined for the entire study area. The number and type of vehicle trips vary with differing types of land use. For example, a shopping center is likely to have larger traffic volumes than an industrial development. However, a larger percentage of the trips to an industrial development are work-related and take place during the morning and evening rush hours, while shopping centers attract traffic throughout the day.

McComb Group, Ltd. projected the quantity of residential and commercial potential based upon demand and what the city can reasonable support. Future residential development was estimated by examining trends in single and multi-family development with Cottage Grove and the southeast metropolitan area. An additional 10,750 households will be constructed in Cottage Grove by Year 2025. The development is expected to be split evenly between single family and multi-family dwellings. Forty percent of all building permits are estimated to be townhomes, twinhomes, and other medium density developments, while higher density units will account for the remaining multi-family. The estimated annual growth of single and multi-family households is listed on **Table 3-1**.

Commercial development was projected in two areas of town: TH 61 / Keats Avenue and Keats Avenue and Military Road. Near the TH 61 / Keats Avenue Interchange, commercial is expected to grow from 295,900 square feet in 2010 to 646,800 square feet in 2025. The majority of this growth is expected to be grocery and discount stores, with additional growth in convenience goods, services, building materials, food service, medical, auto parts, and convenience/gas. Near the intersection of Military Road and Keats Avenue, commercial land use is expected to increase from 18,000 square feet in 2005 to 204,200 square feet in 2025.

Using the residential and commercial projections above, Hoisington Koegler Group Inc. developed a land use scenario for both neighborhoods illustrated in **Figures 3-1** to **3-3**. In order to analyze the traffic impacts associated with this land development scenario, the area was divided into segments called traffic analysis zones (TAZ). Land use was distributed into each TAZ to determine how many vehicle trips would enter or exit each zone per day. These trips were applied to a computer representation of Cottage Grove's roadway network contained in the Washington County Year 2020 Travel Demand Model. **Figure 3-4** depicts the location of these TAZs in the project area. The number of projected households and employees by zone is displayed on **Table 3-2**.

3.2 Future (2020) Traffic Forecasts

Year 2020 traffic forecasts for a complete build-out of the East Ravine area were developed using the Washington County Travel Demand Model. Daily traffic forecasts were developed for each of the key roadway segments listed in **Section 2.1**, and turning movement projections were estimated for each of the key intersections listed in **Section 2.2**. The model included the addition of the East Ravine Parkway and

Table 3-1
Building Permit Potential

Year	Single Family	Multi-Family	Total Households
2006	58	58	116
2007	134	134	268
2008	160	160	320
2009	211	211	422
2010	223	223	446
2011	264	264	528
2012	276	276	552
2013	283	283	566
2014	288	288	576
2015	292	292	584
2016	297	297	594
2017	301	301	602
2018	306	306	612
2019	311	311	622
2020	316	316	632
2021	321	321	642
2022	326	326	652
2023	331	331	662
2024	336	336	672
2025	341	341	682

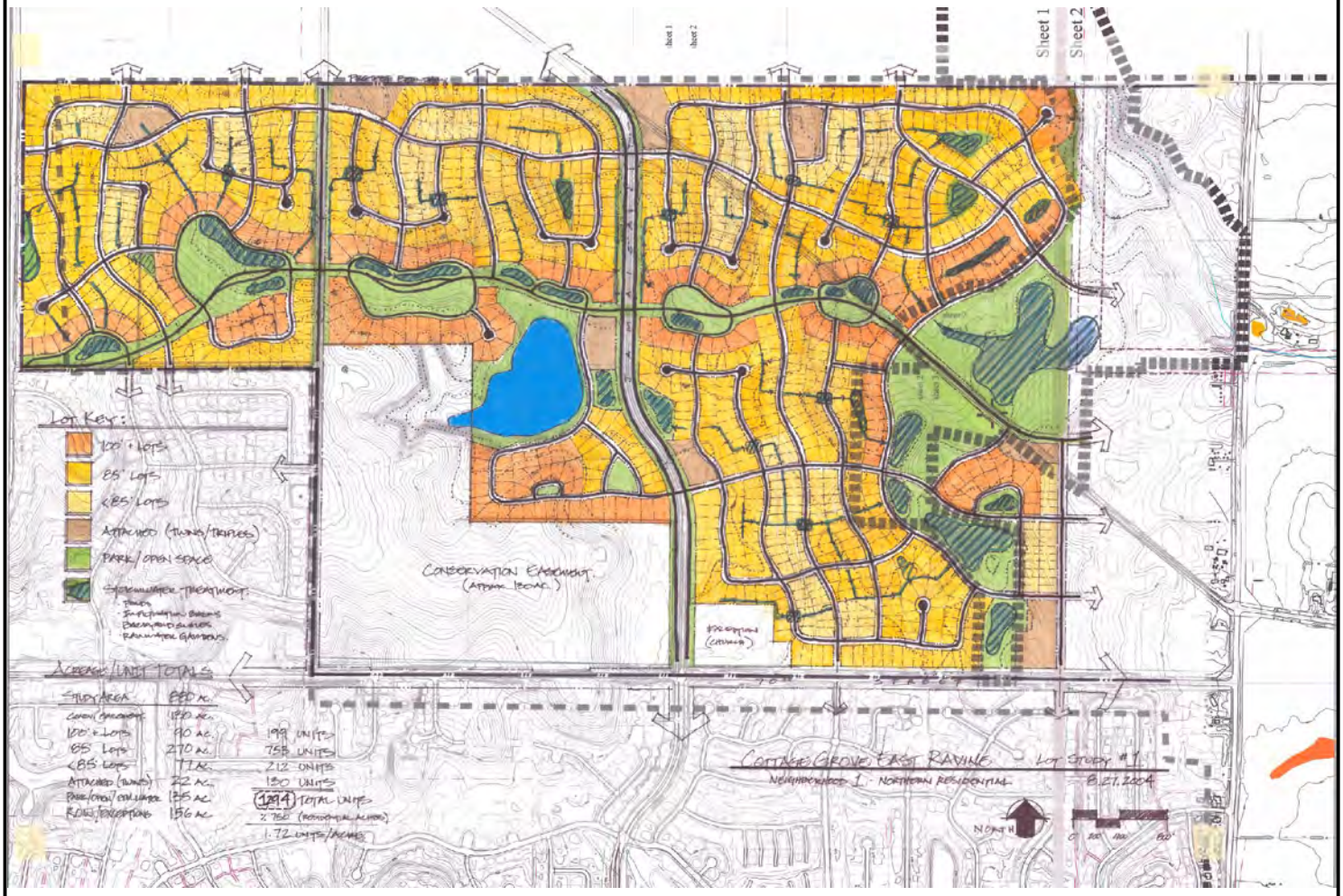
Source: McComb Group, Ltd.

the closure of the CSAH 20 (Military Road) and CSAH 19 (Keats Avenue) intersection. It should also be noted that alternative modes of transportation were not represented in this model since the percentage of use is insignificant. According to the U.S. Census Bureau, transit, bicycling, and walking accounted for a total of 2.5 percent of commuters in Cottage Grove in Year 2000.

Year 2020 ADT volumes are illustrated on **Figure 3-5** and **Table 3-3**. Traffic is expected to grow rapidly with development. An additional 80,000 daily vehicle trips are forecasted within the project area. Generally, traffic volumes on key roadways range from 69,000 vpd on the expressway to 2,000 vpd on collectors. It should be noted that adjustments were made to the daily forecasts to account for the deviations between the corresponding base year traffic counts and the modeled assignments.

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Source: Hoisington Kroegler Group, Inc.

Land Use Scenario

Figure 3-1

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Source: Hoisington Kroegler Group, Inc.

Land Use Scenario

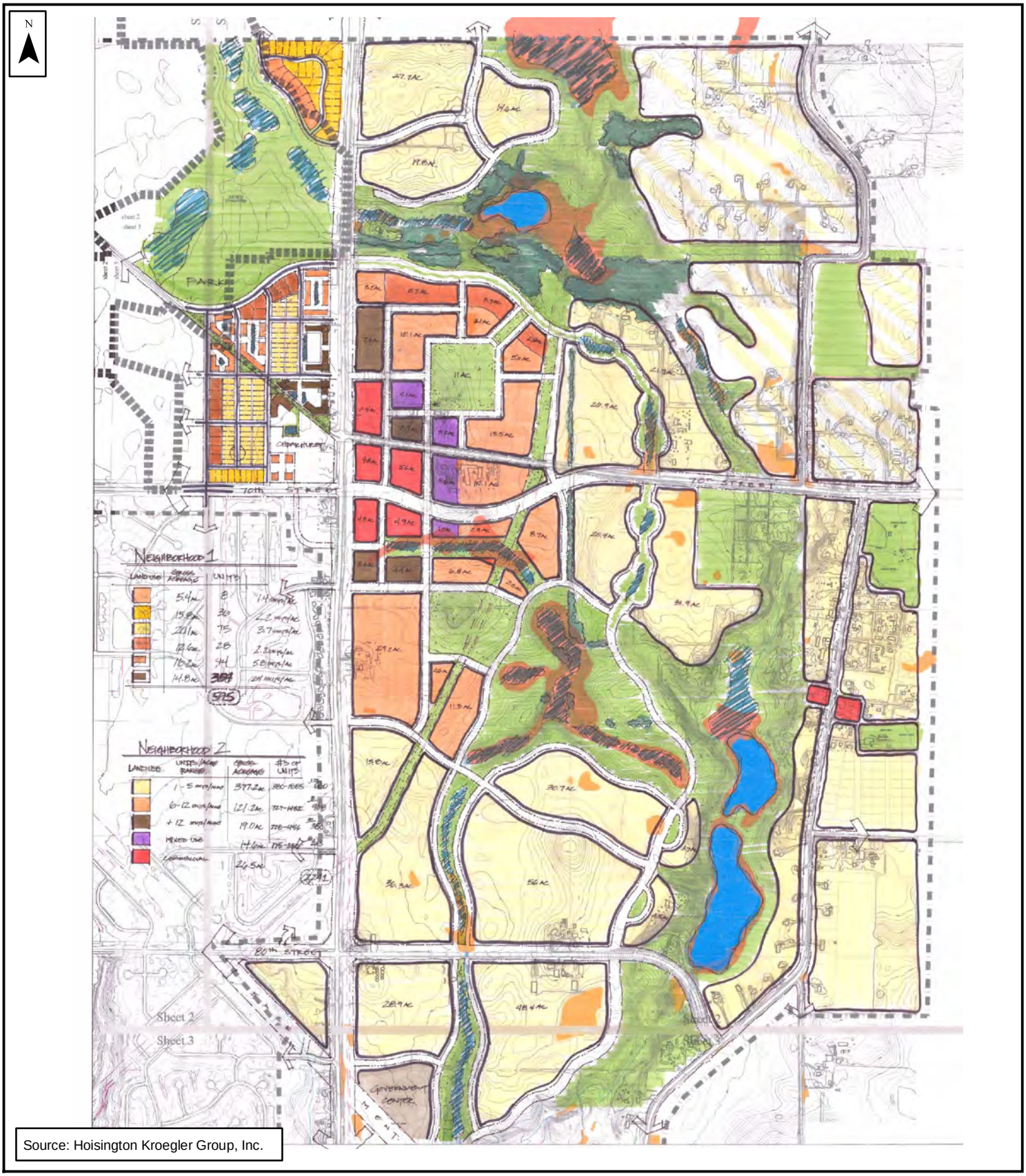
Figure 3-2

June 10, 2005

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Source: Hoisington Kroegler Group, Inc.

Land Use Scenario

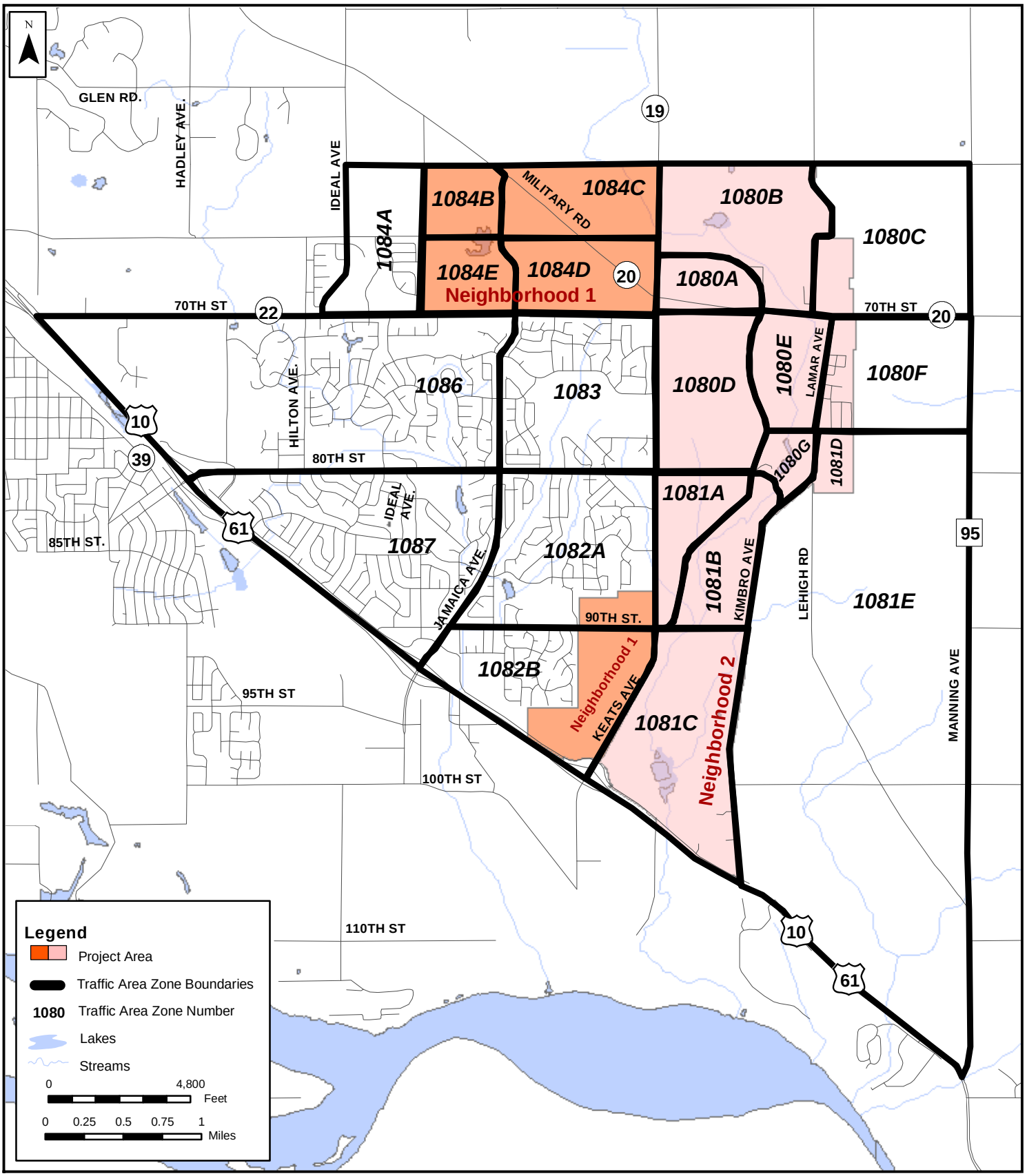
Figure 3-3

June 10, 2005

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Project Area Traffic Analysis Zones

Figure 3-4

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Table 3-2
Future (2020) Socioeconomic Data by TAZ

Zone	City of Cottage Grove Comprehensive Plan 2020		Full Build-Out of East Ravine[1]	
	Households	Employees	Households	Employees
1080	1,106	65	3,800	570
1081	1,237	250	275	660
1082	1,951	1,090	1,200	1,530
1083	1,224	182	1,224	182
1084	645	22	1,800	0
1085	1,216	5	1,216	5
1086	2,581	1,280	2,581	1,280
1087	1,872	1,040	1,872	1,040
1088	316	2,195	316	2,195
1089	45	50	45	50
1090	2,057	2,325	2,057	2,325
1091	94	107	94	107
Total	**14,344**	**8,611**	**16,480**	**9,944**

Source: City of Cottage Grove Comprehensive Plan (2020) and Howard R. Green Company

[1] Full build-out is based upon land use scenarios developed by Hoisington Koegler Group Inc,

The Year 2020 ADT projections were compared against projections from the *Washington County 2020 Traffic Forecast Map* developed as a part of the *Washington County Comprehensive Plan* (1996). The previous plan had estimated some development in Cottage Grove, but not to the extent of the full development reviewed in this study. The full development of the East Ravine area is expected to increase traffic projections on most major roadways. However, some reductions are seen on CSAH 20 (70th Street) east of CSAH 19 (Keats Avenue) and on CSAH 19 (Keats Avenue). This is due in part to the addition of the East Ravine Parkway to the model. The parkway is expected to carry over 5,000 vpd in all locations. The comparison is illustrated on **Figure 3-6**.

PM peak hour turning movements for each of the key intersections by applying growth rates of daily counts to existing PM peak hour turning movement volumes shown in **Section 2.2**. These volumes are displayed on **Table 3-4** and **Figure 3-7**.

3.3 Future Operation Analysis and Determination of Deficiencies

Table 3-5 is a summary of the expected future traffic operations for the seven key roadway segments. The methodology used for the operations analysis can be found in **Section 2.4.1**. As noted previously, the LOS D/E boundary was used as the index of congestion for the City of Cottage Grove. Using this guideline, congestion is expected on CSAH 20 (Military Road) and two areas of CSAH 19 (Keats Avenue): north of CSAH 20 and between 90th Street and US 61.

A summary of the expected traffic operations on the eighteen key intersections is displayed on **Table 3-6**. Eleven of the eighteen key intersections are expected to operate at LOS F with the existing lane geometry and traffic control as noted on **Table 2-2**. These intersections include US 61 SB Ramp/CSAH 22 (70th Street), US 61 SB Ramp/Jamaica Ave, US 61 NB Ramp/Jamaica Avenue, US 61 SB Ramp/CSAH 19 (Keats Avenue), US 61/Kimbro Avenue, 80th Street/Jamaica Avenue, 80th Street/CSAH 19 (Keats Avenue), CSAH 22 (70th Street)/CSAH 19 (Keats Avenue), CSAH 22 (70th Street)/Jamaica Avenue,

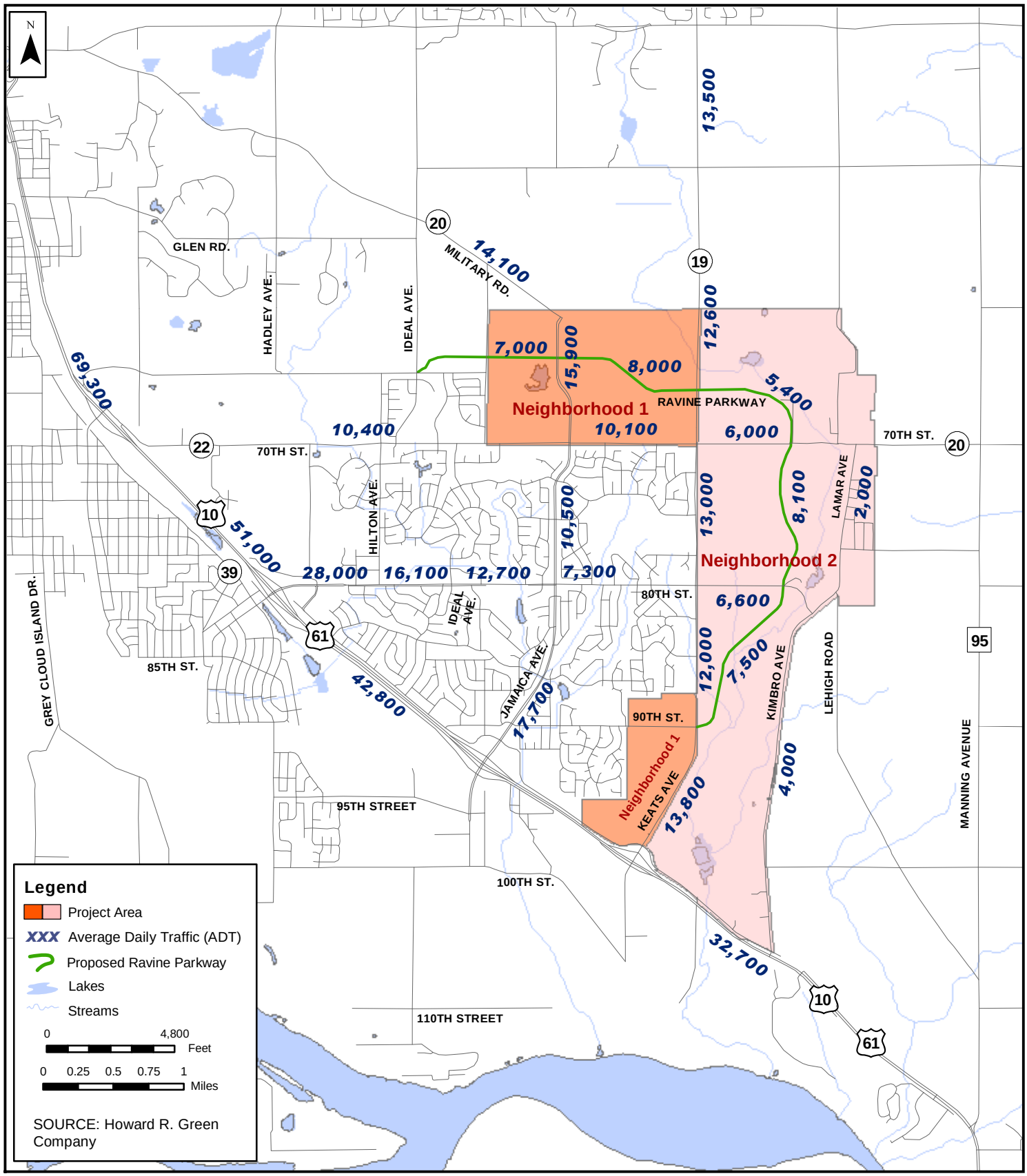
Table 3-3
Future (2020) Average Daily Traffic

Location		Year 2002 AADT Counts	Expected Year 2020 ADT
US 61	North of 70th Street	53,000	69,300
US 61	Between 70th Street and 80th Street	42,000	51,100
US 61	Between 80th Street and CSAH 19	31,000	42,800
US 61	Between CSAH 19 and Kimbro Avenue	26,000	32,700
CSAH 22 (70th Street)	Between US 61 and Jamaica Avenue	6,400	10,400
CSAH 22 (70th Street)	Between Jamaica Avenue and CSAH 19	2,200	10,100
80th Street	Between US 61 and Hinton Avenue	22,300	28,000
80th Street	Hinton Avenue and Ideal Avenue	12,600	16,100
80th Street	Ideal Avenue and Jamaica Avenue	10,100	12,700
80th Street	Between Jamaica Avenue and CSAH 19	7,400	9,300
80th Street	CSAH 19 to Kimbro Avenue	1,200	6,600
Jamaica Avenue	Between Military Road and 70th Street	4,200	15,900
Jamaica Avenue	Between 70th Street and 80th Street	7,400	10,500
Jamaica Avenue	Between 80th Street and US 61	11,200	17,700
CSAH 19 (Keats Avenue)	North of CSAH 20	5,600	12,600
CSAH 19 (Keats Avenue)	Between CSAH 20 and CSAH 22	7,600	12,600
CSAH 19 (Keats Avenue)	Between CSAH 22 and 80th Street	6,200	13,000
CSAH 19 (Keats Avenue)	Between 80th Street and 90th Street	6,200	12,000
CSAH 19 (Keats Avenue)	Between 90th Street and US 61	6,200	13,800
Kimbro Avenue	Between Lamar Avenue and US 61	500	4,000
CSAH 20 (Military Road)	Between Ideal Avenue and Jamaica Avenue	5,000	14,100
CSAH 20 (Military Road)	Between Jamaica Avenue and CSAH 19	1,450	-
CSAH 20 (Military Road)	CSAH 19 to Lamar Avenue	3,000	6,000
Lamar Avenue	70th Street to Kimbro Avenue	1,200	2,000

Source: Mn/DOT Year 2002 ADT Flow Maps and Howard R. Green Company

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Future (2020) ADT Volumes

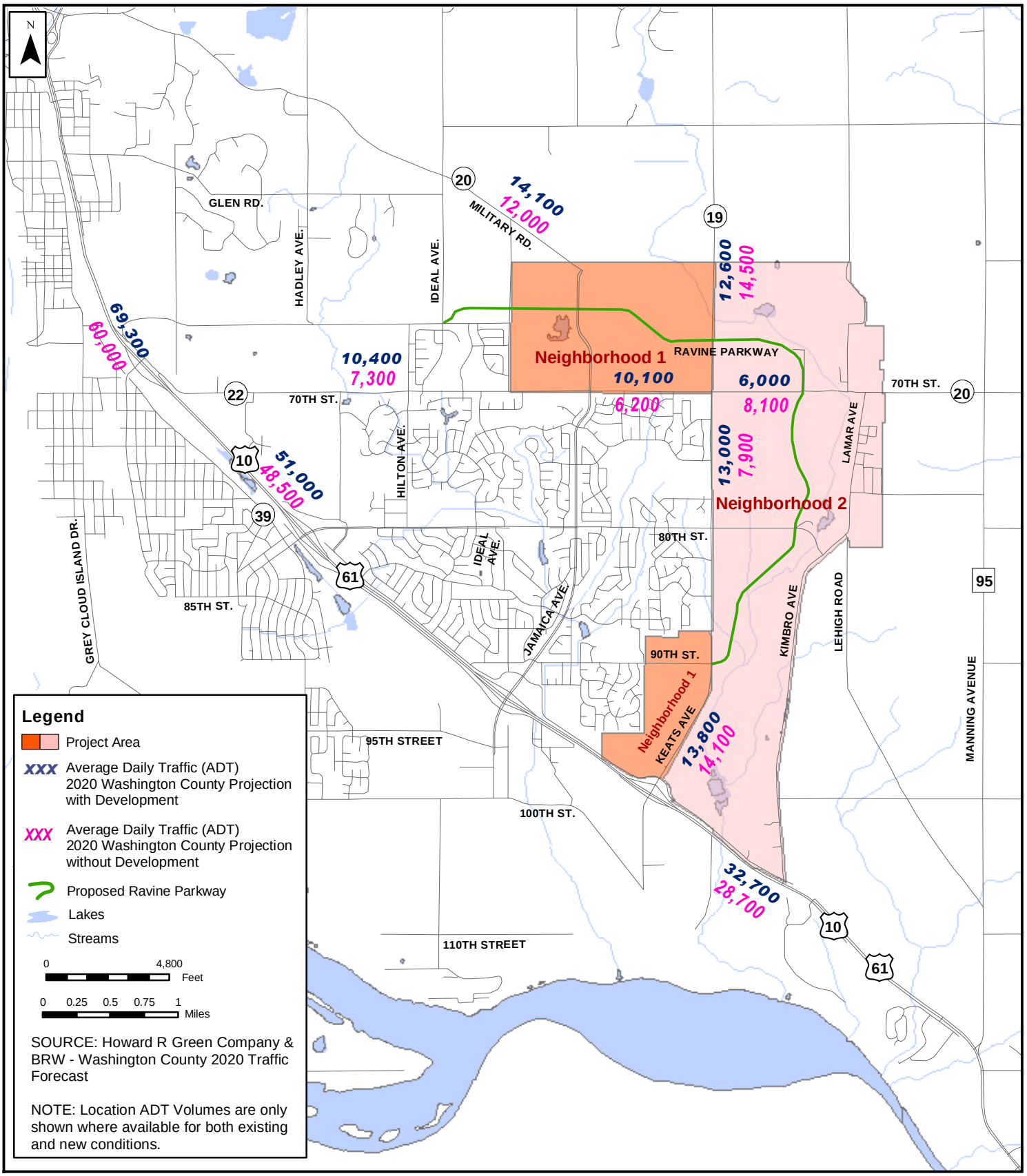
Figure 3-5

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Future (2020) ADT Volumes Comparison

Figure 3-6

June 10, 2005

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Howard R. Green Company
IBI Group
McComb Group, Ltd.

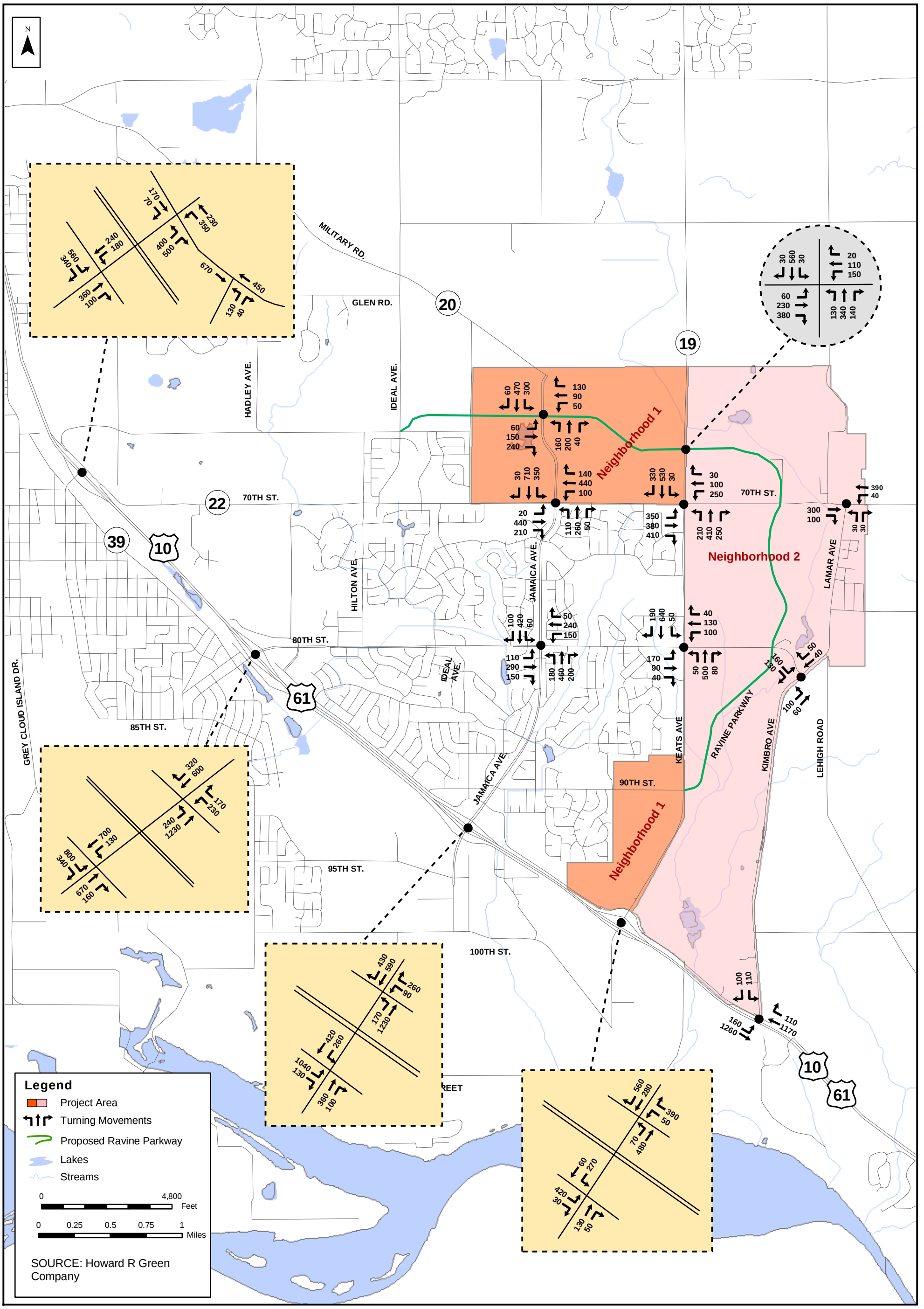
Table 3-4
Future (2020) PM Peak Hour Turning Movement Volumes

Intersection	West Approach			East Approach			South Approach			North Approach		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
US 61 SB Ramp/CSAH 22 (70th Street)	0	360	100	180	240	0	0	0	0	560	0	340
US 61 NB Off Ramp/CSAH 22 (70th Street)	130	0	40	0	0	0	0	450	0	0	670	0
US 61 NB On Ramp/CSAH 22 (70th Street)	400	0	500	0	0	0	350	230	0	0	170	70
US 61 SB Ramp/80th Street	0	670	160	130	700	0	0	0	0	800	0	340
US 61 NB Ramp/80th Street	240	1230	0	0	600	320	230	0	170	0	0	0
US 61 SB Ramp/Jamaica Avenue	1040	0	130	0	0	0	0	360	100	260	420	0
US 61 NB Ramp/Jamaica Avenue	0	0	0	90	0	260	170	1230	0	0	590	430
US 61 SB Ramp/CSAH 19 (Keats Avenue)	420	0	30	0	0	0	0	130	50	270	60	0
US 61 NB Ramp/CSAH 19 (Keats Avenue)	0	0	0	50	0	390	70	480	0	0	280	560
US 61/Kimbro Avenue	160	1260	0	0	1170	110	0	0	0	110	0	100
80th Street/Jamaica Avenue	110	290	150	150	240	50	180	460	200	60	420	100
80th Street/CSAH 19 (Keats Avenue)	170	90	40	100	130	40	50	500	80	50	640	190
80th Street/Kimbro Avenue	160	0	130	0	0	0	100	60	0	0	40	50
CSAH 22 (70th Street)/Lamar Avenue	0	300	100	40	390	0	30	0	30	0	0	0
CSAH 22 (70th Street)/CSAH 19 (Keats Avenue)	350	350	410	250	100	30	180	440	250	30	530	330
CSAH 22 (70th Street)/Jamaica Avenue	20	440	210	90	440	110	110	260	50	320	710	30
CSAH 20 (Military Road)/Jamaica Avenue	0	0	1140	0	0	0	820	0	0	0	0	0
CSAH 20 (Military Road)/CSAH 19 (Keats Avenue)	0	0	0	0	1250	0	0	760	0	0	0	0

Source: Howard R. Green Company

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City of Cottage Grove



Future (2020) Turning Movement Volumes

Figure 3-7

June 10, 2005

Hoisington Koegler Group Inc.
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Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

Table 3-5
Future (2020) Segment Level of Service

Location		LOS
US 61	North of 70th Street	D
US 61	Between 70th Street and 80th Street	C
US 61	Between 80th Street and CSAH 19	C
US 61	Between CSAH 19 and Kimbro Avenue	C
CSAH 22 (70th Street)	Between US 61 and Jamaica Avenue	D
CSAH 22 (70th Street)	Between Jamaica Avenue and CSAH 19	C
80th Street	Between US 61 and Hinton Avenue	D
80th Street	Hinton Avenue and Ideal Avenue	B
80th Street	Ideal Avenue and Jamaica Avenue	B
80th Street	Between Jamaica Avenue and CSAH 19	A
80th Street	CSAH 19 to Kimbro Avenue	A
Jamaica Avenue	Between Military Road and 70th Street	D
Jamaica Avenue	Between 70th Street and 80th Street	B
Jamaica Avenue	Between 80th Street and US 61	C
CSAH 19 (Keats Avenue)	North of CSAH 20	D
CSAH 19 (Keats Avenue)	Between CSAH 20 and CSAH 22	D
CSAH 19 (Keats Avenue)	Between CSAH 22 and 80th Street	D
CSAH 19 (Keats Avenue)	Between 80th Street and 90th Street	D
CSAH 19 (Keats Avenue)	Between 90th Street and US 61	E
Kimbro Avenue	Between Lamar Avenue and US 61	A
CSAH 20 (Military Road)	Between Ideal Avenue and Jamaica Avenue	E
CSAH 20 (Military Road)	Between Jamaica Avenue and CSAH 19	-
CSAH 20 (Military Road)	CSAH 19 to Lamar Avenue	B
Lamar Avenue	70th Street to Kimbro Avenue	A

Source: Howard R. Green Company

Table 3-6
Future (2020) Intersection PM Peak Hour Level of Service

Intersection	Level of Service				
	West Approach	East Approach	South Approach	North Approach	Intersection
US 61 SB Ramp/CSAH 22 (70th Street)	C	D	- -	F	E
US 61 NB Off Ramp/CSAH 22 (70th Street)	C	- -	C	E	D
US 61 NB On Ramp/CSAH 22 (70th Street)	E	- -	A	A	A
US 61 SB Ramp/80th Street	B	B	- -	C	B
US 61 NB Ramp/80th Street	B	A	C	- -	B
US 61 SB Ramp/Jamaica Avenue	F	- -	A	A	F
US 61 NB Ramp/Jamaica Avenue	- -	F	A	A	F
US 61 SB Ramp/CSAH 19 (Keats Avenue)	F	- -	A	A	F
US 61 NB Ramp/CSAH 19 (Keats Avenue)	- -	D	A	A	A
US 61/Kimbro Avenue	A	A	- -	F	F
80th Street/Jamaica Avenue	E	C	F	F	F
80th Street/CSAH 19 (Keats Avenue)	C	C	F	F	F
80th Street/Kimbro Avenue	B	- -	A	A	A
CSAH 22 (70th Street)/Lamar Avenue	A	A	C	- -	A
CSAH 22 (70th Street)/CSAH 19 (Keats Avenue)	F	F	A	A	F
CSAH 22 (70th Street)/Jamaica Avenue	F	F	F	F	F
CSAH 20 (Military Road)/Jamaica Avenue	C	C	F	C	F
CSAH 20 (Military Road)/CSAH 19 (Keats Avenue)	F	C	F	E	F

Source: Howard R. Green Company

Jamaica Avenue/Ravine Parkway, and CSAH 19 (Military Avenue) /Ravine Parkway. However, the intersection of CSAH 19 (Keats Avenue) and CSAH 22 (70th Street) was modeled as a four-leg intersection instead of the existing T-intersection. The assumed lane configuration included left and right turn lanes on all legs. Expected segment and intersection traffic operations are also displayed on **Figure 3-8**.

3.4 Roadway Improvements and Phasing

The purpose of this section is to identify future development improvements based on the full build-out of the East Ravine area. Improvements included recommended roadway cross-sections and intersection control measures necessary to eliminate the roadway deficiencies for the land use scenario. An approximate timing plan was developed, but it should be noted that the timing and intensity of additional development in the project area will dictate what roadway enhancements are needed and on when they should occur.

As noted in the previous section, two of the seven key roadway sections are expected to be deficient with the full build-out of the East Ravine project area. As noted in the previous section CSAH 20 (Military Road) and CSAH 19 (Keats Avenue) are not expected to meet capacity needs in the future, and should be upgraded from two-lane facilities to four-lane facilities.

While the entire length of CSAH 20 (Military Road) is expected to be deficient, only segments of CSAH 19 (Keats Avenue) operated poorly. However, the two segments with deficiencies are on the north and south areas of the city, with three miles of separation. Providing a consistent lane configuration would provide a safer section, eliminating the merging and diverging along the roadway.

Additionally, Mn/DOT should consider the closure of US 61 and Kimbro Avenue since this intersection will require signals in the future. Mn/DOT has designed US 61 to operate as an expressway with the placement of interchanges at one-mile spacing. The next logical interchange would be TH 95 (Manning Avenue). With this closure, a majority of traffic volumes on Kimbro Avenue will relocate to CSAH 19 (Keats Avenue) and TH 95 (Manning Avenue) as shown on **Figure 3-9**.

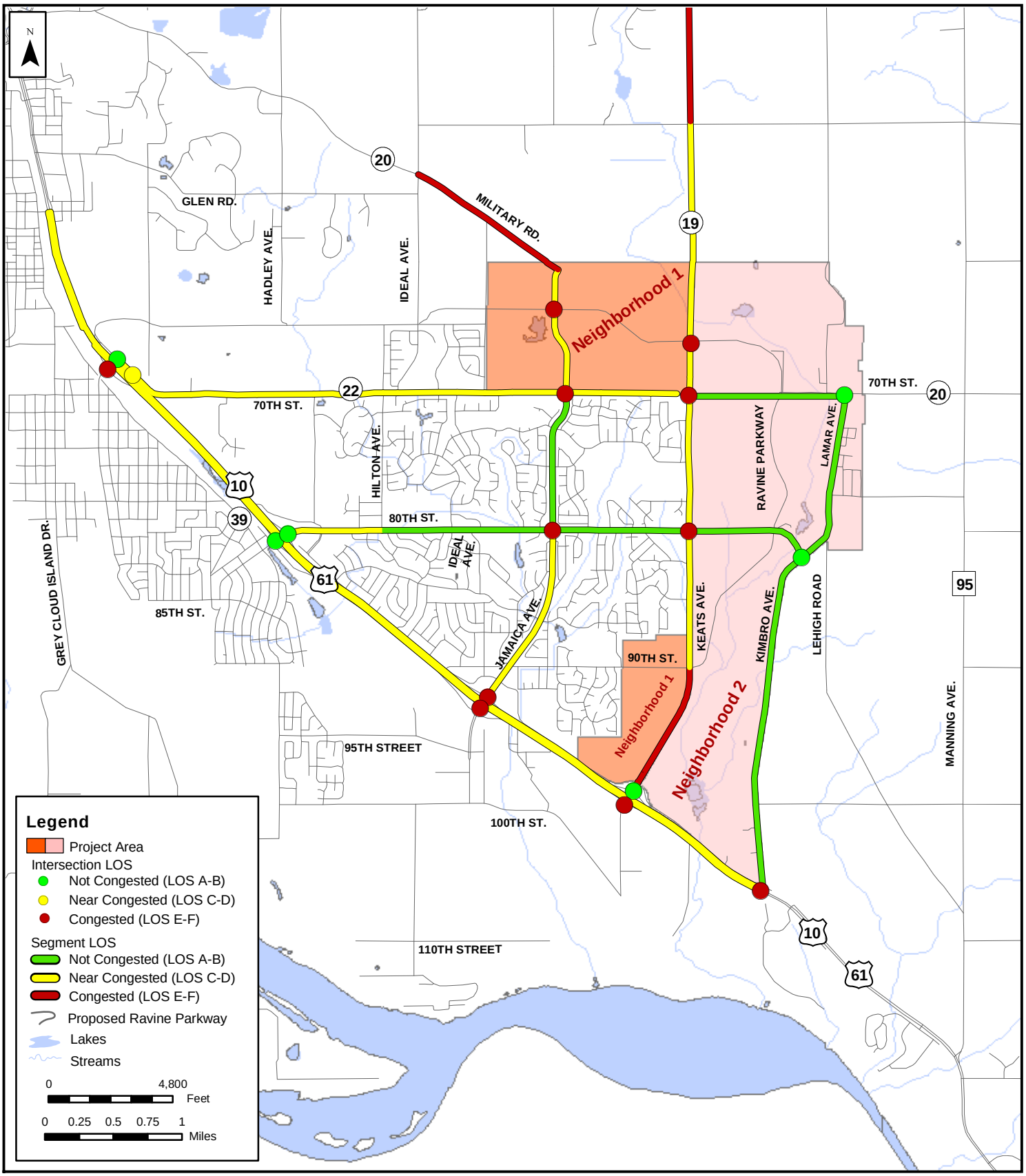
Lastly, the City of Woodbury has approved development of a mall and additional commercial development near Interstate 94 and CSAH 19. This development was not included in the model. It is anticipated that this development will be a draw for additional traffic along CSAH 19 (Keats Avenue) in Cottage Grove.

Therefore, the entire length of CSAH 20 (Military Road) and CSAH 19 (Keats Avenue) should be upgraded from two-lane facilities to four-lane facilities. The recommended roadway sections should be used at this time for estimating future right-of-way needs and jurisdictional priority.

As noted in the previous section, the travel demand model assumed the CSAH 20 (Military Road) and CSAH 19 (Keats Avenue) intersection was closed. Because of the close proximity of this intersection to CSAH 22 (70th Street) and CSAH 19 (Keats Avenue), the intersections have operational and safety deficiencies that are expected to escalate in the future as traffic volumes increase. The city has determined that CSAH 22 (70th Street) is the preferred route because of its connection to US 61. Concern has been raised about the time impacts this may put upon motorists traveling from the east of Cottage Grove and take CSAH 20 (Military Road) as the shortest path. Motorist will now be expected to use Jamaica Avenue as an alternate route. It should be noted that in the future, both of these routes will likely have three traffic signals. Even though the extension of CSAH 20 (Military Road) is shorter, the time difference is expected to be minimal. The city can reduce these impacts by providing adequate lane geometry at intersections and by synchronizing traffic signals along the routes.

East Ravine Pre-Design

City of Cottage Grove



Future (2020) Roadway and Intersection LOS

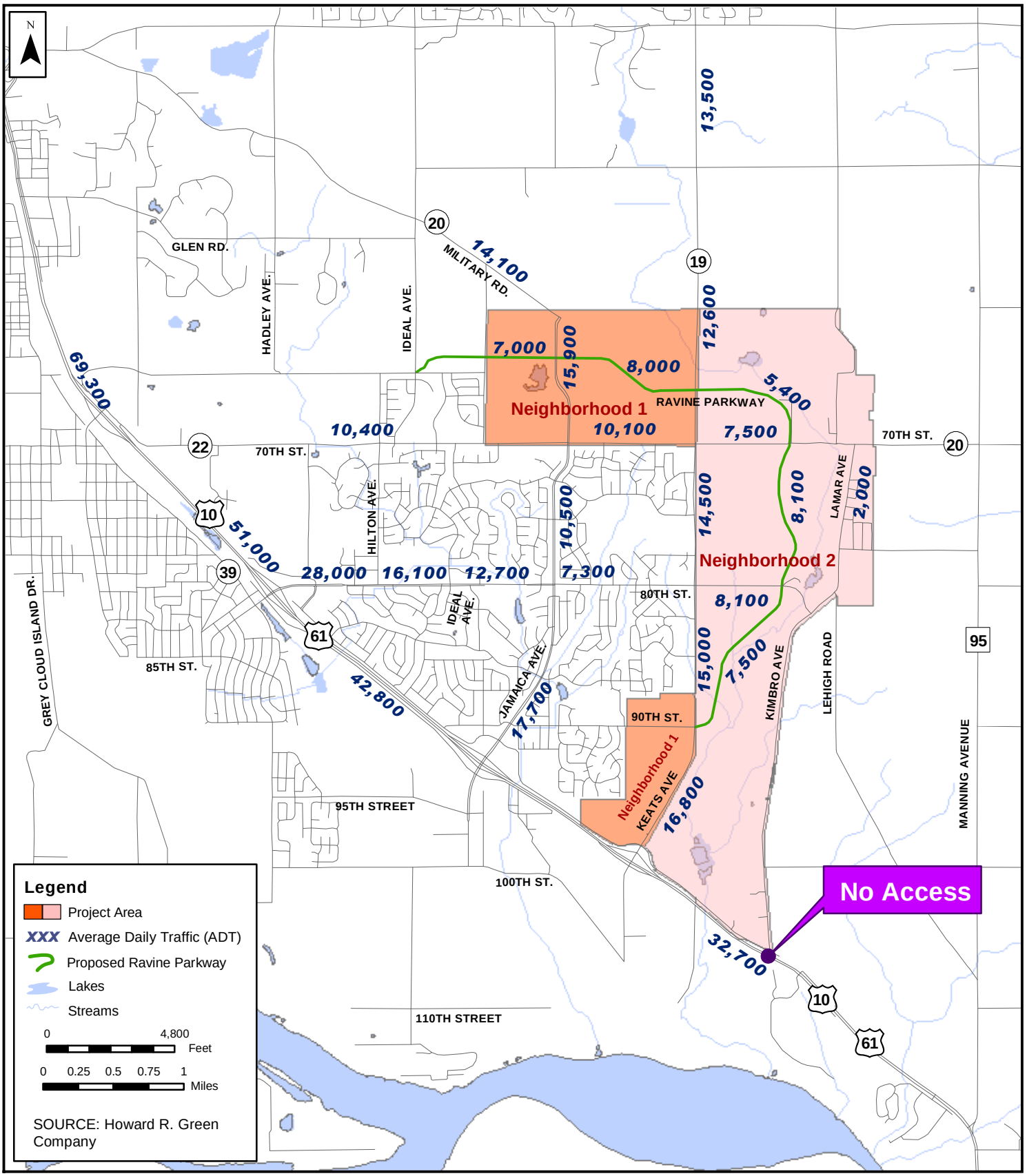
Figure 3-8

June 10, 2005

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design

City of Cottage Grove



Future (2020) ADT Volumes with Closure of Kimbro Avenue at US 61

Figure 3-9

June 10, 2005

Hoisington Koegler Group Inc.
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Howard R. Green Company
IBI Group
McComb Group, Ltd.

For the PM peak hour, all eleven intersections listed as deficient in the previous section were analyzed with the addition of traffic signals. All locations met the LOS criteria with the change in traffic control as noted on **Table 3-7**.

Table 3-7
Future (2020) Intersection PM Peak Hour Level of Service with Additional Traffic Signals

Intersection	Level of Service				
	West Approach	East Approach	South Approach	North Approach	Intersection
US 61 SB Ramp/CSAH 22 (70th Street)	B	B	- -	A	B
US 61 SB Ramp/Jamaica Ave	E	- -	C	D	D
US 61 NB Ramp/Jamaica Ave	- -	C	B	A	B
US 61 SB Ramp/CSAH 19 (Keats Avenue)	C	- -	A	B	C
US 61/Kimbro Avenue	A	A	- -	C	A
80th Street/Jamaica Avenue	C	C	C	C	C
80th Street/CSAH 19 (Keats Avenue)	C	C	B	A	B
CSAH 22 (70th Street)/CSAH 19 (Keats Avenue)	C	C	B	C	C
CSAH 22 (70th Street)/Jamaica Avenue	C	C	B	B	C
Jamaica Avenue/Ravine Parkway	A	A	A	A	A
CSAH 19 (Military Avenue) /Ravine Parkway	A	B	B	B	B

Source: Howard R. Green Company

The roadway and intersection improvements are displayed on **Figure 3-10**. The proposed development of the signal and multi-family residential units and commercial development is expected to occur incrementally over the next 20 years. Therefore, implementation of all improvement and mitigations listed are expected to be needed over time. The timing and magnitude of the improvements and mitigations will be dependent on the size, type, and location of the developments that occur each year both inside and outside the project area. Which improvements and mitigations will be needed first will depend on where and when developments occur.

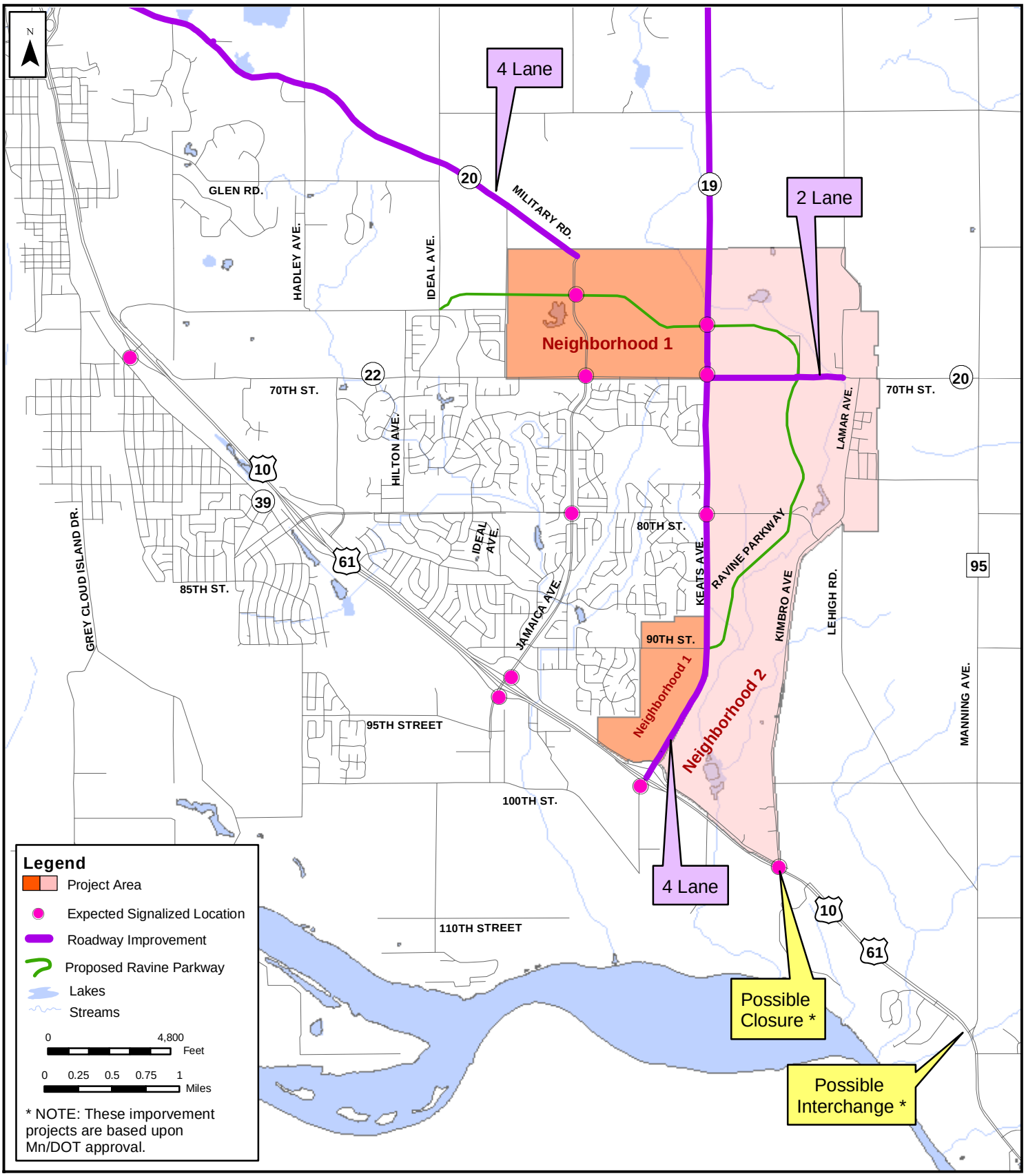
It must be remembered that the development scenario examined here is hypothetical. If future land development deviates significantly from the proposed scenario, the traffic impacts and ensuing potential improvements and mitigations might differ from what has been presented in this report.

Given that there are many uncertainties surrounding the timing and need for roadway improvements associated with development in the study area, is recommended that the initial mitigation strategy associated with traffic impacts should be the establishment of a traffic monitoring program to track traffic growth on area roadways. The purpose of the traffic-monitoring program is to identify if the traffic has increased on the key roadways and to identify whether the increase in traffic is of such magnitude to warrant initiation of further assessment, project development, and programming recommendations.

The results fro the 2025 development scenario identified delays occurring on the minor street approaches at several thru-STOP intersections. One potential solution to improve the operations for these minor street movements is to install a traffic signal. With the installation of a traffic signal, there would now be a portion of time in which the major street traffic would be required to stop at the intersection while the signal is servicing the minor street movements. Therefore, the delays for the minor street would be expected to decrease; however, the delays for the major street would be expected to increase. Typically,

East Ravine Pre-Design

City of Cottage Grove



Recommended Roadway Improvements

Figure 3-10

June 10, 2005

Hoisington Koegler Group Inc.
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the major street approaches have a significantly higher volume of traffic than the minor street approaches. If a greater volume of vehicles (major street approaches) is now experiencing a greater delay, the overall intersection LOS would be expected to decrease with the installation of a traffic signal compared to a thru-STOP condition.

Therefore, the Minnesota Department of Transportation (Mn/DOT) and other agencies have established supplementary guideline besides minor street delay for when and where to potentially install traffic signals. Two of these guidelines include signal justification reports (SJR) and recommended minimum signal spacing.

An SJR is a document that examines the existing conditions, provides a description of the project, discusses the need for the project, includes a signal warrant analysis, and states the reasons a signal system is justified at the specific location. Warrants have been developed that provide a guideline for intersection signalization. The criteria for meeting these guidelines are listed in the Minnesota Manual on Uniform Traffic Control Devices (MMUTCD). Justification for a signalized intersection should be based on meeting one or more of the established warrants in the MMUTCD. However, satisfying the conditions of one or more signal warrants does not alone justify the installation of a signal. Additional studies should be conducted by the appropriate roadway authorities to determine if the installation of a traffic signal will improve overall safety and/or the operations of the intersection. An SJR must be approved by the appropriate roadway authorities prior to signal installation.

Mn/DOT has also established recommended access/signal spacing guidelines for different functionally classified roadways. Therefore, prior to installation of a traffic signal, these recommended signal spacing guidelines must also be considered. In an urban or urbanizing area, signal spacing on arterials and collectors should be a minimum of ¼ miles apart.

However, a possible timeline for signal placement was developed in order to assist local jurisdictions in fiscal planning. **Table 3-8** lists the locations of expected signal system installations, broken into five-year increments. The southbound ramp of US 61 and Jamaica Avenue is currently deficient, and should be assessed for a potential traffic signal. The remaining signal installations are expected to vary with time, based upon development occurring first in Neighborhood 1, with development of Neighborhood 2 following after Year 2010.

3.5 Transit

As noted previously, the use of alternative modes within the City of Cottage Grove is limited. The 2000 Census estimates that about 1.3 percent of commuters use public transportation as their means to work. However, the City would like to expand the transit opportunities to residents. According to the *City of Cottage Grove Comprehensive Plan* (October 2000), the City has requested more capacity at the temporary park and ride lot, and has begun exploration of a multi-modal transit hub. Additionally, the City is in support of the Red Rock Corridor Commuter Rail. The rail would run from Hasting to St. Paul. A feasibility study for this project was completed in 2000, and the alternatives analysis and environmental process has begun to narrow alternatives.

Table 3-8
Traffic Signal Phasing

Year	Intersection
2005-2010	CSAH 22 (70th Street)/CSAH 19 (Keats Avenue)
	US 61 SB Ramp/Jamaica Ave
	80th Street/Jamaica Avenue
2010-2015	US 61 NB Ramp/Jamaica Ave
	US 61 SB Ramp/CSAH 19 (Keats Avenue)
	80th Street/CSAH 19 (Keats Avenue)
	CSAH 22 (70th Street)/Jamaica Avenue
	US 61 SB Ramp/CSAH 22 (70th Street)
2015-2020	US 61/Kimbro Avenue
	Jamaica Avenue/Ravine Parkway
	CSAH 19 (Military Avenue) /Ravine Parkway

Source: Howard R. Green Company

4.0 Summary

This study evaluates the traffic impacts of the development of approximately 560 acres of developable land on the east side of Cottage Grove. The East Ravine area is expected to reach full build-out in 20 years. However, the travel demand model used for the traffic analysis used Year 2020 conditions in Washington County with full build-out of the East Ravine. Seven key roadways (broken into twenty-four segments for analysis) and eighteen key intersection listed below were selected for this study because they will provide primary access to the regional road system and will likely be the primary roadways when the area develops.

Key Roadways

- US 61 between Glen Road and Kimbro Avenue
- CSAH 20 (Military Road) between Ideal Avenue and Lamar Avenue
- CSAH 22 (70th Street) between US 61 and CSAH 19 (Keats Avenue)
- 80th Street between US 61 and Kimbro Avenue
- Jamaica Avenue between CSAH 20 (Military Road) and US 61
- CSAH 19 (Keats Avenue) between Dale Road and US 61
- Lamar Avenue/Kimbro Avenue between 70th Street to US 61

Key Intersections

- US 61/70th Street Ramps (3 intersections)
- US 61/80th Street Ramps (2 intersections)
- US 61/Jamaica Ave Ramps (2 intersections)
- US 61/CSAH 19 (Keats Avenue) Ramps (2 intersections)
- US 61/Kimbro Avenue
- 80th Street/Jamaica Avenue
- 80th Street/CSAH 19 (Keats Avenue)
- 80th Street/Kimbro Avenue
- CSAH 20 (Military Road)/Lamar Avenue
- CSAH 22 (70th Street)/CSAH 19 (Keats Avenue)
- CSAH 22 (70th Street)/Jamaica Avenue
- CSAH 20 (Military Road)/Jamaica Avenue
- CSAH 20 (Military Road)/CSAH 19 (Keats Avenue)

An operation analysis was completed for roadway segments and intersections. Roadway operations were evaluated by comparing average daily traffic counts with level of service bar charts developed using methodologies from the Highway Capacity Manual. Intersections were evaluated using the expected intersection delay. In the existing year, the intersection of CSAH 22 (70th Street)/Jamaica Avenue is the only intersection operating below the desired level of service.

Forecasted average daily traffic volumes were used to estimate future roadway operations. These forecasted were developed using the Washington County 2020 Travel Demand Model. Assuming the existing geometry, two of the seven roadways operated under congested conditions. Eleven of the eighteen intersections operated below the desired level of service. The following projects are recommended to mitigate the impacts:

Roadway Improvements

- Reconstruct CSAH 20 (Military Road) as a four-lane facility with turn lanes.
- Reconstruct CSAH 19 (Keats Avenue) as a four-lane facility with turn lanes.
- Realign the intersection of CSAH 20 (70th Street) and CSAH 19 (Keats Avenue) to be the major connection to US 61 and close the intersection of CSAH 20 (Military Road) and CSAH 19 (Keats Avenue)
- Discuss the possible closure of US 61 and Kimbro Avenue and a possible future interchange at US 61 and TH 95 (Manning Avenue) with Mn/DOT and other authoritative jurisdictions.

Intersection Improvements (Installation of Traffic Signals at the Following Locations)

- US 61 SB Ramp/CSAH 22 (70th Street)
- US 61 SB Ramp/Jamaica Ave
- US 61 NB Ramp/Jamaica Avenue
- US 61 SB Ramp/CSAH 19 (Keats Avenue)
- US 61/Kimbro Avenue, 80th Street/Jamaica Avenue
- 80th Street/CSAH 19 (Keats Avenue)
- CSAH 22 (70th Street)/CSAH 19 (Keats Avenue)
- CSAH 22 (70th Street)/Jamaica Avenue
- Jamaica Avenue/Ravine Parkway
- CSAH 19 (Military Avenue) /Ravine Parkway

Cottage Grove
Where Pride and Prosperity Meet

City Council Action Request

7O

Meeting Date	11/18/2020
Department	Community Development
Agenda Category	Consent Agenda
Title	2020 East Ravine Alternative Urban Areawide Review (AUAR) and Mitigation Plan Update
Staff Recommendation	Adopt Resolution 2020-149 approving the final 2020 East Ravine AUAR and Mitigation Plan Update and authorizing the publication of the notice of decision.
Budget Implication	N/A
Attachments	East Ravine 2020 AUAR Update CC Memo.tif 3.73MB East Ravine AUAR Update Resolution.tif 4.29MB East Ravine AUAR Document.tif 128.07KB

Cottage Grove
Where Pride and Prosperity Meet

TO: Honorable Mayor and City Council
Jennifer Levitt, City Administrator

FROM: John M. Burbank, AICP, Senior Planner

DATE: November 10, 2020

RE: 2020 East Ravine AUAR Final Action Packet

Introduction

The City Council is requested to authorize the adoption of the final 2020 East Ravine Alternative Urban Areawide Review (AUAR) and Mitigation Plan Update and to publish the final notice of decision with the Environmental Quality Board (EQB).

Background

The City Council approved the draft 2020 East Ravine AUAR Update on March 18, 2020. As required by state statute, the City published the Update in the weekly EQB Monitor publication for dissemination to the required distribution list in May, which is attached. The City, performing as the Responsible Government Unit (RGU), received comments on the Update from four organizations or agencies. A draft comment response packet was prepared to address the comments which was reviewed and accepted by the City Council on October 7, 2020.

Per State Statute, the revised Update was once again submitted to the EQB for one last 10-day review period for comment. The City did not receive any additional comments or objections during that review period which ended November 9, 2020.

As a result, the final draft of 2020 East Ravine AUAR and Mitigation Plan Update is being presented to the City Council for final adoption and publication of the notice of decision.

Recommendation

The City Council is recommended to adopt the attached resolution approving the final 2020 East Ravine AUAR and Mitigation Plan Update and authorizing the publication of the notice of decision.

Attachment:
- Final 2020 East Ravine AUAR and Mitigation Plan Update Packet

CITY OF COTTAGE GROVE, MINNESOTA
CITY COUNCIL
RESOLUTION 2020-XXX

A RESOLUTION ADOPTINGTHE FINAL 2020 EAST RAVINE ALTERNATIVE URBAN AREAWIDE REVIEW (AUAR) AND MITIGATION PLAN UPDATE AND AUTHORIZING THE PUBLICATION OF THE FINAL NOTICE OF DECISION WITH MINNESOTA ENVIRONMENTAL QUALITY BOARD (EQB)

WHEREAS, the City Council of the City of Cottage Grove approved the draft 2020 East Ravine Alternative Urban Areawide Review (AUAR) Update on March 18, 2020. As required by state statute, the City published the AUAR Update in the weekly EQB Monitor publication for dissemination to the required distribution list. The City, performing as the Responsible Government Unit (RGU), received comments on the 2020 AUAR and Mitigation Plan Update from four organizations or agencies; and

WHEREAS, a draft comment response packet was prepared to address the comments that were given to the City Council for adoption on October 7, 2020. The City Council adopted the response to the comments and revised the draft AUAR documents and mitigation plan; and

WHEREAS, the final publication in the EQB Monitor was completed on Monday, October 26, 2020. No additional comments or objections were received by the November 9, 2020 comment/objection deadline; and

WHEREAS, based on the lack of additional comments and the City successfully completing all of the required actions related to the 2020 East Ravine AUAR and Mitigation Plan Update, the final 2020 East Ravine AUAR and Mitigation Plan Update packet was presented to the City Council for adoption and publication of the notice of decision.

NOW, THEREFORE BE IT RESOLVED, that the City Council of the City of Cottage Grove has approved the final 2020 East Ravine AUAR and Mitigation Plan Update and has authorized the publication of the notice of decision with the Minnesota Environmental Quality Board.

Passed this 18th day of November 2020.

_____
Myron Bailey, Mayor

Attest:

_____
Joe Fischbach, City Clerk

Cottage Grove East Ravine AUAR and Mitigation Plan

Update

November 10, 2020

Cottage Grove

Where Pride and Prosperity Meet

Prepared by the City of Cottage Grove

As the Responsible Governmental Unit (RGU)

The 2020 Update text and edits are Colored Blue and is bold italicized.

The 2015 Update text is Colored Brown and is bold italicized.

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Executive Summary

What is an AUAR?

An Alternative Urban Areawide Review (AUAR) is authorized under Minnesota Rules Chapter 4410.3610 as an alternative form of environmental review for development projects. Generally, the AUAR consists of one or more development scenarios, an inventory of environmental and cultural resources, an assessment of the "cumulative" impacts that the development scenarios may have on these resources as well as public infrastructure services, and a set of mitigation measures that reduce or eliminate the potential impacts generated by the development. The AUAR is intended to address the "cumulative" impacts resulting from a sequence of related development projects as opposed to an Environmental Assessment Worksheet (EAW) or Environmental Impact Statement (EIS) which simply looks at a single project's impacts and does not attempt to outline mitigation initiatives.

Why an AUAR for this Project?

An AUAR was chosen for the Cottage Grove East Ravine project area because it will provide a better framework for coordinating a number of future development projects that will occur over a long period of time, identifying potential impacts, and focusing on effective, efficient mitigation strategies.

How is an AUAR used?

An AUAR is used as a tool to help parties interested in development within the project area understand the existing environmental and cultural resources present on a site prior to initiating detailed planning and design. It is also used to identify key initiatives that must or should be undertaken to minimize negative impacts generated by proposed development.

Any proposed development in the project area would need to be reviewed for consistency with the AUAR and Mitigation Plan. If a development plan is not consistent with these documents or other statutory requirements, the developer may need to conduct additional environmental documentation or review or request an amendment to the AUAR. Natural and cultural inventory information in the AUAR and the Mitigation Plan will be used to guide development. Design and construction would proceed only after all approvals and appropriate agreements are complete.

Overview of the AUAR Process

The City of Cottage Grove last adopted its Comprehensive Plan in October of 2000. This plan identified the eastern portion of the community as a future phase for development with urban services and generally a low density residential land use pattern. The Metropolitan Council recently completed a regional sanitary sewer project that makes sanitary

sewer services available. The City of Cottage Grove began a significant master planning effort in 2002 to help define a more specific land use and development pattern and to address the implications of future development on a number of important public infrastructure systems including surface water management, traffic and transportation, sanitary sewer and public water supply.

The East Ravine Planning District is a roughly 3,800-acre portion of largely undeveloped land stretching along County Road 19 from Highway 61 north to the City of Cottage Grove's border with Woodbury. This planning initiative establishes a vision of what this area will look like based on how the city's residents and landowners want to see the area developed. The process establishes a framework to ensure that development occurs efficiently and complies with the vision that Cottage Grove residents and landowners aspire to.

As the availability of developable land in those parts of the city already built up begins to disappear, developers and the City have turned their sights towards the land in the East Ravine Planning District. The City of Cottage Grove, with a population of slightly more than ~~30,000~~ ***37,000***, wants to avoid the out-of-control growth that other metropolitan communities have experienced, because such rapid growth can be accompanied by a host of problems such as traffic congestion and inadequate amenities and infrastructure. Such difficulties could become unmanageable without an effective planning process because of the unusual size of the area. ***To date, the growth that has occurred in the East Ravine has met the City's desires for controlled and manageable growth and has met regional density requirements.***

In order to help the City develop a framework that city staff and decision makers will use to evaluate future development proposals within the area, the City hired a multi-firm consultant team led by the Minneapolis-based planning firm Hoisington Koegler Group Inc. With the assistance of the consultant team, the City conducted a three year process that, among other things, helped residents and landowners articulate a vision for the area, as well as establish a set of goals and objectives for how, where, and what type of development should occur in the East Ravine Planning District. This AUAR ***and subsequent required updates*** is one product of that process.

DESCRIPTION OF THE DEVELOPMENT SCENARIO

The East Ravine Pre-Design Planning Project consists of roughly 3,800 acre area of largely undeveloped land that generally lies north of 70th Street, east of County Road 19, and west of Lamar and Kimbro Avenues.

Large areas of predominantly Single Family residential housing are interspersed with a combination of medium and higher density attached residences to provide a balance of housing opportunities and meet the lifecycle housing needs and desires of the community. ***The housing products that have been developed to date have provided a variety of single and multiple family products and affordability offerings, as well as smaller lot sizes while still meeting the established densities for the area.***

The development scenario identifies two commercial areas or "nodes." One in the Cedarhurst area at 70th Street and Keats Avenue would have a smaller scale, integrated neighborhood commercial emphasis. ***This area has not had any development activity to date.*** The Cottage View area node in the south near Highway 10/61 is being oriented toward larger scale community commercial uses. One of the primary goals of the planning process is to design an efficient, safe, and interconnected system of local and collector streets. ***This area of the East Ravine saw the 2016 development of a 27-acre commercial site for a Walmart store and included improvements to East Point Douglas Road and the construction of a roundabout at the Highway 61 interchange. Additional roadway and utility planning are beginning to occur in this district as the City explores the option of locating and developing a Community Center along Ravine Parkway in this area.***

One of the major features ~~***to meet that goal***~~ to emerge from the ***East Ravine planning*** process is Ravine Parkway. The parkway will provide both a transportation corridor and a major design feature for the project. As a new collector street, the parkway will traverse the entire project area beginning in the northwest and meandering east and south towards Highway 10/61. Portions of the parkway will include natural landscaped areas, trailways, ponds, and wetlands. Other portions will appear more like Summit Avenue in St. Paul with large green boulevard and median areas. Along the parkway, local residential street loops will create neighborhood focal points and amenities out of green island areas. Sidewalks and trails linking area homes to the parkway, will allow safe and convenient movement throughout the eastern portion of Cottage Grove and connect to the remainder of the community. ***Two major segments of Ravine***

Parkway were installed in 2018 and 2019 between Keats Avenue and Jamaica Avenue and east of Hinton Avenue. The missing connection portion that links these two project areas will be completed as development occurs.

Transportation planning also includes the proposal to realign portions of Military Road to correct system design inefficiencies. The proposal would use a realigned portion of existing Jamaica Avenue to connect southward to 70th Street. Given the historic role of Military Road, the character and location of the former road alignment will be reflected in a new system of *adjacent* local streets and trails.

Major roadways and streets including 70th Street, 80th Street and Keats Avenue (County Road 19) will be established as green corridors throughout the project area. Expanded right-of-way and easement areas will create larger scale open spaces that will provide buffers to adjacent land uses and a continuation of the community's open space heritage. These green corridors will include trails and landscaping treatments that will vary in form and style depending on the specific location in the project area.

The City is utilizing current management practices and policies to plan for local ponding and surface water management needs in the planned neighborhoods. The City is also coordinating with the South Washington Watershed District to address regional storm water drainage needs to minimize redundant expenditures and loss of taxable development area.

IDENTIFICATION OF POTENTIAL IMPACTS

Natural, Cultural and Physical Resources

Past and current land uses in the project area have primarily been agricultural. Some farmsteads exist which generally consist of a residential structure and various outbuildings such as barns, sheds or silos. Other uses include large lot residential development on individual septic systems and private wells*~~, a couple of golf courses, and a campground~~*.

Wetlands are few within the project area. A small complex of wetlands exist west of Jamaica Avenue north of 80th Street. The primary natural resource feature in the project area is the Central draw or east ravine feature which serves as a natural drainage way for much of the region. *The wetland located west of Jamaica Avenue and north of 70th Street was officially renamed as Lake Robert in 2018 by the Minnesota DNR and Washington County after receiving a petition by the required number of signatures.*

Natural resources are prominent within the East Ravine Planning District. A large portion *of* the natural resource base is contained within the Cottage Grove Ravine Regional Park. Cottage Grove has a commitment to natural resources as evident by past efforts to identify and protect natural resources. The City of Cottage Grove currently has a *~~Sensitive Environmental Areas~~ Conservancy* Overlay District and a Tree Preservation Ordinance in place providing a foundation for protection of environmental resources. The impact on these resources from future urban development and infrastructure systems can be mitigated through the use of these types of existing tools. *~~A significant amount of land in the East Ravine Pre-design study area falls in the Sensitive Environmental Areas Overlay District.~~*

The City is also committed to the preservation of the community's historic identity and character for future generations. The Comprehensive Plan contains a significant chapter on Historic Preservation which lays the policy guidance for decision making relative to preservation of historical and cultural resources. Also serving as a guide for future community development decision making that acknowledges need for change while providing protection for historically significant buildings and sites is the Old Cottage Grove Historic District Preservation Planning Report, 2002. The report contains a comprehensive inventory of all the heritage resources within the district.

Municipal Infrastructure

The City of Cottage Grove presently obtains its raw water supply from deep wells in the Prairie du Chien-Jordan aquifer. The preliminary plan for the Public Water Supply and Impact improvements in the East Ravine area consists of approximately 290,000 linear feet (55 miles) of watermain pipe and 3.0 MG of storage to serve an estimated 5400 units. This system is described in a detailed technical memorandum dated February 7th, 2005 titled Cottage Grove East Ravine Planning Study – Watermain and attached as Appendix 1. Updated water system information is provided in Appendix 1A – 2006 Water Supply and Distribution Plan.

Sanitary sewer service is provided through the Metropolitan Council Environmental Services regional collection and treatment systems. The recently completed South Washington County Interceptor project provides services to the East Ravine Planning District. The preliminary plan for sanitary sewer serving the East Ravine area includes roughly 242,000 feet of sanitary sewer pipe with a total estimated design flow of approximately ~~12.13 million gallons per day (MGD). This system is outlined in a *technical memorandum dated February 7, 2005 titled Cottage Grove East Ravine Planning Study – Sanitary Sewer* and included as Appendix 2.~~ ***8.11 million gallons per day (MGD). Updated sanitary sewer system information and calculations for the East Ravine area are provided in Section 18. Updated City wide sanitary sewer system information is provided in Appendix 2A, Sanitary Sewer System, Cottage Grove 2040 Comprehensive Plan.***

Storm Water Management

The overall goal of the stormwater practices being proposed for the East Ravine area of Cottage Grove is to minimize the generation of stormwater runoff created by urbanization and to retain the runoff in a series of natural infiltration basins rather than concentrate to a single point for collection, treatment and discharge. This approach mimics the current infiltration patterns that presently exist in the study area of Cottage Grove. The net result will be minimization and, in some areas, avoidance of discharge of stormwater to surface waters; which in turn will lessen the overall amount of pollutants associated with the stormwater like the Mississippi River; resulting in less burden on the environment.

The South Washington Watershed District (SWWD) has ~~***begun to implement***~~ ***completed a significant percentage of*** a regional project which will convey runoff through the East Ravine project area in a system of detention areas and interconnecting pipes. As of the date of this report, the SWWD has completed land acquisition for an approximately 150-acre area of Neighborhood 1 North. When fully complete, the SWWD system will create a stormwater link to the Mississippi River. The SWWD has expressed a willingness to work with the City of Cottage Grove towards a combined City/Watershed District stormwater management system. The proposed Cottage Grove stormwater plan utilizes the natural detention areas acquired by the SWWD, but does not anticipate the need to rely on the proposed connecting storm drains, thereby protecting the Mississippi River and minimizing inputs to Cottage Grove Ravine Regional Park from the effects of local urbanization.

The detailed storm water management report documenting the approach to the East Ravine area is included as Appendix 5. ***Updated storm water system information is provided in Appendix 5A, 2019 Surface Water Management Plan. SWWD storm water facilities have been incorporated into the City's Surface Water Management Plan as both local and watershed improvements have been coordinated.***

Traffic Related Impacts

The East Ravine planning project evaluated the traffic impacts of the development scenario. The East Ravine area is expected to reach full build-out in 20 years. However, the travel demand model used for the traffic analysis used Year 2020 conditions in Washington County with full build-out of the East Ravine. The detailed methodology and analysis of traffic impacts is contained in a technical memorandum included as Appendix 3 of the AUAR. Seven key roadways (broken into twenty-four segments for analysis) and eighteen key intersection listed below were selected for this study because they will provide primary access to the regional road system and will likely be the primary roadways when the area develops.

Key Roadways

US 61 between Glen Road and Kimbro Avenue

~~***CSAH 20 (Military Road) between Ideal Avenue and Lamar Avenue***~~

Ravine Parkway

CSAH 22 (70th Street) between US 61 and CSAH 19 (Keats Avenue)

80th Street between US 61 and Kimbro Avenue

Jamaica Avenue between CSAH 20 (Military Road) and US 61

CSAH 19 (Keats Avenue) between Dale Road and US 61

Lamar Avenue/Kimbro Avenue between 70th Street to US 61

Key Intersections

US 61/70th Street Ramps (3 intersections)

US 61/80th Street Ramps (2 intersections)

US 61/Jamaica Ave Ramps (2 intersections)

US 61/CSAH 19 (Keats Avenue) Ramps (2 intersections)

US 61/Kimbro Avenue

80th Street/Jamaica Avenue

80th Street/CSAH 19 (Keats Avenue)

80th Street/Kimbro Avenue

CSAH 20 (Military Road)/Lamar Avenue

CSAH 22 (70th Street)/CSAH 19 (Keats Avenue)

CSAH 22 (70th Street)/Jamaica Avenue

~~***CSAH 20 (Military Road)/Jamaica Avenue***~~

~~***CSAH 20 (Military Road)/CSAH 19 (Keats Avenue)***~~

An operation analysis was completed for roadway segments and intersections. Roadway operations were evaluated by comparing average daily traffic counts with level of service bar charts developed using methodologies from the Highway Capacity Manual. Intersections were evaluated using the expected intersection delay. In the existing year, the intersection of CSAH 22 (70th Street)/Jamaica Avenue is the only intersection operating below the desired level of service. Forecasted average daily traffic volumes were used to estimate future roadway operations. These forecasted were developed using the Washington County 2020 Travel Demand Model. Assuming the existing geometry, two of the seven roadways operated under congested conditions. Eleven of the eighteen intersections operated below the desired level of service. The following projects are recommended to mitigate the impacts:

Roadway Improvements

~~Reconstruct CSAH 20 (Military Road) as a four-lane facility with turn lanes~~.

Reconstruct CSAH 19 (Keats Avenue) as a four-lane facility with turn lanes.

Realign the intersection of CSAH 20 (70th Street) and CSAH 19 (Keats Avenue) to be the major connection to US 61 and close the intersection of CSAH 20 (Military Road) and CSAH 19 (Keats Avenue) ***(Roundabout installed and Realignment Complete 2015)***

Discuss the possible closure of US 61 and Kimbro Avenue and a possible future interchange at US 61 and TH 95 (Manning Avenue) with Mn/DOT and other authoritative jurisdictions.

Intersection Improvements (Installation of Traffic Signals at the Following Locations)

US 61 SB Ramp/CSAH 22 (70th Street)

US 61 SB Ramp/Jamaica Ave

US 61 NB Ramp/Jamaica Avenue

US 61 SB Ramp/CSAH 19 (Keats Avenue)

US 61/Kimbro Avenue, 80th Street/Jamaica Avenue

80th Street/CSAH 19 (Keats Avenue)

~~*CSAH 22 (70th Street)/CSAH 19 (Keats Avenue)*~~

~~*CSAH 22 (70th Street)/Jamaica Avenue*~~

Jamaica Avenue/Ravine Parkway

CSAH 19 (Keats Avenue) /Ravine Parkway

MITIGATION INITIATIVES

The Mitigation Plan identifies key steps that the City will take to mitigate potential impacts identified in the AUAR. In addition to general mitigation initiatives, the mitigation plan includes strategies in the following areas:

Natural and Physical Resources
Cultural Resources
Land Use Management
Erosion Control and Sedimentation
Water Supply and Appropriation
Wastewater System
Storm Water Management
Traffic Management

Alternative Urban Area Wide Review (AUAR) Worksheet Form

This section consists of the Environmental Assessment Worksheet (EAW) form and response to questions as modified by Environmental Quality Board (EQB) AUAR Guidance as of ~~*July 2004 September 2008*~~ **December 2015** The EAW question is shown in bold uppercase text, AUAR guidance is shown in faded italicized text, and the response to the question is shown in regular text.

The 2015 Update text is Colored Brown and is bold italicized.
The 2020 Update text and edits are Colored Blue and bold italicized.

1. TITLE

Cottage Grove 2015 East Ravine AUAR Update.
Cottage Grove 2020 East Ravine AUAR Update.

2. Proposer

John M. Burbank
City of Cottage Grove
12800 Ravine Parkway South
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3. RGU

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4. REASON FOR AUAR AND UPDATE PREPARATION

In conjunction with the East Ravine Master Planning process, the City of Cottage Grove prepared the environmental assessment document in the form of an AUAR to understand the cumulative impacts of future development and to develop mitigation strategies to minimize potential environmental impacts. *The East Ravine AUAR and Mitigation Plan received final approval in March of 2006 and was subsequently included with the City's 2030 Comprehensive Plan amendment.*

The Cottage Grove 2015 East Ravine AUAR Update Report is being completed in conformance with MN Rules 4410.3610, Subpart 7(A).

The Cottage Grove 2020 East Ravine AUAR Update Report is being completed in conformance with MN Rules 4410.3610, Subpart 7(A). In addition, the adoption of the 2040 Comprehensive Plan modified the land use on several properties from Commercial to Mixed use.

5. LOCATION AND MAPS

The AUAR Project Area is located on the east side of the City Cottage Grove. Figure 5.1 shows the project location.

No changes have been made in relation to the scope, size or location of the AUAR project area since the original AUAR was approved.

County: Washington
City: Cottage Grove
Locations: The Cottage Grove East Ravine Planning District, is an approximately 4,000 acre portion of largely undeveloped land stretching along the east side of County Road 19 from Highway 61 north to the City of Cottage Grove's border with Woodbury and including a portion north of 70th Street east of CR 19 generally to Ideal Avenue.

The following figures are included within the *AUAR:*

Figure 5.1—Project Location
Figure 5.2—AUAR Boundary/USGS Map
Figure 5.3—East Ravine Districts/Aerial Photo
Figure 5.4—Traffic Analysis Zones (TAZ)
Figure 5.5—Existing Municipal Service Area (MUSA) and 2020 MUSA Expansion
Figure 6.1—East Ravine Development Scenario/Master Plan
Figure 6.2—Preliminary Phasing Plan
Figure 9.1—Existing Land Use
Figure 10.1—Land Cover
Figure 10.2—Watercourses, Wetlands, Lakes and Streams
Figure 10.3—Natural Resources Overlay
Figure 17.1—Existing Storm Water System
Figure 17.2—Proposed Storm Water System
Figure 19.1—Soils Map
Figure 21.1—Roadway System
Figure 21.2—~~*2000 2014*~~ *2015* Average Daily Traffic

Figure 21.3—Build Out Average Daily Traffic
Figure 25.1—Cultural Resources Overlay
Figure 27.1—City of Cottage Grove *2030* Comprehensive *Land Use* Plan
Figure 27.1A—City of Cottage Grove *2040* Comprehensive Land Use Plan
Figure 27.2—Washington County Comprehensive Plan
Figure 27.3—Upper Ravine District Development Update Detail
Figure 27.4—~~2014~~ 2018 Roadway Functional Classification Map

The following figures have been added to the AUAR.

Figure 10.3A—Grassland/Shrubland Map
Figure 10.3B—Lawn/Landscaping Map
Figure 18.1 – Land Use with East Ravine Boundary
Figure 18.2 – Sewer Districts with East Ravine Boundary
Figure 27.1A—City of Cottage Grove 2040 Comprehensive Land Use Plan
Figure 27.3-- Development Update Exhibit 2020 Update
Figure 27.4—~~2014~~ 2018 Roadway Functional Classification Map
Figure 27.5—2040 Development Staging Map

The planned development scenario for the East Ravine has not been modified since the adoption of the AUAR, but certain components of the plan need to be modified to address current market conditions and development practices. Smaller lot sizes appear to be the biggest change from the original development scenario in the residential subdivisions that have been approved. In exchange for the relaxation of the standards, the City has been exacting extensive park, open space and trailway improvements. The higher density resulting from the decreased lot sizes are consistent with regional growth policies.

The residential development that occurred since 2015 was significantly in conformance with the planned neighborhood layouts and internal local road networks. The trend for smaller lot sizes and housing product size continued since 2015 and reflects the current market demand for different housing opportunities and price points. Regional density goals have been maintained on average in the planning area.

6. DESCRIPTION

The ***original*** development scenario was derived with input from a group of area residents on a Community Advisory Team, City Advisory Commissions, and from two workshop meetings of the City Council and Planning Commission held in the spring and summer of 2004. The development scenario utilized the East Ravine's existing topographic features, transportation corridors, greenways, and development patterns to establish a plan for new neighborhood areas, distinct to Cottage Grove, interconnected by a network of parks, trails, and storm water drainage features.

The development scenario is illustrated in Figure 6.1 and consists of the following components:

Housing - Large areas of predominantly Single Family residential housing are interspersed with a combination of medium and higher density attached residences to provide a balance of housing opportunities and meet the lifecycle housing needs and desires of the community. Housing types include single family detached, ***villas***, multi-family attached (townhomes, rowhouses, twin homes) and multi-family stacked (condominiums and apartments). Housing densities would range from lower density single family neighborhoods at less than 3 units per acre to higher density "village" type neighborhoods such as Cedarhurst ranging from 6 to 12 units per acre. The most intense residential uses would be located in the Cottage View and Cedarhurst areas with densities in the 6 to 12 unit per acre range, ***and in the new mixed use land use districts, which would allow for a density of up to 40 units per acre for select projects.***

~~*Since adoption of the AUAR, only four single family residential developments have been approved by the City and constructed. The projects were located in Upper Ravine Neighborhood One North and consisted of 278 total single family lots. The acreage for these subdivisions totaled 149 gross buildable acres and was within the scope of the original development scenario.*~~

Since adoption of the AUAR through 2019, there were, ~~only four~~ nineteen single family residential developments ~~have been~~ approved by the City. The projects were located in Upper Ravine Neighborhood One North and consisted of ~~278~~ 747 total single family lots. The acreage for these subdivisions totaled ~~149~~ 310 gross buildable acres and was within the scope of the original development scenario with an average density of 2.40 units per gross acre.

Commercial – The development scenario identifies two commercial areas or "nodes." One in the Cedarhurst area at 70th Street and Keats Avenue would have a smaller scale, integrated neighborhood commercial emphasis. This pattern of commercial use would typically include smaller building footprints on smaller parcels. The Cottage View area node in the south near Highway 10/61 is more oriented toward larger scale community commercial uses including larger "big box" type commercial uses with intensive parking needs. Larger parcels are required for this type of use. Floor area ratios (square feet of gross leasable area to gross site acreage) for commercial uses would range from 0.2 for the larger scale community commercial to .5 for the more village oriented commercial uses.

Since adoption of the AUAR, the only commercial development activity that was approved was an 180,000 square foot Walmart store located on 23.5 acres of commercially guided land located in the Cottage View area of Neighborhood One South. Additional traffic studies were completed in conjunction with the development review process for this project. The recommendations found in the traffic studies were incorporated into the approval of the Walmart project. Construction for this project was completed in the first quarter of 2014. This project is within the scope of the original development scenario. The Traffic Study is included as Appendix 11. No additional commercial activity has occurred in the East Ravine planning area.

Transportation - One of the primary goals of the planning process is to design an efficient, safe, and interconnected system of local and collector streets. One of the major features to meet that goal that emerged from the process is the East Ravine Parkway which essentially runs through both neighborhoods and provides a connecting link for the entire East Ravine community. The parkway will provide both a transportation corridor and a major design feature for the project. As a new collector street, the parkway will traverse the entire project area beginning in the northwest and meandering east and south towards Highway 10/61. Portions of the parkway will include natural landscaped areas, trailways, ponds, and wetlands. Other portions will appear more like Summit Avenue in St. Paul with large green boulevard and median areas. Along the parkway, local residential ~~*street loops*~~ ***subdivision entrance outlots and buffers*** will create neighborhood focal points and amenities out of green island areas. Sidewalks and trails linking area homes to the parkway, will allow safe and convenient movement throughout the eastern portion of Cottage Grove and connect to the remainder of the community.

Since the adoption of this AUAR, the East Ravine Parkway was formally named as Ravine Parkway South by the Cottage Grove City Council. Two segments of this roadway have been completed to date in conjunction with the construction of the Washington County South Service Center and the new Cottage Grove City Hall and Public Safety facility. The City is currently working with Washington County on identifying controlled access points within Upper Ravine Neighborhood One North, which includes segments of the Ravine Parkway. The City has also coordinated with Washington County on the realignment of the intersection of 70th Street and Keats Avenue in accordance with the City's 2030 Comprehensive Plan. This realignment project is currently under construction and is anticipated for completion in the spring of 2015. These roadway projects were analyzed in the original AUAR and adopted Comprehensive Plan. Portions of the 70th Street realignment were incorporated into the South Washington Watershed District's (SWWD) regional storm sewer extension project. This portion of the project was included in a separate AUAR that was prepared by the SWWD. Access to a copy of this document can be found at http://www.swwdmn.org/. In 2018 and 2019, three additional segments of the parkway were constructed between Keats Avenue and Hinton Avenue. Since the last update to the AUAR, Washington County has adopted a county access management plan that was supported by Cottage Grove.

Transportation planning also includes the proposal to realign portions of Military Road to correct system design inefficiencies. The proposal would use a realigned portion of existing Jamaica Avenue to connect southward to 70th Street. Given the historic role of Military Road, the character and location of the former road alignment will be reflected in a new system of local streets and trails.

Green Corridors - Major roadways and streets including 70th Street, 80th Street and Keats Avenue (County Road 19) will be established as green corridors throughout the project area. Expanded right-of-way and easement areas will create larger scale open spaces that will provide buffers to adjacent land uses and a continuation of the community's open space heritage. These green corridors will include trails and landscaping treatments that will vary in form and style depending on the specific location in the project area. Park and recreation features will also be included in these green corridors or will be connected to them via trails and sidewalks.

All new developments along the major roadways within the district are required to have a landscape buffer component that averages 75 feet and is protected by easements and covenants. The design criteria within this dedicated buffer area are expected to be consistent from subdivision to subdivision along the major roadways. The required buffer area was successfully implemented in the design approval for the ~~four~~ single family residential subdivisions recently approved along Ravine Parkway, 70th Street, and Jamaica Avenue. This action has been implemented as development occurs adjacent to the major roads in the planning area.

As a component of the 70th Street realignment project and in conjunction with the concept review of several new residential developments for the Upper Ravine Neighborhood One North that have occurred recently, the City has begun to refine the design concepts for the new Historic Military Road Trail Corridor and new intersection geometrics for Military Road and Jamaica Avenue in Woodbury. Completion of this realignment project is expected in 2015 or 2016 depending on development activity. Portions of Military Road have been permanently closed as a result of adjacent residential development. The new historic trail segments include landscaping, architectural benches, interpretive signage, and prairie restorations. The Jamaica Avenue upgrade and realignment have yet to occur.

Surface Water Management - The City is utilizing current management practices and policies to plan for local ponding and surface water management needs in the planned neighborhoods. The City is also coordinating with the South Washington Watershed District *(SWWD)* to address regional storm water drainage needs to minimize redundant expenditures and loss of taxable development area. *The overall goal of the stormwater practices being proposed for the East Ravine area of Cottage Grove is to take advantage of the suitable soils in this area to infiltrate urban runoff in both City and SWWD facilities.* ~~minimize the generation of stormwater runoff created by urbanization and to retain the~~

~~runoff in a series of natural infiltration basins rather than concentrate to a single point for collection, treatment and discharge.~~ This approach mimics the current infiltration patterns that presently exist in the study area of Cottage Grove. The net result will be ***to use infiltration in a strategic way to manage urban runoff volumes and pollutant loads within the East Ravine area.*** ~~— minimization and, in some areas, avoidance of discharge of stormwater to surface waters; which in turn will lessen the overall amount of pollutants associated with the stormwater like the Mississippi River; resulting in less burden on the environment.~~

Development Staging/Phasing – Development staging for the project is for Upper Ravine Neighborhood 1 to be served first followed by Neighborhood 2. Services to Neighborhood 1 could begin as soon as all approvals and permits are in place. Neighborhood 2 is anticipated to be provided infrastructure facilities ~~***by roughly 2015 or***~~ when Neighborhood 1 has become substantially developed. A phasing plan is included as Figure 6.2.

The following table provides a breakdown of ***2040*** Future Land Use by acreage according to Neighborhood 1 and Neighborhood 2 and the total project area. ~~***Road right-of-way is not included in these land use acreages.***~~

A major portion of the planned trunk sanitary sewer for the Upper Ravine District was installed by the City in 2007 in order to serve the first two residential subdivisions located west of Jamaica Avenue. The additional two residential developments approved in this district are benefiting from the use of this infrastructure. Infiltration has continued to be utilized in development areas where allowed by the City's Wellhead Protection Plan.

Since the adoption of the AUAR, the SWWD has completed four of the five phases of the Central Draw Overflow and Storage Project.

When fully developed, the East Ravine will contain the following mix of land uses:

Table 6.1 - Development Scenario – Future Land Use Acreages

2040 Future Land Use Acreage	Acres
Commercial	42.6
High Density Residential	127.50
Low Density Residential	1179.3
Medium Density Residential	236.3
Mixed Use	129.2
Open Water	28.7
Parks and Open Space	1419.52
Public/Semi Pubic	45.00
Right-of-Way	69.75
Rural Residential	566.81

Table 6.1 - Development Scenario – Future Land Use Acreages

Category	Total Project Area	*Upper & Lower Ravine District*	*East Ravine District*
12 + DU/Acre	54	37	17
1-5 DU/Acre	1,357	750	607
2 Acre Lots Unsewered	465	0	465
6-12 DU/Acre	151	30	121
Cedarhurst	8	8	0
Civic	39	13	26
Civic Campus	49	0	49
Commercial	129	80	49
Easement	13	0	13
Mixed Use	21	6	15
Park/Open Space/Ponding	1,499	457	1,042
Grand Total	3,785	1,381	2,404

The residential and commercial development that occurred within the East Ravine did not modify the described land use categories identified in the table 6.1. Within the civic campus land use area, the City and Washington County each constructed new government buildings. Washington County's building is 40,000 square feet on 7.9 acres of land. The City's new City Hall/Public Safety building is 66,335 square feet on 6.82 acres of land. ~~The remaining 24.28 acres remain vacant and may be developed further in the future with a regional joint effort public safety training facility.~~ The 45,508 square foot HERO Center training facility was constructed on the 9.02-acre balance of the civic campus in 2019. The 2040 ComprehensivePlan converted the 129 acres of Commercial land use to Mixed Use. The City is currently updating the zoning ordinance to reflect the new Mixed Use classification.

7. PROJECT MAGNITUDE DATA

The following tables represent project magnitude data for the Cottage Grove East Ravine project. This data was generated with an understanding of the market forces and land development interests in the project areas trade market. Residential and commercial development trends were reviewed in conjunction with building permit data to support market research conducted by McComb Group, Ltd. in Fall of 2003. A report titled *East Ravine Development Potential: Retail and Residential* completed by the McComb Group was published in December of 2003 and is available from the City.

The Cottage Grove Demographic Characteristics and Retail Sales Potential Study was updated in September 2009. This Study is included in the Appendix of this report.

As a part of the 2040 Cottage Grove Comprehensive Plan, a Market and Development Context Report was prepared in 2016. This report is included in the Appendix 12 for reference.

Residential Demand: Residential demand was estimated at over 10,000 new homes by 2025. The East Ravine planning process was conducted to test the land capacity for new housing consistent with City policies and directions provided through the planning process. More detailed site design testing and planning resulted in approximately 6,500 housing units over the next 20 year period as depicted in Table 7.1 below. ~~**Housing unit types would be mixed between single family detached at 46%, single family attached (twinhomes, townhomes) at 24% and multi-family stacked (condominiums, apartments) at 30%.**~~ **Neighborhood 1 and Neighborhood 2 are made up of a variety of land uses, as presented in Table 7.1. Housing unit types would be mixed between single family detached at 80%, single**

family attached (twin homes, townhomes) at 12%, and multi-family stacked (condominium, apartments) at 8%. Average densities across all residentially guided land areas would be slightly over 4 units per net acre. Density is based on developable land area less major road right-of-way, protected water bodies, NWI wetlands, lands owned by the South Washington County Watershed District for stormwater management, and park/open space areas not intended for development. ~~**Residential densities in Neighborhood 2 also do not include the land use category of 2 acre lots un-sewered. If this land area were to be included in the calculation for density, Neighborhood 2 would have a net density of 2.8 units per acre as opposed to 4.4.**~~ **Residential densities do not include Rural Residential land uses.** Densities are presented in Table 7.1.

Table 7.1 - Project Magnitude Data - 20 Year Residential Growth

The timing of the residential growth in Cottage Grove was delayed by the downturn in the economy and housing market which impacted the development staging of the growth and is covered elsewhere in this document. Unless subjected to a major change in regional forecasting methodologies, the projected growth figures included below are still considered accurate minus the 120 single family units platted to date.

East Ravine Land Use		Neighborhood 1 Acreage	Neighborhood 2 Acreage
Low Density Residential		578	567
Medium Density Residential		86	139
High Density Residential		57	70
Commercial		35	5
Industrial		0	1
Institutional		17	27
Major ROW & River		6	121
Mixed Use/Village Center		68	57
Parks/Open Space		352	642
Rural Estate		0	516
Undeveloped/Uncategorized		186	455
Total Acreage		**1,383**	**2,600**

East Ravine Project Areas		Residential Acres*	Total Units	Density - Units per Acre
Neighborhood 1		720	3,207	4.45
Neighborhood 2		775	3,347	4.32
Total		**1,495**	**6,554**	**4.38**

Residential Land Use		Units	Percent of Overall Total
Single Family Detached		2,994	46%
Multi-Family Attached		1,602	24%
Multi-Family Stacked		1,958	30%
Total Units		**6,554**	**100%**

*Does not include Rural Residential land uses

Total Project Area Housing Units	Units		Percent of Overall Total
Single Family Detached	2,994		46%
Multi-Family Attached	1,602		24%
Multi-Family Stacked	1,958		30%
Total Units	6,554		100%
	Residenital Acres*	Total Units	Density - Units per Acre
Neighborhood 1	823	3,207	3.90
Neighborhood 2	760	3,347	4.40
Total Project Area	1,583	6,554	4.14
* does not include existing large lot / unsewered residential in neighborhood #2			

Note: density is represented as a "net" acreage including land areas guided as residential excluding wetlands, bodies of water, regional parks and greenways and major road right-of-way.

There are two primary Commercial land use nodes in the project area. Neighborhood 1 includes the bulk of the commercial area at ***the Cottage View area at*** CR 19 and Highway 61. The other area is the Cedarhurst area at 70th Street east of CR 19 in Neighborhood 2. Collectively, these two areas could accommodate approximately 850,000 square feet of new commercial retail development. The *East Ravine Development Potential: Retail and Residential* market study provided the research to support this level of retail growth over the next 20 year period.

In 2012, the City Council approved a 23.5-acre commercial development that is located in the Cottage View Area of Neighborhood 1 South. The project completed construction in March of 2014. The new Mixed Use zoning ordinance that is being drafted by the City to coincide with the 2040 land use modification from Commercial to Mixed Use would include vertical mixed use residential in addition to traditional retail based commercial and office uses within the East Ravine. At this time, it is premature to estimate what the ratio of units and density that the market would bear. Infrastructure and roadway improvements will be analyzed and required as development occurs.

Table 7.2 - Project Magnitude Data - 20 Year Commercial Growth

	Commercial Acres	*Total Units Sq. ft.*
Neighborhood 1 - Undeveloped	*64*	*200,000*
Neighborhood 1 - Developed	*0*	
Neighborhood 2 - Undeveloped	*62.5*	*470,000*
Neighborhood 2 - Developed	*23.5*	*180,000*
Total Project Area	*150*	*850,000*

There have been no modifications to the information reported in Table 7.2.

8. PERMITS AND APPROVALS REQUIRED

Table 8.1 presents a list of known local, state, and federal permits and approvals. The specific permits and approvals will depend on the type and magnitude of a particular development project. Additional consultation with city and agency staff will be needed to clarify whether a permit or approval is necessary.

Table 8.1 - Permits and Regulatory Review/Approvals

There have been no modifications to the information reported in Table 8.1.

There have been no modifications to the information reported in Table 8.1.

Unit of Government	Type of Permit/review or approval	Regulatory Citation (as may be noted)
City of Cottage Grove	Subdivision Approval	
	Planned Unit Development Approval	
	Rezoning	
	Flood Fringe and Floodway Overlay	
	Conditional Use Permit Approval	
	Grading Permit/Drainage and Stormwater	
	Site Plan Review Approval	
	Comprehensive Plan Amendments	
	Zoning Ordinance Amendments	
	Variance	
Washington County	Roadway Access Permit	
	Utilities in Right-of-Way Permit	
Minnesota Department of Natural Resources	Utility Crossings Permit	MN Statute 103G, MN Rules 6115.0810
	Natural Heritage Program Coordination	Federal Endangered Species Preservation Act of 1973, as amended in 1978, 1982, and 1988; MN Statutes Chapter 84.0895; MN Rules Chapter 6134
	Wetland Permit	
U.S. Army Corps of Engineers	Clean Water Act Section 404/10 Wetland Permits	Section 404 Of The Clean Water Act Title 33CFR26 - Water Pollution Prevention and Control Subchapter IV - Permits and Licenses
Minnesota Department of Health	Water Main Plan Review	MN Rules 4720
Minnesota Pollution Control Agency	NPDES Permit	MN Statute 115, MN Rules 7002
	Sanitary Sewer Extension Permit	
	401 Water Quality Certificate	
	Surface Water Discharge Permit	
	Wastewater Permit	
	Indirect Source Permit (ISP)	

Unit of Government	Type of Permit/review or approval	Regulatory Citation (as may be noted)
South Washington County Watershed District	Grading/Drainage/Storm sewer Permit	
Metropolitan Council Environmental Services		
Minnesota State Historic Preservation Office	Cultural Resource Coordination	Section 106 of the Historic Preservation Act, Protection of Historic Properties" (36 CFR Part 800), MN Statutes 138.31-.42, MN Private Cemeteries Act- MN Statute 307.08
Minnesota Department of Transportation	Utilities in Right-of-Way Permit	
	Access Permit	
Minnesota Environmental Quality Board (EQB)	Environmental Assessments (AUAR)	Minnesota Rules 4410

9. LAND USE

Past and current land uses in the project area have primarily been agricultural. Some farmsteads exist which generally consist of residential structures and outbuildings such as barns, sheds or silos. Other uses include large lot residential development on individual septic systems and private wells. This type of use is primarily focused on the eastern edge of the project area in what is commonly known as Old Cottage Grove, along Military Road or along Keats Avenue. Figure 9.1 illustrates existing land use in the project area.

Table 9.1 - Existing Land Use

~~*There have been no changes in the information reported in Table 9.1.*~~

The steady development in the East Ravine is constantly shifting the existing land use acreage as properties develop in accordance with the East Ravine Master Plan and adopted comprehensive plans. No ongoing or aggregate study has been completed to date to track these inevitable conversions as areas in the East Ravine are developed.

Existing Land Use	Total Acres
Agricultural Use	2,441
Commercial	61
Park/Open Space	568
Public / Semi Public	53
Road Right of Way	70
Rural Residential	738
Urban Residential	69
Grand Total	4,000

Adjacent land uses consist of a combination of urban land uses to the west of the project area (predominantly a single family, low density residential use) and rural land uses to the east of the project area (farm fields). Highway 61 is located to the south of the project area and The City of Woodbury is located to the north. In Woodbury, land uses are currently agriculture oriented with longer term plans for residential growth.

A site owned by 3M Corporation is located at the northern boundary of Cottage Grove, east of CR 19. The site has extensively been monitored by both 3M Corporation and the Minnesota Pollution Control Agency. Additional documentation as to the status of this site is available through the City of Cottage Grove or through the MPCA.

10. COVER TYPES

Cover Type Map

Figure 10.1 shows natural resources such as threatened and endangered species and cover types such as cropland, basswood forest, brushland, coniferous plantation, dry oak forest, dry oak savanna, dry prairie, lowland hardwood forest/wet meadow, lowland hardwood forest, maple-basswood forest, mesic oak forest, mixed hardwood forest, oak woodland-brushland, old field, and wetland/open water marshes. Figure 10.2 presents mapping of watercourses, wetlands, lakes, and floodplains. Figure 9.1 shows existing development patterns.

Current natural community land cover is presented in Table 10.1. The future level of impact cannot be predicted at this time since specific development plans are not in place.

Table 10.1 - ~~*Current*~~ *2006* Natural Community Land Cover

Land Classification	Existing Acres	Land Classification	Existing Acres
Coniferous Forest	5.14	Maple-Basswood Forest	63.13
Agricultural Land	2050.15	Mesic Prairie	2.38
Deciduous Forest	8.35	Mixed Coniferous/Deciduous Forest	36.03
Dry Prairie	17.73	Oak Forest	682.28
Floodplain Forest	1.60	Oak Savanna	57.49
Grassland/Brushland	240.70	Oak Woodland/Brushland	149.46
Impervious Surfaces	220.11	Other/Transitional Land	25.65
Lawn/Landscaping	252.02	Planted Coniferous Forest	62.02
Lowland-Hardwood Forest	28.13	Wetland	104.92
Total Acres			**4007.29**

Consistent with the modifications in land use through development, modifications to land cover within the East Ravine are not actively quantified due to a lack of purpose as development occurs within the scope of approved land use plans within the planning district.

Overlay

Figure 9.1 presents existing land use and Figure 6.1 presents the development scenario representing future land use that can be viewed in conjunction with Figures 10.1 Natural Resources and 10.2 Water Features. Cottage Grove has a commitment to natural resources and has prepared a Natural Resource Inventory completed by BRAA in 1998. Community woodlands and wetlands are also regulated by the City's Tree Preservation Ordinance and the Wetlands Conservation Act. Figure 10.3 presents a Natural Resources Overlay identifying Environmentally Sensitive Features as identified in the City's Comprehensive Plan.

With urban development, the face of the existing landscape is inevitably and irreparably modified. The City recognizes that the areas identified for growth on the approved 2030 and 2040 land use plans will shift the ratios of the different land classifications identified in table 10.1. In utilizing the City's Park and Open Space Plan and the Tree Preservation Ordinance, the natural communities that have a significant local value have and will be preserved. The current development review process does not break out the land use classification changes to the level of detail identified initially in Table 10.1 and is not a component of review for development of the East Ravine Planning Area.

11. FISH, WILDLIFE, AND ECOLOGICALLY SENSITIVE RESOURCES

Wildlife and Fish Resources

There is a variety of wildlife in the AUAR study area due to the diverse types of habitat available. Wetlands, woodlands, grasslands, and croplands found in the area provide good cover and habitat for many common species found in the upper Midwest. Development will result in an overall loss of habitat quantity and quality in the area. In the short term, animals will be displaced by construction activities, moving into other areas where they will be forced to compete for resources and typically experience higher rates of mortality than resident wildlife. In the long term, the ability of the area to support wildlife will be diminished. The frequency of conflicts between humans and wildlife will increase in the form of nuisance wildlife complaints.

The statements in this section remain unchanged.

The statements in this section remain unchanged.

Wetlands

There are approximately 105 acres of wetlands within the project area. Wetlands were identified using National Wetland Inventory (NWI) Maps, the *Cottage Grove Natural Resources Inventory* (Cottage Grove Natural Resource Inventory 1998), MnDNR Public Water Inventory (PWI) Maps, and the Minnesota Land Cover and Classification System (MLCCS). There are four MnDNR public water wetlands located in the project area (82W-Gables Lake, 83W-Unnamed wetland, 84W-Unnamed wetland, and 87W-Regional Park Lake). The wetlands that are present within the project area are depicted on Figure 10-2. These wetlands provide habitat for numerous waterfowl, amphibians, reptiles, and upland wildlife species. Several species of migratory birds (ducks, geese, and cranes) commonly use wetlands.

Only one of the residential subdivisions that developed since the adoption of the AUAR had a wetland identified during the required wetland delineation reports that were completed as a part of the development process. That project was The Waters at Michael's Pointe, which is adjacent to a deep, open water marsh that is one of the few natural wetlands in Cottage Grove that is of a considerable size. This designated wetland (now named Lake Robert) was protected during construction in accordance with the requirements of Minnesota DNR and the South Washington Watershed District. The Watershed District has this wetland identified as Protect 1 which requires a 100-foot wide average wetland buffer. There were no other non-residential developments that had a wetland identified or impacted.

Subsequent projects with wetlands have been delineated and impacts have been avoided or mitigated as required by the South Washington Watershed District, who is also the LGU.

Watercourses

The City of Cottage Grove, MLCCS, MCBS, Metropolitan Council, and MnDNR information was used to classify and map woodland areas. Cottage Grove Ravine Creek is a watercourse that runs through the project area and a portion of it is a MnDNR public water. The portion that is a MnDNR public water starts just north of 80th Street and flows south through Neighborhood 2. There are approximately 143,000 linear feet of watercourses within the project area. In

general, watercourse corridors provide habitat for upland wildlife and migratory birds. Migratory birds, amphibians, reptiles, and waterfowl are common types of species found along creeks.

The only impact to the reported watercourse was that additional public drainage and utility easements were acquired over a portion of the creek in Section 23 as a part of a minor subdivision that was a component of the acquisition of parkland by Washington County. In 2017 the SWWD completed a stream bed stabilization project within the Cottage Grove Regional Park in conjunction with the stormwater overflow outlet construction project.

Lakes

The City of Cottage Grove, MLCCS, MCBS, Metropolitan Council, and MnDNR information was used to classify and map woodland areas. Gables Lake and Regional Park Lake are both located within the project area and are both identified by the MnDNR PWI map as public water wetlands (82W and 87W, respectively). Gables Lake and Regional Park Lake account for the approximately 26 acres of lakes within the project area. Lakes provide habitat for migratory birds, fish, waterfowl, amphibians, and reptiles.

Gables Lake is upstream of all development that occurred in the East Ravine. The Regional Park Lake is downstream from the Washington County Government Center and the New Cottage Grove City Hall that were constructed since the approval of the AUAR. This water body was not compromised by these two projects as the sites were developed with surface water rate and quality controls that were constructed in accordance with the South Washington Watershed Districts standards and requirements and the City's surface water management plan.

Woodland Areas

Woodland areas comprise approximately 27 percent of the total project area, accounting for an estimated 1,094 acres. Several forest stands are found throughout the project area while others align the Cottage Grove Ravine Creek corridor. Similar to agricultural/open lands, the woodlands provide habitat areas to numerous wildlife species described above.

The City of Cottage Grove, MLCCS, MCBS, Metropolitan Council, and MnDNR information was used to classify and map woodland areas. The forest cover classifications within the project area are depicted on Figure 10.3, Natural Resources. The majority of the woodlands were classified as oak forest and oak woodland/brushland. The City of Cottage Grove had a natural resource inventory completed for the city in 1998 and the information is summarized below for the project area.

The residential and commercial developments that occurred in the East Ravine since the adoption of the AUAR were subject to the submission and review of tree preservation inventories. In instances when tree removal related to development consistent with the 2030 Land Use Plan was in excess of ordinance criteria, the projects were subject to tree replacement or cash mitigation approval conditions.

~~*11.a.1.4.1 Neighborhood 1 (North) Natural Communities*~~

~~Neighborhood 1 (north) is located north of 70th Street South and south of Military Road. Just north of 70th Street South is a fairly large (117 acre) oak forest. This area has been logged in recent years. Oaks are the dominant tree species, but a much greater proportion of the canopy is made up of other tree species such as aspen *(Populus tremuloides)*, butternut *(Juglans cinerea)*, black cherry *(Prunus serotina)* , hackberry *(Celtis L.)*, and bitternut hickory *(Carya nutt)*. The shrub layer is dominated by buckthorn *(Plantago aristata)*.~~

~~Just north of this large oak forest is a mature oak forest. According to Constance Otis, this area was last logged during the late 1800s. Since then, the canopy has recovered and today is dominated by white oak *(Quercus alba)* and bur oak *(Quercus macrocarpa)* with a good diversity of other species in the subcanopy including bitternut hickory, butternut,~~

basswood *(Tilia linden)*, red oak *(Quercus borealis),* and hackberry. There are also scattered sugar maple *(Acer saccharum)* and red maple *(Acer rubrum)* in this community. The shrub layer is fairly diverse containing elderberry *(Sambucus canadensis)*, chokecherry *(Aronia medikus),* and several species of currant and pagoda dogwood *(Cornus alternifolia)*. The ground cover is very diverse containing such species as jack-in-the-pulpit *(Arisaema triphyllum),* enchanter's nightshade *(Circaea L.)*, bloodroot *(Sanguinaria L.)*, and several species of ferns including sensitive and maidenhair fern *(Adiantum pedatum)*. Unfortunately buckthorn has invaded this community and will likely become dominant in the future.

11.a.1.4.1 Neighborhood 1 (North) Natural Communities

Neighborhood 1 (north) is located north of 70th Street South and south of Military Road. Just north of 70th Street South is a fairly large (117 acre) oak forest. This area has been logged in recent years. Oaks are the dominant tree species, but a much greater proportion of the canopy is made up of other tree species such as aspen (Populus tremuloides), butternut (Juglans cinerea), black cherry (Prunus serotina), hackberry (Celtis occidentalis), and bitternut hickory (Carya cordiformis). The shrub layer is dominated by buckthorn (Rhamnus cathartica). Just north of this large oak forest is a mature oak forest. According to Constance Otis, this area was last logged during the late 1800s. Since then, the canopy has recovered and today is dominated by white oak (Quercus alba) and bur oak (Quercus macrocarpa) with a good diversity of other species in the subcanopy including bitternut hickory, butternut, basswood (Tilia americana), red oak (Quercus rubra), and hackberry. There are also scattered sugar maple (Acer saccharum) and red maple (Acer rubrum) in this community. The shrub layer is fairly diverse containing elderberry (Sambucus canadensis), chokecherry (Prunus virginiana), and several species of currant and pagoda dogwood (Cornus alternifolia). The ground cover is very diverse containing such species as jack-in-the-pulpit (Arisaema triphyllum), enchanter's nightshade (Circaea lutetiana), bloodroot (Sanguinaria canadensis.), and several species of ferns including sensitive and maidenhair fern (Adiantum ~~pedatum~~). Unfortunately, buckthorn has invaded this community and will likely become dominant in the future.

> ***The Dodge Nature Center became the owners of this property in 2013 and has already begun a buckthorn management program.***

A wetland is located west of this mature oak forest. The majority of this wetland consists of a deep, open water marsh. Along the edges of the wetland, species such as sedge, cattail, rice cutgrass *(Leersia oryzoides)*, river bulrush *(Scirpus fluviatilis)*, and blue flag iris *(Iris versicolor),* dominate. Within shallow areas along the wetland edge, there are numerous mudflats containing plantain, cow parsnip *(Heracleum lanatum)*, broad-leaved arrowhead *(Sagittaria latifolia)*, and marsh fern *(Thelypteris palustris)*. These same species, along with cattail, are also present on several floating bog mats. Submergent plants and floating leaf species such as yellow water lily *(Nuphar lutea)* and duckweed *(Lemna minor)* are present in many open water areas of the wetland. Invasion by reed canary grass *(Phalaris arundinacea)* and buckthorn has occurred along much of the wetland margin. However, these species have not moved much beyond the wetland edges.

Just west of this large wetland is a small, shallow, open water/emergent marsh, containing many of the same species found in the large wetland. Some of the common species include lake sedge *(Carex lacustris),* blue flag iris, plantain *(Alisma subcordatum),* and broadleaf arrowhead. At the time of the original survey, this wetland contained only a small pool of water in its center. Buckthorn has encroached into the wetland margin.

A degraded wet meadow dominated by reed canary grass is located east of the large wetland. This area appears to have been farmed at one time.

The rest of Neighborhood 1 (north) consists of farm/agriculture land except for two small areas on the north side of Military Road. One area is a conifer plantation dominated by scotch pine *(Pinus sylvestris)* with boxelder *(Acer negundo)* and trembling aspen mixed along the plantation edges. West of this conifer plantation is an old field dominated by introduced grasses such as smooth brome *(Bromus ciliatus),* bristly foxtail *(Setaria spp.)*, and kentucky bluegrass *(Poa pratensis)*.

A wetland is located west of this mature oak forest. The majority of this wetland consists of a deep, open water marsh. Along the edges of the wetland, species such as sedge, cattail, rice cutgrass (Leersia oryzoides), river bulrush (Schoenoplectus fluviatilis), and blue flag iris (Iris versicolor), dominate. Within shallow areas along the wetland edge, there are numerous mudflats containing plantain, cow parsnip (Heracleum lanatum), broad-leaved arrowhead (Sagittaria latifolia), and marsh fern (Thelypteris palustris). These same species, along with cattail, are also present on several floating bog mats. Submergent plants and floating leaf species such as yellow water lily (Nuphar lutea) and duckweed (Lemna minor) are present in many open water areas of the wetland. Invasion by reed canary grass (Phalaris arundinacea) and buckthorn has occurred along much of the wetland margin. However, these species have not moved much beyond the wetland edges. Just west of this large wetland is a small, shallow, open water/emergent marsh, containing many of the same species found in the large wetland. Some of the common species include lake sedge (Carex lacustris), blue flag iris, plantain (Plantago major), and broadleaf arrowhead. At the time of the original survey, this wetland contained only a small pool of water in its center. Buckthorn has encroached into the wetland margin.

A degraded wet meadow dominated by reed canary grass is located east of the large wetland. This area appears to have been farmed at one time. The rest of Neighborhood 1 (north) consists of farm/agriculture land except for two small areas on the north side of Military Road. One area is a conifer plantation dominated by scotch pine (Pinus sylvestris) with boxelder (Acer negundo) and trembling aspen mixed along the plantation edges. West of this conifer plantation is an old field dominated by introduced grasses such as smooth brome (Bromus ciliatus), bristly foxtail (Setaria spp.), and Kentucky bluegrass (Poa pratensis).

The residential development that occurred in Neighborhood 1 did not impact the Dodge Nature Center Property which is protected by a land conservation easement or any of the identified wetlands. In 2013, the Minnesota List of Endangered, Threatened and Special Concern Species was amended to include butternut (Juglans cinerea)

11.a.1.4.2 Neighborhood 1 (South) Natural Communities

Neighborhood 1 (South) is located north of Highway 61 and west of County State Aid Highway (CSAH) 19. This area contains low to moderate quality, dry, sand gravel prairie and some old fields now grown over with trees, shrubs, and grasses. Wildlife values for this area were rated as low due to the lack of natural community diversity and poor connectivity to other natural areas.

The few communities that exist in this area are all located near the intersection of Highway 61 and CSAH 19A. One community is an old field dominated by introduced graminoids (grasses) and weedy forbs. Common graminoids include smooth brome and Kentucky bluegrass. Common forbes include common milkweed *(Asclepias L.)*, daisy fleabane *(Erigeron strigosus)*, spotted knapweed *(Centaurea maculosa)*, and goatsbeard *(Tragopogon pratensis)*. This field was probably cultivated in the recent past.

East of the old field is a young mixed hardwood forest dominated by boxelder, green ash *(Fraximus pennsylvanica),* and Chinese elm *(Ulmus parvifolia).* Both the shrub and ground cover layer contain mostly exotic and/or weedy shrubs and herbaceous plants. The shrub layer is dominated by buckthorn, the ground layer by wood nettle *(Laportea Canadensis)* and Virginian stickseed *(Lappula redowskii)*.

East of the drive in movie theatre is a dry prairie occurring on a very doughty site with numerous areas of exposed fine sand. In general, Kentucky bluegrass and smooth brome dominate this site. Where the site contains exposed sand, small patches of little bluestem *(Andropogon scoparius)* along with a fair diversity of dry prairie forbs occur. Some of the more common forbs include whorled milkweed, daisy fleabane, common milkweed, flowering spurge *(Euphorbia corollata)*, sulfer cinquefoil *(Potentilla recta),* and thimbleweed *(Anemone patens)*.

A poor quality dry prairie almost completely overgrown by woody vegetation and leafy spurge is located east of the dry prairie.

A mixed hardwood forest that contains mostly non-native and/or weedy tree species and shrub and ground cover species is located south of the drive-in movie theater.

The rest of the Neighborhood 1 (south) consists of farm/agriculture land.

The 23.5-acre Walmart development is located in the Cottage View area west of the former drive-in theatre site. As a component of that project, there was tree removal and grading of the Walmart site and the western half of the former drive-in site now referenced as the Apache Parcel. A tree inventory and mitigation plan were completed in accordance with the City's Tree Preservation Ordinance for this project. The City Forester reviewed the plan for accuracy and conformance. Tree mitigation fee of $148,000 was required as per the ordinance and collected with the building permit for Walmart. This fee was placed in the City's Public Landscaping Initiative Fund, which is designated for landscape improvements in major transportation corridors, trailway corridors, and park and open space areas. The balance of the former drive-in site has been continuously graded under the guidance of an Interim Conditional Use Permit as the property owner prepares the site for a more suitable development topography.

11.a.1.4.3 Neighborhood 2 Natural Communities

Neighborhood 2 is located north of Highway 61 and east of CSAH 19. As a whole the natural resources in the area consists mainly of dry oak forest, mesic oak forests, and conifer plantations. Historic items such as the historic Dr. William Furber House and St. Mathew's Church Cemetery are located in this area. The house is valued for its eclectic period architecture and the cemetery is important for its artistic tombstones in association with Cottage Grove's 19th Century German immigrants.

The northern area of Neighborhood 2 consists of woodland-brushland, dry oak savanna, mesic oak forest, basswood forest, and maple forest. In addition, this area also contains a small lake and a wetland. The diversity of different natural communities is high.

Oak forests along with a variety of other community types including conifer plantation and lowland hardwood forest dominate the central area of Neighborhood 2.

The southern area of Neighborhood 2 consists mainly of mesic and dry oak forests. This area also includes several small dry, sand gravel prairies, a wet meadow/fen wetland, and a number of conifer plantations.

The only development activity that occurred in Neighborhood 2 was the construction of the Washington County South Service Center and the Cottage Grove City Hall/Public Safety facility, and the realignment of 70th Street (CSAH 20) which Washington County is in the process of completing. This realignment project only impacted the built environment along the corridor and active agricultural fields. The government campus projects contain rain gardens, native plantings, prairie, and Oak Savannah restorations. The end of 2019 brought the completion of the HERO Center, which is a public safety training facility located on 85th Street in the northern portion of the civic campus identified in the East Ravine Planning Area.

11.a.1.5 Grassland/Shrubland and Lawn/Landscaping

The City of Cottage Grove, MLCCS, MCBS, Metropolitan Council, and MnDNR information was used to classify and map grassland/shrubland and lawn/landscaping areas. Grassland/shrubland and lawn/landscaping comprise approximately 13 percent of the total project area, accounting for 513 acres. Grassland/shrubland ***and lawns/landscaping*** within the project area are depicted in ***Figures 10.3A and 10.3B, respectively***. Similar to agricultural/open lands, the grassland/shrubland and lawn/landscaping areas provide habitat to numerous wildlife species described above.

No areas of grassland/shrubland were disturbed beyond the areas identified as development area within the original approved East Ravine Master Plan. Areas developed as residential will have lawn and landscaping areas established as they develop. In addition to front boulevard trees and corner trees, the City requires two deciduous trees, two coniferous trees, and ten shrubs to be planted at every home constructed on a lot in the East Ravine Planning Area as well as citywide.

11.a.1.6 Agricultural/Other Transitional Land

The City of Cottage Grove, MLCCS, MCBS, Metropolitan Council, and MnDNR information was used to classify and map woodland areas. Agricultural/other transitional land comprises the largest portion of the entire project area, accounting for 2,076 acres, approximately 52 percent of the project area. The agricultural/other transitional is defined as agricultural land, undeveloped land, and land that was not classified during the biological inventory of the area and is not differentiated from cropland. Some overlapping of other land types already described are included in this area.

The agricultural/other transitional areas provide nesting habitat, cover, and food for wildlife. There are numerous small and medium sized mammals that utilize these lands including white-tailed deer, raccoons, red and gray fox, woodchuck, squirrel, and other small mammals. Song and game birds may also be present throughout the project area and include a variety of edge, open, and woodland species.

No areas of Agricultural or Transitional lands were disturbed beyond the areas identified as development areas within the original approved East Ravine Master Plan.

11.a.1.7 Impervious Surfaces

The City of Cottage Grove, MLCCS, MCBS, Metropolitan Council, and MnDNR information was used to classify and map impervious surface areas. Impervious surface areas comprise approximately 220 acres of the project area, primarily roadways, parking areas, and buildings associated with development.

~~*The statements in this section remain unchanged.*~~

For residential developments in the East Ravine, it is estimated that 33 percent of developed areas are impervious surfaces. The surface water management plan for each project specifies a tailored strategy for the capture and treatment of surface water impacted by housing construction and associated impervious land cover.

11.a.1.8 Proposed Development

The proposed development pattern seeks to preserve a significant portion of the project area as park or open space area. Approximately 1,580 acres or just over 41% of the project area is in some form of green space as itemized in Table 11.1.

The ~~four~~ 21 approved subdivisions that have occurred since 2006 are consistent with the East Ravine Master Plan. In addition, the City worked with Washington County in the expansion of the Ravine Regional Park along Kimbro Avenue. The acquisition financing of the new parkland was a component of the negotiated agreement relating to the offset of regional parkland utilized for the Civic Campus. Consistent with the modifications in land use and land cover through development, the preservation of open space within the East Ravine is not actively quantified due to a lack of purpose as development occurs within the scope of approved land use plans within the planning district.

Table 11.1 - Open Space/Green Land Uses in the Development Scenario

Open Space/Green Land Use	Acres
Civic Campus	49
Community Park	207
Existing Conservation Easement	164
Water/Ponds	194
Neighborhood Park	51
Proposed Conservation Easement	356
Regional Green Corridors	136
Regional Park	427
Total	1,584

The park and open space development that has occurred to date is in significant conformance with the green space identified in Table 11.1 and the correlating areas found on the 2030 and 2040 Land Use Plans, the future park and open space plan, and Figure 6.1 of this document. The statements in this section remain unchanged.

11.a.1.9 Potential Habitat Impacts

The conversion of open land, agricultural land, woodland, grassland, shrub land, and wetlands to urban types of development will disturb the habitat and feeding areas and affect current wildlife species. Increased runoff volumes during construction and from developed areas will drain to wetlands and creeks in the area (see the response to Questions 16 and 17). Presently, development and infrastructure design plans are largely unknown for properties within the project area. Due to the unknown nature of future development within the project area, the extent of impacts on wildlife and natural resources is not fully known. Alternative site design to help to maintain areas for natural habitat are supported by the subdivision design policies as identified in the City of Cottage Grove's existing plans and ordinances help to maintain areas for natural habitat.

The statements in this section remain unchanged.
The statements in this section remain unchanged.

11.b.1 Natural Heritage Program

~~The MnDNR NHP, data was obtained from the MnDNR and is included in Figure Natural Resources. In addition, the City of Cottage Grove also purchased the electronic database containing NHP data from the MnDNR to review for the AUAR.~~

~~There is one natural heritage recorded wildlife species and one recorded plant species that occur within the project area, the Blanding's turtle (state listed threatened) and Kitten-tails (state listed threatened). There are no state listed endangered species recorded for the project area.~~

~~In addition, the MnDNR NHP database has two recorded natural communities that occur within the project area, the Dry Prairie (Southeast) Sand-Gravel Subtype and the Mixed Emergent Marsh (Prairie). These natural communities are recorded in the NHP database because they are uncommon but are not protected by State or Federal laws.~~

The natural communities and the species referenced in this section were not impacted by the development that occurred since the adoption of the AUAR.

Minnesota Department of Natural Resources (DNR) Division of Ecological & Water Resources reviewed data contained in the Natural Heritage Information System (NHIS; ERDB 20210043). The review identified ecologically significant areas, providing recommendations to avoid or minimize impacts to the areas of concern. The review also identified state and federally listed species and specified measures that must be taken prior to and during construction. These comments are summarized in the paragraphs below, included in full in Appendix 13 and supplemented by Figure 10.1, depicting future land use and areas of concern.

Threatened & Endangered Species

Rusty Patched Bumble Bee (Bombus affinis)

The rusty patched bumble bee (RPBB) is a federally listed endangered species. The U.S. Fish & Wildlife Service (FWS) maps the RPBB as having low potential to occur within the project area. The DNR's NHIS indicates the RPBB was historically present within the township. Most development related to the AUAR would convert agricultural areas, which historically degraded RPBB habitat. In existing agricultural areas, future land conversion may provide cultural vegetation for RPBB foraging.

Limited conversion of woodland may take place northwest of 70th Street and Jamaica Avenue (see. 11.a.1.4.1). This woodland likely represents suitable habitat (e.g. wintering and spring foraging) within the AUAR study area. Given the FWS probability mapping, a non-federal project does not require consultation pursuant to federal regulations. If development becomes federalized, then consultation may be needed. In absence of a federal trigger, the City may, at its discretion and after publication of revised Voluntary Guidance for Incidental Take Permits of the RPBB, enter into voluntary consultation.

Loggerhead Shrike (Lanius ludovicianus)

Loggerhead shrike is a state-listed endangered species known to occur near the AUAR study area. This species may occur in a variety of natural and cultural settings. The DNR advises avoiding clearing trees and shrubs from April through July. If clearing takes place within that window, the DNR may require a nest survey prior to construction.

Kitten-tails (Besseya bullii)

Kitten-tails is a state-listed endangered species documented within areas designated for future park/open space which will not be converted. Small portions of suitable habitat within Sections 11 and 22 of the AUAR study area (e.g. savanna, prairie, and woodland) may be converted. If future improvements propose to convert this land, then additional coordination will take

Blanding's Turtle (Emydoidea blandingii)

Blanding's turtle is a state-listed threatened species documented within the AUAR study area. DNR requires avoidance measures contained in full within Appendix 13, and summarized below:

- ***Avoid certain wetland and stream impacts between October 15 and April 15***
- ***Provide Blanding's turtle information flyer to all contractors***
- ***Erosion control blankets shall only consist of bio-netting or natural netting, and not plastic-containing products***
- ***Avoid mulch and revegetation products augmented with synthetics***
- ***Monitor for turtles during construction and report sightings to DNR***
- ***Move any turtles from harm's way by hand and otherwise do not disturb individuals***

Species of Concern

Lark sparrow (Chondestes grammacus) and Bell's vireo (Vireo bellii) are state-listed species of concern. These species are not afforded formal protection under the law; however, the City understands the avoidance measures recommended for Loggerhead shrike to limit potential incidental disturbance to these species.

Ecological Areas

Multiple native vegetation communities and areas with biodiversity significance rated as moderate significance or below significance are present within the AUAR study area. The area of biodiversity significance and native habitat community located northwest of 70th Street and Jamaica Avenue (see 11.a.1.4.1) may be converted in part by the development scenario. The Local Government Unit considering wetland impacts, if applicable, may need to consider the status of these lands in deciding whether a project subject to the Wetlands Conservation Act will permanently adversely affect a rare natural community, and, therefore if a wetland impacts must not be permitted.

11.b.1.1 Blanding's Turtle

The Blanding's turtle *(Emydoidea blandingii)* is a state-listed threatened species associated with sandy soils and a variety of wetland types. A species is ranked as threatened, if the species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Threatened species are protected under the Federal Endangered Species Preservation Act of 1973, as amended in 1978, 1982, and 1988; Minnesota Statutes Chapter 84.0895; Minnesota Rules Chapter 6134.

The preferred habitat of the Blanding's turtle includes calm, shallow water, rich, aquatic vegetation and sand uplands for nesting. Studies by Congdon *et.al.* (1983) in Michigan and by Linck in Massachusetts have shown that nesting females may travel considerable distances (200 to 400 meters) to a nesting area, passing enroute what appears to be suitable nesting habitat immediately adjacent to the marsh in which they reside (Coffin and Pfannmuller 1988).

Blanding's turtles need both wetland and upland habitats to complete their life cycle. The loss of wetland habitat through drainage or flooding to convert wetlands into ponds or lakes, loss of upland habitat through development or conversion to agriculture, human disturbance (including collection for pet trade, road kills during seasonal movements), and increases in predator populations (skunks, raccoons, etc.) that prey on nests and young all contribute to a decline in this species.

In long-lived species, protecting the adults is critical to any conservation strategy. A female turtle may produce as many as 500 eggs during her life. Losing many of these long-lived females, through habitat loss or direct mortality, would seriously jeopardize the ability of a population to maintain itself. One of the potential threats is mortality while crossing roadways. Roadway design and large culverts or tunnels may provide an alternative route for turtles, but requires further evaluation to refine design and effectiveness (Lang 2000).

The species referenced in this section were not reported to have been impacted or potentially impacted by the development that occurred since the adoption of the AUAR.

The statements in this section remain unchanged.

11.b.1.2 Kitten-Tails

The Kitten-tail (*Besseya bullii*) is a state-listed threatened plant species. A species is ranked as threatened, if the species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range. Threatened species are protected under the Federal Endangered Species Preservation Act of 1973, as amended in 1978, 1982, and 1988; Minnesota Statutes Chapter 84.0895; Minnesota Rules Chapter 6134.

The Minnesota Kitten-tail populations are largely restricted to the bluffs and terraces of the St. Croix, Mississippi, and Minnesota River valleys, specifically where the three rivers converge in the Twin Cities area. The plants prefer gravelly soil in dry prairies, savannas, and open woods (Coffin and Pfannmuller 1988).

The Kitten-tail is quite distinctive and bears no close resemblance to any other species encountered in Minnesota. It is characterized by a dense spike of sessile, yellowish flowers, each with two long exerted stamens. The basal leaves are

large and heavily veined. The stem leaves are small and alternate and partially clasp the stem. The plants flower early in the spring, but the spike and the basal leaves remain visible throughout most of the summer (Coffin and Pfannmuller 1988).

The kitten-tails that were identified within the East Ravine development area were located within the borders of the Cottage Grove Regional Park, so no negative impact occurred as a result of the development that occurred within the planning area.

The statements in this section remain unchanged.

11.b.1.3 Other Information

U.S. Fish and Wildlife Service (USFWS) resources indicate that the bald eagle *(Haliaeetus Leucocephalus)*, Leedy's roseroot *(Sedum integrifolim spp. Leedyi)*, and prairie bush clover *(Lespedeza leptostachya)* are listed as federally threatened in Minnesota and documented to occur in Washington County. However, there are no records indicating that these species occur within the project area. Given the location and type of activity proposed, the USFWS determined that the project is not likely to adversely affect any federally listed or proposed federally threatened or endangered species or adversely modify their critical habitat. This precludes the need for further action on this project as required under Section 7 of the Endangered Species Act of 1973.

The statements in this section remain unchanged.

The statements in this section remain unchanged.

12. PHYSICAL IMPACTS ON WATER RESOURCES

There will be no physical impacts on water resources within the project area. ***Section 2 of the Surface Water Management Plan (SWMP) describes the water resources within the City, discussing the watersheds, land uses, groundwater, and key water resources.***

13. WATER USE

Based on information obtained from existing water supply studies and consultation with City engineering consultants at Bonestroo Rosene Anderlik and Associates ***(now Stantec),*** the existing water supply and treatment for the East Ravine area will be provided off site. In addition, the existing well field is felt to be adequate for the needs that will be generated by the development scenario envisioned for the East Ravine area. The proposed East Ravine plan would increase the water demand by approximately 13.0 Million Gallons per Day. Appendix 1 contains a technical memorandum titled *Cottage Grove East Ravine Planning Study: Watermain* prepared by Howard R. Green Company in February of 2005. This memo provides the methodology and details concerning impacts on future water usage for the project area. Figures illustrating the water systems are included in Appendix 1.

Contact inquiries in relation to this study are to be directed to Stantec.

The City's Water Supply and Distribution Plan was subsequently updated in 2006 and includes proposed trunk watermain improvements within the East Ravine. This plan continues to be used as a guide for new development and is included in Appendix 1A. Figures illustrating the water systems are also included in Appendix 1A.

14. WATER-RELATED LAND USE MANAGEMENT DISTRICTS

There are no water related land use management districts that are impacted by the project. ***The Surface Water Management Plan (SWMP) has been included as Appendix 5A and describes land and water resources for the City of Cottage Grove, including wetlands and districts within the East Ravine area.***

~~*The statements in this section remain unchanged.*~~

15. WATER SURFACE USE

There are no recreational water bodies in the project area. ***Section 2.5 of the Surface Water Management Plan (SWMP) describes the key water resources within the City including the wetlands, lakes, draws, ravines, streams, and the Mississippi River, and is included as Appendix 5A.***

~~*The statements in this section remain unchanged.*~~

16. EROSION AND SEDIMENTATION

Normal grading practices associated with urban development will be associated with future development in the Cottage Grove East Ravine. Certain areas where topographic relief is dramatic have been placed in an open space or green land use pattern to minimize potential for erosion and sedimentation problems. Best management practices will be applied to all construction projects in the area to prevent erosion and sedimentation during construction projects. ***Section 7.2.1 of the Surface Water Management Plan (SWMP) describes the City's erosion and sediment control responsibilities as required by the NPDES MS4 Permit.***

~~*The statements in this section remain unchanged.*~~

17. WATER QUALITY-STORMWATER RUNOFF

Stormwater management was studied at depth for the Cottage Grove East Ravine project. A detailed analysis of stormwater issues and plans is provided as Appendix 5 to this AUAR. The report analyzes existing stormwater systems and drainage patterns as well as site characteristics that would promote environmentally friendly storm water management practices. Figure 17.1 illustrates the existing storm water management system which uses a series of existing small swales and depressions. The area is favorable to infiltration due to the sandy soils and significant depth to groundwater or bedrock.

The stormwater management goal for this project is to utilize the natural drainage and infiltration capabilities of the existing land. Stormwater management areas along planned parkways (as illustrated in Figures 6.1 and 17.2 will be utilized to collect, infiltrate and direct overflow of runoff from adjacent neighborhoods. Overflow from the parkway stormwater basins will be directed to larger natural infiltration basins which have the capacity to infiltrate all the runoff from a 100-year storm event. Emergency overflow from the larger infiltration basins for events greater in intensity than a 100-year event could be provided either through the existing Cottage Grove drainage system and/or through the future regional stormwater conveyance system being planned by the South Washington Watershed District. The future stormwater management system is illustrated in ~~***Figure 17.2***~~ ***Appendix 5A, "Regional Surface Water Drainage" figure.***

The statements in this section remain unchanged.

Updated storm water system information is provided in Appendix 5A, 2019 Surface Water Management Plan (SWMP). The "Regional Surface Water Drainage" figure within the 2019 SWMP depicts both the existing and future stormwater management systems.

18. WATER QUALITY-WASTEWATER

A detailed analysis of sanitary sewer infrastructure systems and wastewater generation was conducted for this project. The analysis is included as Appendix 2, a Technical Memorandum from Howard R. Green Company titled Cottage Grove East Ravine Planning Study: Sanitary Sewer dated February of 2005.

The City of Cottage Grove has a Comprehensive Sewer Policy Plan that was completed in May of 1992 ***(1996 Cost and Rate Update)*** by Bonestroo, Rosene, Anderlik & Associates ***(now Stantec).*** The purpose of the Comprehensive Sewer Policy Plan was to provide the City with an inventory of existing facilities and a guide for the expansion of Cottage Grove's trunk sanitary sewer system to serve its saturation population. The report served as the sewer element of the public facilities plan for the Metropolitan Council and the Comprehensive Sewer Policy Plan (CSPP) for the Metropolitan Waste Control Commission (MWCC). The City's 2000 Comprehensive Plan Update included an updated inventory of the sanitary sewer systems and projections for wastewater flows based on the updated future land use plan. This update provided the data to assist the Metropolitan Council Environmental Services (MCES) in planning for the now constructed Eagles Point Plant and the South Washington County Interceptor Sewer which will provide trunk sanitary sewer facilities to the East Ravine area. This background data served as a starting point for the East Ravine sanitary sewer analysis.

There are eight major sanitary sewer districts in the city of Cottage Grove, each defining the limits of service for a separate trunk system. The East Ravine is in the Cottage Grove Ravine District (6,993 acres). This area is served by the South Washington County Interceptor which will service the eastern 35% of Cottage Grove, the Central and Cottage Grove Districts in Woodbury, and possibly other communities to the north in Washington County.

The treatment and disposal of wastewater occurs at the Cottage Grove Treatment Plant which is under the jurisdiction of the MCES.

This preliminary sanitary sewer design for the East Ravine area (as detailed in Appendix 2) was accomplished in accordance with Metropolitan Council Environmental Service (MCES) and Ten State Standards guidelines. Construction plans for South Washington County Gravity Interceptor Phase 1 and South Washington County Gravity Interceptor Phase 2 were used to determine the existing location of the trunk interceptor running along Keats Avenue (CSAH 19). Existing sanitary stubs as indicated on the interceptor plans were utilized where possible. However, In order to provide an efficient design some new connections to the interceptor are included in this preliminary plan. The study area is primarily divided into two sections, Neighborhood ***1*** ~~***One***~~ located west of Keats Avenue and Neighborhood ***2*** ~~***Two***~~ located east of Keats Avenue. Design characteristics for each neighborhood are presented within Appendix 2.

Table 7-6 in Appendix 2B shows design flows for the ultimate system for sewer districts west of the MCES line. Looking at the flows coming through and from the East Ravine area, Table 18.1 shows design flows based on the 2040 land uses for everything within the Cottage Grove Ravine Sewer District that flows into the MCES line. This includes flows that originate outside of the East Ravine Area. Figure 18.2 displays the East Ravine boundary, sewer districts, and nodes.

Table 18.1 - ~~*Summary of Current and Future Residential Waste Generation*~~ *Design Flows (MGD) for 2040 Land Use*

~~*The statements in this section remain unchanged.*~~

The City's 2040 Comprehensive Plan included an updated inventory of the sanitary sewer systems and projections for wastewater flows based on the updated future land use plan and the South Washington Interceptor (the South Washington Interceptor was not yet constructed when the original AUAR was prepared). This document is included in Appendix 2A.

East Ravine Design Flows (MGD) for 2040 Land Use						
From Node	To Node	Add Subdistricts[1]	Average Flow (MGD)	Total Ave Flow (MGD)	Peak Flow Factor (PFF)	Design Flow (MGD)
	MH #50	CGR-3 (A)	0.001	0.001	4.0	0.00
48	49	CGR-1	0.113	0.113	4.0	0.45
49	50	CGR-2	0.118	0.232	3.8	0.88
50	MCES #1	CGR-3 (1)	0.096	0.328	3.6	1.18
		CGR-12 (3)	0.009	0.009	4.0	0.04
	MH #26	CGR-12 (1)	0.057	0.066	4.0	0.26
51	MCES #3	CGR-15 (1)	0.333	0.333	3.6	1.20
K	MH #45	CGR-4B	0.243	0.243	3.7	0.90
L	M	CGR-8	0.120	0.120	3.9	0.47
M	MH #40	CGR-7	0.340	0.460	3.5	1.61
A	B	CGR-4C	0.001	0.001	4.0	0.01
B	C	CGR-6	0.000	0.002	4.0	0.01
C	F			0.002	4.0	0.01
D	E	CGR-11	0.000	0.000	4.0	0.00
E	F	CGR-9	0.003	0.003	4.0	0.01
F	G			0.005	4.0	0.02
H	I	CGR-14	0.000	0.000	4.0	0.00
I	J	CGR-13	0.000	0.000	4.0	0.00
J	G	CGR-12 (B)	0.000	0.000	4.0	0.00
G	MCES #2	CGR-10	0.000	0.005	4.0	0.02
	MCES #2	CGR-10 (3)	0.018	0.018	4.0	0.07
	MH #30	CGR-12 (2)	0.006	0.006	4.0	0.02
N	O	CGR-16	0.000	0.000	4.0	0.00
O	S	CGR-19	0.000	0.000	4.0	0.00
P	R	CGR-15 (2)	0.000	0.000	4.0	0.00
Q	R	CGR-17	0.000	0.000	4.0	0.00
R	S	CGR-18	0.000	0.001	4.0	0.00
S	T			0.001	4.0	0.00
T	W	CGR-20	0.001	0.002	4.0	0.01
U	V	SE-3	0.000	0.000	4.0	0.00
V	LS-1	SE-2	0.000	0.000	4.0	0.00
	LS-1	SE-6	0.030	0.030	4.0	0.12
LS-1	W	SE-5	0.068	0.098	4.0	0.39
	W	SE-4	0.221	0.221	3.8	0.84
W	LS-2	SE-1	0.000	0.321	3.6	1.15
	LS-2	CGR-21	0.689	0.689	3.3	2.27
LS-2	51			1.010	3.1	3.13
51	MCES #3	CGR-15 (1)	0.333	1.343	3.0	4.03
					Total Design Flow:	8.11

NOTE:

1. Sewer Districts were split according to flow areas and neighborhoods. (#) represents areas that were split between neighborhoods and/or the East Ravine boundary. (1) represents areas within Neighborhood 1. (2) represents areas within Neighborhood 2. (3) represents areas outside of the East Ravine boundary. (A) and (B) represent areas that had different flow areas and therefore the district was split for which direction flows went. These divisions are shown on Figure 18.2.

Neighborhood 1 Sub Areas		Design Flow Rate (MGD)
	A	1.16
	B	0.02
	C	0.06
	D	0.3
	E	0
	F	0.03
	G	0.49
	H	0.17
Subtotal Neighborhood 1		2.23
Neighborhood 2 Sub Areas		
	I	0.2
	J	2.12
	K	0.67
	L	0.02
Subtotal Neighborhood 2		3.01
Total East Ravine Flows		5.24

Future domestic wastewater flows were estimated for the East Ravine area based on a series of sub areas established for Neighborhoods 1 and 2. ~~The flows were based on the projected land uses as described in question 6 and illustrated in Figure 6.1. Table 18.1 provides a summary of flows by each sub area. A map of the identified sub-areas and other figures are included within Appendix 2.~~ ***Table 18.2 displays the land uses within the East Ravine area based on acreage, for sewer districts only within the boundary, as displayed in Figure 18.1. Table 18.3 shows flow rates based on land use that are used to estimate flows. These rates are applied to the acreage of each district to calculate average flows per land use by district, as displayed in Table 18.4. These average flows are then multiplied by a Met Council Peak Flow Factor to determine the design flow per district. These design flows, specifically within the East Ravine Area, are shown in Table 18.5, separated by neighborhood.***

Table 18.2 – East Ravine Area Future Land Use by District

East Ravine Area Land Use														
		UNDEVELOPABLE/UNSEWERED				PLATTED/PLANNED			EXISTING AND FUTURE					
DISTRICT NUMBER	TOTAL ACREAGE	Wetland / Undevelopable	Parks / Open Space	Rural Estate	Major ROW & River	Low Density Residential	Medium Density Residential	High Density Residential	Industrial	Institution	Mixed Use/Village Center	Urban Reserve	Commercial	Golf
		(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)	(Acres)
CGR-1	224.02	32.02	57.10	0.00	0.00	134.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CGR-2	368.29	89.98	72.67	0.00	0.00	184.94	0.00	0.00	0.00	10.71	9.99	0.00	0.00	0.00
CGR-3	284.17	23.21	87.78	0.00	0.18	125.11	47.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CGR-4	551.29	71.13	125.35	170.60	15.57	65.48	68.82	19.65	0.00	0.00	14.70	0.00	0.00	0.00
CGR-6	376.44	20.77	0.73	354.31	0.37	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00
CGR-7	270.45	3.22	7.83	0.00	27.96	95.27	43.51	50.06	0.00	0.27	42.33	0.00	0.00	0.00
CGR-8	388.96	109.15	72.70	38.86	26.18	137.15	0.00	0.37	0.00	2.00	0.00	0.00	2.53	0.00
CGR-9	445.57	0.23	24.41	404.65	13.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.31	0.00
CGR-10	354.08	14.10	72.36	18.24	10.81	204.32	26.05	0.00	0.00	8.20	0.00	0.00	0.00	0.00
CGR-11	479.19	1.40	0.00	476.48	1.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CGR-12	267.77	36.31	104.56	18.04	12.51	64.79	0.40	0.14	0.00	31.02	0.00	0.00	0.00	0.00
CGR-15	454.94	70.81	128.05	47.33	14.57	22.25	23.11	56.44	0.00	0.00	57.87	0.00	34.51	0.00
CGR-17	255.65	114.23	86.04	41.67	13.45	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00
CGR-20	154.90	33.83	54.28	59.20	6.65	0.00	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00

Table 18.3 – Flow Rates

Land Use	Rate (Gal/Ac/Day)
Low Density Residential	840
Medium Density Residential	1750
High Density Residential	2400
Commercial	1500
Industrial	1500
Institutional	250
Mixed Use/Village Center	1500
Urban Reserve	630

Table 18.4 – East Ravine Area Average Flows

DISTRICT NUMBER	PLATTED/PLANNED			EXISTING AND FUTURE					TOTAL
	Low Density Residential	Medium Density Residential	High Density Residential	Industrial	Institutional	Mixed Use	Urban Reserve	Commercial	
	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)
CGR-1	0.113	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.113
CGR-2	0.101	0.000	0.000	0.000	0.003	0.015	0.000	0.000	0.118
CGR-3	0.014	0.084	0.000	0.000	0.000	0.000	0.000	0.000	0.097
CGR-4	0.055	0.120	0.047	0.000	0.000	0.022	0.000	0.000	0.245
CGR-6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CGR-7	0.080	0.076	0.120	0.000	0.000	0.063	0.000	0.000	0.340
CGR-8	0.115	0.000	0.001	0.000	0.001	0.000	0.000	0.004	0.120
CGR-9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.003
CGR-10	0.156	0.046	0.000	0.000	0.000	0.000	0.000	0.000	0.201
CGR-11	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CGR-12	0.054	0.001	0.000	0.000	0.008	0.000	0.000	0.000	0.063
CGR-15	0.019	0.040	0.135	0.000	0.000	0.087	0.000	0.052	0.333
CGR-17	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CGR-20	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.001

Table 18.5 – East Ravine Area Design Flows

	East Ravine Area Design Flow			
	Districts	Average Flow (MGD)	PFF	Design Flow (MGD)
Neighborhood 1	CGR-1	0.113	4.0	0.453
	CGR-2	0.118	4.0	0.473
	CGR-3	0.097	4.0	0.390
	CGR-12[1]	0.057	4.0	0.228
	CGR-15[1]	0.333	3.6	1.199
	Sub-Total Neighborhood 1			**2.743**
Neighborhood 2	CGR-4[2]	0.245	3.7	0.905
	CGR-6[2]	0.000	4.0	0.000
	CGR-7	0.340	3.6	1.224
	CGR-8	0.120	3.9	0.470
	CGR-9[2]	0.003	4.0	0.014
	CGR-10[2]	0.201	3.8	0.764
	CGR-11[2]	0.000	4.0	0.000
	CGR-12[1,2]	0.006	4.0	0.025
	Sub-Total Neighborhood 2			**3.402**
	Total East Ravine Flows			**6.145**

NOTES:

1. Districts CGR-12 and CGR-15 are divided between Neighborhood 1 and 2. Land use areas and flow rates were divided by acreage within each neighborhood.
2. Average Flow does not account for flows outside of East Ravine Boundary.
3. Sewer Districts CGR-15, CGR-17 and CGR-20 are within the East Ravine Boundary, Neighborhood 2 but the flows flow outside of the boundary and therefore are not included in this table.

Based on the design flow calculations shown in Table 18.1 and Table 7-6 (in Appendix 2), the connections to the MCES system were evaluated for any future upgrades to the City or MCES collection system for the development of the East Ravine area. Based on the record plans from the MCES Interceptor project that was completed in 2002, the capacities of each pipe segment connecting the City's system to the MCES system was evaluated. By comparing the capacities with the information in Table 18.5 and Table 7-6, and as shown in Table 18.6, the development of the East Ravine area does not require any upgrades to the existing MCES system. The City's sewer system in the East Ravine area will be analyzed per the capacities and built as development occurs.

Table 18.6 – Capacity of MCES Connections

Subdistricts	MCES Connection	Size	Slope	Capacity	Design Flow
		(in)	(%)	(MGD)	(MGD)
CGR-1, 2, 3 (1)	#1	18	0.17	3.31	1.18
CGR-3 (A)	#50	18	0.15	3.11	0.00
CGR-4B	#45	10	0.34	0.98	0.90
CGR-7, 8	#40	16	0.18	2.48	1.61
CGR-4C, 6, 9, 10, 11, 12 (B), 13, 14	#2	30	0.06	7.67	0.02
CGR-12 (2)	#30	12	0.24	1.33	0.02
CGR-12 (1), 12 (3)	#26	12	0.25	1.36	0.23
CGR-15 (1), 15 (2), 16 thru 21 & SE-1, thru 6	#3	30	0.08	8.86	4.03
WD-1 thru 14 & C-1 thru 7 & ED-1 thru 6 & TG-1 thru 10 & L-1, 2	#4	27*	0.19	10.31	10.19

*This segment of pipe is a 30" RCP lined with a 27" PVC liner.

No new on-site systems are proposed to serve the East Ravine area.

The information in this table remains unchanged.

19. GEOLOGIC HAZARDS AND SOIL CONDITIONS

Most of the project area is located in a groundwater recharge area due to the predominantly sandy soils, underlain by gravel and rock, which allows rapid percolation of water into the aquifer. Groundwater depth ranges from a shallow of 40 feet to upwards of 300 feet in places. The Prairie du Chien aquifer is located close to the surface and is accessed by a limited number of rural homes for private well water. The Jordan aquifer is much deeper ranging in depth from 150 to 300 feet and is the principal source of water of the City's wells.

The bulk of the project area's geologic formation is classified as "outwash (Superior)" with some areas of shallow bedrock. The areas of shallow bedrock are located on the western edge of Neighborhood 1 and in the central portion of Neighborhood 2. Areas of shallow bedrock are most prominent east of Keats Avenue, and east of the project area. Figure 19.2 illustrates the general depth to bedrock.

Sensitivity to Pollution: The Geologic Atlas (MGS 1989) maps the sensitivity to pollution of the water table aquifer. The water table aquifer in the area is within the glacial material that consists of glacial till or outwash. The map indicating the aquifer's sensitivity is based on several assumptions and is to be used as a general gauge of the overall susceptibility to pollution based on the travel time of pollutants from a surface source to the water table aquifer. A shorter anticipated time of travel translates into a higher sensitivity rating for the aquifer. The majority of the East Ravine (and the entire City of Cottage Grove) has a high susceptibility of groundwater to pollution.

A standard soils map is included as Figure 19.1. Soils are predominantly of a sandy loam nature, highly permeable with relatively good agricultural suitability.

The statements in this section remain unchanged.

The statements in this section remain unchanged.

20. *SOLID WASTES; HAZARDOUS WASTES; STORAGE TANKS*

A) Solid Wastes

The development scenario includes a mixture of residential and commercial uses. These uses will generate additional municipal solid waste (MSW) and recycling products. Based on information provided by ~~Dan Schoepke, Sr., Environmentalist for~~ Washington County, estimates for MSW and recycling on a household and employee basis were generated. These numbers are as follows:

Waste Generation	*2012*	*2018*
MSW per HH/year	*. 820 tons*	*.606 tons*
MSW per employee/year	*1.407 tons*	*. 582 tons*
MSW recycled per HH/year	*0.356 tons*	*.582 tons*
MSW recycled per employee/year	*0.847 tons*	*.670 tons*

Estimates are based on the total household and employment projections for Washington County as of ~~2012~~ 2018 ~~(89,875 HH and 74,605 jobs)~~ 96,424Households and 87,611 jobs and the total amount of MSW collected ~~(178,673 tons)~~ 117,017 tons ~~recycled (32,023 tons of residential and 63,227 tons non-residential)~~ (56,161 tons of residential and 56,161 tons non-residential) in Washington County. An assumption was made that the total amount of MSW is split 50/50 residential/commercial.

~~**SOLID WASTES; HAZARDOUS WASTES; STORAGE TANKS**~~

~~*A) Solid Wastes*~~

~~The development scenario includes a mixture of residential and commercial uses. These uses will generate additional municipal solid waste (MSW) and recycling products. Based on information provided by Dan Schoepke, Sr. Environmentalist for Washington County, estimates for MSW and recycling on a household and employee basis were generated. These numbers are as follows:~~

~~MSW per HH/year~~	~~1.248 tons~~
~~MSW per employee/year~~	~~1.335 tons~~
~~MSW Recycled per HH/year~~	~~0.385 tons~~
~~MSW Recycled per Employee/year~~	~~0.757 tons~~

~~Estimates are based on the total household and employment projections for Washington County as of 2003 (77,456 HH and 72,442 jobs) and the total amount of MSW collected (193,366 tons) and recycled (29,829 tons of residential and 54,803 tons non-residential) in Washington County. An assumption was made that the total amount of MSW is split 50/50 residential/commercial.~~

~~Using the average waste and recyclables per household and employee, waste generation and recyclable materials were estimated based on future development projections in the East Ravine. These numbers are presented in Tables 20.1 and 20.2.~~

Table 20.1 - Summary of ~~*Current and*~~ Future Residential Waste Generation

Residential Waste Generation Rates	Current estimate of Waste Generation in tons	Future Households	Future Estimates of Waste Per Year (in Tons)
MSW/household/year	0.606	6,700	4060.2
Tons of Recycled Product /household/year	0.036	6,700	241.2

~~Waste Generation Rates (Residential)~~	~~East Ravine Existing Households~~	~~Current Estimate of Waste Per Year (in tons)~~	~~Future Household Estimate~~	~~Future Estimate of Waste Per Year (in tons)~~
~~1.248 tons of MSW/household/year~~	~~255~~	~~318.299~~	~~6,700~~	~~8,363.149~~
~~0.385 tons of recycled product/household/year~~	~~255~~	~~98.203~~	~~6,700~~	~~2,580.230~~

Table 20.2 - Summary of ~~Current and~~ Future Non-Residential Waste Generation

Non Residential Waste Generation Rates	Current Estimate of Waste Generation in tons	Future Employees	Future Estimates of Waste Per Year (in Tons)
MSW/Employee/year	1.407	1,700	2391.9
Tons of Recycled Product / employee/ year	0.847	1,700	1439.9

~~Waste Generation Rates (Non-Residential)~~	~~Existing Employees~~	~~Current Estimate of Waste Pear Year (in tons)~~	~~Future Employment Estimate*~~	~~Future Estimate of Waste Per Year (in tons)~~
~~1.335 tons of MSW/employee/year~~	~~500~~	~~667.313~~	~~1,700~~	~~2,268.865~~
~~0.757 tons of recycled product/employee/year~~	~~500~~	~~378.254~~	~~1,700~~	~~1,286.065~~

* Employment estimates based on project magnitude data of 850,000 square feet of commercial space at one employee per 500 square feet of space.

The statements in this section remain unchanged.

The current waste generation information is included above and the future waste generation rates included in table 20.1 and 20.2 remain unchanged.

B) Hazardous Wastes

No response required.

The statements in this section remain unchanged.

The statements in this section remain unchanged.

C) Storage Tanks

There are no specific locations for above or below ground storage tanks known at this time. If any business should need above or below ground storage tanks, it would need to follow MPCA and other applicable standards and procedures.

The statements in this section remain unchanged.

The statements in this section remain unchanged.

21. Traffic

A detailed traffic study was completed and is included as Appendix 3. This traffic study provides an analysis of existing traffic volumes, patterns and roadway characteristics for the East Ravine project area, provides analysis on impacts on traffic that would be caused by the development scenario and offers mitigation measures in the form of roadway improvements, intersection and signal adjustments and traffic management measures. The complete response to question 21 is referenced to the technical memorandum included as Appendix 3. This includes all figures illustrating existing traffic/transportation systems and future traffic impacts.

A component of the Walmart commercial development included the completion of traffic studies that can be referenced in appendix 11. Phase I of the infrastructure improvements recommended in these studies were completed in 2013. ~~Any significant additional commercial growth in this neighborhood will require Phase II of the traffic improvements identified.~~

In 2017, the Phase II roadway improvements were completed in conjunction with the East Point Douglas Road and Highway 61 roundabout traffic improvement construction project. The traffic study of East Point Douglas Road and CSAH 19 is provided in Appendix 11.

A new version of Figure 3.5 (2020 ADT Volumes) from the 2005 traffic study in Appendix 3 has been provided to incorporate future traffic projections from the City's 2040 Comprehensive Plan (Figure 21.3—2040 Traffic with Ravine Parkway). As can be seen, traffic volumes in 2040 are generally projected to be less than originally thought in 2020 per the 2005 study. Because of this, impacts due to traffic and noise are expected to be consistent with (if not less than) the original studies of this AUAR.

22. VEHICLE-RELATED AIR EMISSIONS

For roadway projects, the two pollutants of concern are carbon monoxide (CO) and PM10. The EPA and the Minnesota Pollution Control Agency (MPCA) do not require PM10 analysis. To assure that a project is not in violation of the National Ambient Air Quality Standards (NAAQS), the need for an air quality analysis to address emissions of CO must be determined.

The East Ravine project is in Washington County, one of the Twin Cities seven-county metropolitan areas considered a CO maintenance area. To determine the need for a hot-spot analysis, the Twin Cities has a screening method to compare project locations to a set of the Twin Cities "worst" intersections. If the project has better conditions and does not affect one of these intersections, then it is presumed it will not cause any violations. There are three MPCA monitored locations and seven top intersections (see Table 22.1). The East Ravine project area does not include any of these locations.

Table 22.1 - Top Ten Intersections Twin Cities CO Maintenance Area

~~ID~~	~~DESCRIPTION~~	~~1998 AADT*~~
~~Top 7 Intersections~~		
~~1~~	~~TH 169 at CSAH 81~~	~~77,200~~
~~2~~	~~TH 101 at TH 7~~	~~65,000~~
~~3~~	~~TH 100 at CSAH 81~~	~~71,150~~
~~4~~	~~TH 10 at University Avenue~~	~~63,600~~
~~5~~	~~TH 252 at 85th Avenue~~	~~61,700~~
~~6~~	~~TH 252 at 66th Avenue~~	~~64,500~~
~~7~~	~~TH 252 at Brookdale Drive~~	~~58,550~~
~~3 MPCA Monitored Locations~~		
~~8~~	~~University and Lexington Avenue~~	~~54,500~~
~~9~~	~~Snelling at University Avenue~~	~~57,750~~
~~10~~	~~Hennepin Avenue at Lake Street~~	~~35,800~~

~~*ID*~~	~~*DESCRIPTION*~~	~~*2007 AADT**~~
~~*Top 7 Intersections*~~		
~~*1*~~	~~*TH 169 at CSAH 81*~~	~~*79,400*~~
~~*2*~~	~~*TH 7 at TH 101*~~	~~*66,600*~~
~~*3*~~	~~*TH 252 at 85th Avenue*~~	~~*66,800*~~
~~*4*~~	~~*University Avenue at Snelling Avenue*~~	~~*59,700*~~
~~*5*~~	~~*TH 252 at Brookdale Drive*~~	~~*61,300*~~
~~*6*~~	~~*Cedar Avenue at County Road 42*~~	~~*75,100*~~
~~*7*~~	~~*TH 7 at Williston Road*~~	~~*54,900*~~
~~*3 MPCA Monitored Locations*~~		
~~*8*~~	~~*University and Lexington Avenue*~~	~~*59,700*~~
~~*9*~~	~~*TH 252 at 66th Avenue*~~	~~*72,500*~~
~~*10*~~	~~*Hennepin Avenue at Lake Street*~~	~~*37,000*~~

~~** Most current AADT available*~~

ID	*DESCRIPTION*	*2020 AADT**
Top 7 Intersections		
1	*Cedar Ave. At County Rd 42*	*82,300*
2	*TH 252 at 66th Ave.*	*79,300*
3	*TH 252 at 85th Ave.*	*74,600*
4	*County Rd. 42 at Nicollet Ave.*	*71,400*
5	*TH 252 at Brookdale Dr.*	*68,100*
6	*TH 7 at County Rd. 101*	*60,000*
7	*TH 7 at Williston Rd.*	*54,900*
3 MPCA Monitored Locations		
8	*University Ave. at Lexington Avenue*	*52,600*

9	*University Ave. At Snelling Ave.*	*50,600*
10	*Hennepin Avenue at Lake Street*	*31,300*

Note: University Ave. At Snelling Ave. is no longer being monitored by the MPCA
** Most current AADT available*

The Table22.1 was updated with the latest figures from the MPCA.

The final screening criteria is whether the project roadways will have traffic levels in excess of the benchmark AADT level of ~~77,200~~ *79,400*. The East Ravine project is not forecasted to have traffic levels this high. The results of the screening procedure show that the East Ravine development project does not require a hot-spot analysis.

The statements in this section remain unchanged, but table 22.1 was modified as noted.

Location		2002 AADT Counts	2020 ADT	*2040 ADT*
US 61	North of 70th Street	53,000	69,300	*84,000*
US 61	Between 70th Street and 80th Street	42,000	51,100	*62,000*
US 61	Between 80th Street and Keats Avenue	31,000	42,800	*43,400*
US 61	Between Keats Avenue and Kimbro Avenue	26,000	32,700	*44,400*
70th Street	Between US 61 and Jamaica Avenue	6,400	10,400	*9,700*
70th Street	Between Jamaica Avenue and Keats Avenue	2,200	10,100	*5,200*
80th Street	Between US 61 and Hinton Avenue	22,300	28,000	*24,000*
80th Street	Hinton Avenue and Ideal Avenue	12,600	16,100	*17,100*
80th Street	Ideal Avenue and Jamaica Avenue	10,100	12,700	*12,500*
80th Street	Between Jamaica Avenue and Keats Avenue	7,400	9,300	*5,400*
80th Street	Keats Avenue to Kimbro Avenue	1,200	6,600	*1,250*
Jamaica Avenue	Between Military Road and 70th Street	4,200	15,900	*3,400*
Jamaica Avenue	Between 70th Street and 80th Street	7,400	10,500	*7,500*
Jamaica Avenue	Between 80th Street and US 61	11,200	17,700	*19,500*
Keats Avenue	North of Military Road	5,600	12,600	*13,100*
Keats Avenue	Between 70th Street and Military Road	7,600	12,600	*13,100*
Keats Avenue	Between 70th and 80th Street	6,200	11,000	*11,500*
Keats Avenue	Between 80th Street and 90th Street	6,200	11,000	*9,700*
Keats Avenue	Between 90th Street and US 61	6,200	13,800	*8,450*
Kimbro Avenue	Between Lamar Avenue and US 61	500	4,000	*560*

Military Road	Between Ideal Avenue and Jamaica Avenue	5,000	14,100	*2,550*
Military Road	Between Jamaica Avenue and Keats Avenue	1,450	-	-
Military Road	Keats Avenue to Lamar Avenue	3,000	6,000	*4,700*
Lamar Avenue	70th Street to Kimbro Avenue	1,200	2,000	*1,150*

Source: Mn/DOT Year 2002 ADT Flow Maps and Howard R Green Company

23. STATIONARY SOURCE AIR EMISSIONS

~~*No response required.*~~

~~*The statements in this section remain unchanged.*~~

Nearly all commercial and residential developments have potential to emit greenhouse gases (GHG) from various sources. Project construction may emit GHG by releasing gases that build up in soils. Carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) each build up in soils through plant life cycles and as organic material decays. These gas traps release GHG when disturbed by processes such as agricultural production and excavation. Project construction will use manufactured goods, the production of which likely relies upon energy developed from GHG. Natural gas-fired combustion equipment emit relatively low levels of typical combustion emissions, such as: Oxides of Nitrogen (NOx); Carbon Monoxide (CO); particulate matter (PM) and volatile organic compounds (VOCs); and GHGs such as CO2, CH4 and N2O. Natural gas-fired equipment also emits low levels of hazardous air pollutants (HAPs) that are normal constituents of combustion by-products.

Use of fossil fuels, refrigerants and electricity sourced in part from fossil fuels will continue throughout the expected development lifetime. After construction, sustained use of the site will generate GHG. While the development of a detailed GHG inventory is not possible because the final uses, tenants, buildings, construction materials and contents have not been determined, residential and commercial tenants are anticipated to consume energy developed partly from fossil fuels and may burn natural gas for activities such as heating, cooking or other production. Trips by fuel-burning and electric vehicles relying on fossil fuel-sourced electricity will also generate GHG.

An estimate below of GHG production related to the project, providing general information on the scale of GHG emissions, distinguishes between one-time emissions sourced from construction and annual emissions from onsite use. It should be noted that the full GHG estimates for the Construction and Operational Phases would not occur simultaneously in the same year. Construction GHG emissions will occur only during the relatively short construction phases and will not continue into the Operational Phase. The two phases are evaluated separately as they are not intended to be additive. These quantities represent an estimate of activities that may be reasonably construed to be under the control of the City of Cottage Grove. Individual sources that exceed MPCA and EQB thresholds for air permitting and environmental review may still be required to provide detailed analysis of site-specific GHG emissions. Note that land uses will vary depending upon developer decisions. The exact inventory of such natural gas-fired equipment is not yet known, because the final uses are speculative.

Table 23.1 – Estimated Greenhouse Gas (GHG) Emissions

Annual Construction[1]	
Activity	**Metric Tons CO_2e per Year**
Off-Road Construction Vehicles	5,000
On-Road Construction Vehicles	6,600

Construction Aggregates, Concrete and Hot Mix Asphalt	14,4000
TOTAL CONSTRUCTION PHASE	**26,000**
Operation of Future Developments	
Activity	**Metric Tons CO_2e per Year**
Residential[2] *(inc. energy, waste disposal, 12,000 vehicle miles/household)*	91,944
Commercial[3]	46
Institutional[4]	28
Estimated Annual GHG Emissions	**92,018**

NOTE:

1. Extrapolated from estimates of GHG emissions for mixed use construction at Central Commons, Stillwater, Minnesota. Assumes 80 acres of construction/year. Excludes rural estate and park/greenspace.
2. Calculated for typical consumption using EPA's Carbon Footprint Calculator for 6,554 US Average 2.6 member households. Includes onsite energy consumption, waste/recycling, and 12,000 vehicle miles per household
3. Calculated for typical businesses (assuming 4/acre of commercial land use and 1/acre of mixed use) using commercial CO2e calculator. Assumes combination of big box, grocery/market, restaurant, and miscellaneous retail. Vehicle travel is captured by Residential data provided.

Minnesota Rule 7008.2600, subpart 1C for insignificant facility emissions in air permitting, and Minnesota Rule 4410.4300, subpart 15B for EAW preparation, each set a threshold of 100,000 Metric Tons CO2e for stationary sources. As a whole, development scenario analyzed by the AUAR, near build out, appears to have potential to be near or exceed thresholds for review of a single stationary source; however, those numbers typically are limited to the operation of the facility (e.g. factory emissions) and do not typically include energy production, waste, vehicle miles, and the other data presented here.

At this time, all of the above types of emission sources, in aggregate, do not typically trigger an air emissions permit from MPCA for commercial and residential development projects. However, this determination can only be made once proposed equipment inventories and estimated throughputs are known with reasonable certainty. The Project Owner and/or Tenant(s) are responsible for making air permit applicability or exemption determinations prior to starting construction. Such permit or exemption determinations would apply to direct stationary source emissions resulting from equipment to be operated, and within certain sizes and throughput levels. Regardless of the timing of this future air permitting determination, commercial and residential development projects of the type proposed here do not typically trigger air permitting requirements. Based on the above information, the type and extent of stationary source air emissions to be associated with the Project appear to be minor and are not expected to have the potential for significant environmental effects.

The EQB is developing standards for evaluating GHG emissions for environmental review. In absence of additional guidance, the project does not appear to have potential for significant GHG emissions.

24. DUST, ODORS, NOISE

Existing noise levels were measured at two locations in the project area. Monitoring locations represent undeveloped lands expected to experience commercial and residential development or impacts from commercial and residential development. The future Build alternative and associated traffic volumes expected in the year 2020 were modeled using the Minnesota Department of Transportation traffic noise model, MINNOISE. Monitoring data and modeling results were compared with the Minnesota Pollution Control Agency (MPCA) Noise Rules to evaluate traffic noise impacts and recommend mitigation measures. Modeling results were used to create noise contours showing the location of the residential daytime and nighttime L10 and L50 noise contour lines. L10 and L50 are sound levels in decibels (dBA) that are exceeded in 10 percent or 50 percent, respectively, of the time for a one-hour survey.

The statements in this section remain unchanged.

Existing Noise Levels

On March 3, 2005, noise monitoring was conducted at two locations in the project area. The purpose of the noise monitoring was to document existing noise levels. Noise measurements were conducted in accordance with Minnesota Rules Chapter 7030, Noise Pollution Control. The meteorological conditions were as follows:

Temperature - +2 degrees

Humidity – 76%

Wind – Calm

Barometric Pressure – 30.27" Hg

Table 1 summarizes the equipment Earth Tech staff used to collect monitoring data for this noise analysis.

Table 24.1 - Noise Analysis Instrumentation Summary

Instrument	Make	Model	Calibration Date	Serial Number
Dosimeter 1	Quest	Q-300	2/28/05 at 114.0 dBA	QC6030052
Dosimeter 2	Quest	Q-30	2/28/05 at 114.0 dBA	QC2921212

The monitoring sites were selected at locations where existing noise levels could not be modeled with MINNOISE or to compare measured noise levels to modeled noise levels to confirm the validity of the model. The results of the noise measurements at the monitoring locations are listed in Table 2 and the locations of the sites are indicated on Figures 2 and 3. MPCA maximum allowable daytime noise levels are 65 dBA for L10 and 60 dBA for L50. The maximum nighttime noise levels are 55 dBA (L10) and 50 dBA (L50).

Table 24.2 - Nighttime Noise Monitoring Summary

Site	Date Sampled	Time Sampled	Distance from CL	L10 (dBA)	L50 (dBA)	MPCA Nighttime		Exceeding (Yes/No)
						L10 (dBA)	L50 (dBA)	
Gordon and Bonnie Tank Property	March 3, 2005	6:00 am to 7:00 am	150 feet	56	46	55	50	Yes
Washington County Property	March 3, 2005	6:00 am to 7:00 am	600 feet	51	54	55	50	Yes

The statements in this section remain unchanged.

Future Noise Levels

The traffic noise model analyzed the existing roadway network and proposed East Ravine Parkway. The Howard R. Green Company supplied the existing traffic levels in 2003 and the predicted traffic levels in 2020. Earth Tech adjusted

the 2003 traffic data to 2005 conditions. The Washington County Department of Transportation provided information regarding truck percentages, speed limits, and nighttime peak hour volumes. Earth Tech used aerial orthographic mapping to determine roadway alignments and digitized the existing and proposed roadway alignments for use in the MINNOISE noise model. Keats Avenue, Kimbro/Lamar Avenue, Jamaica Avenue, 80th Street, 70th Street, and Military Road were modeled in the for year 2005 and 2020 peak hour traffic. The proposed East Ravine Parkway was modeled only for year 2020 peak hour traffic. The highest peak hour traffic volume (PHV) for each modeled roadway is shown in Table 24.3.

The traffic stream in the MINNOISE model was determined to be 95% cars, 2% medium trucks, and 3% heavy trucks for all roadways except Keats Avenue. The traffic stream for Keats Avenue was determined to be 93% cars, 3% medium trucks, and 4% heavy trucks. Roadway speeds were modeled as follows:

- Keats Avenue – 55 mph
- Kimbro/Lamar Avenue – 55 mph
- Jamaica Avenue – 45 mph
- 80th Street – 45 mph
- 70th Street – 45 mph
- Military Road – 55 mph
- East Ravine Parkway – 40 mph

Table 24.3 - Peak Hour Traffic Volumes

Location	Existing (2005)		Predicted (2020)	
	Daytime*	Nighttime*	Daytime*	Nighttime*
Keats Avenue				
70th Street to Military Road	1000	750	1680	1260
Kimbro/Lamar Avenue				
US 61 to Lamar Avenue	740	555	480	360
Jamaica Avenue				
70th Street to Military Road	560	420	1510	1135
80th Street				
Jamaica Avenue to Keats Avenue	760	570	980	735
70th Street				
Jamaica Avenue to Keats Avenue	590	445	1520	1140
Military Road				
Ideal Avenue to Jamaica Avenue	750	565	1090	820
East Ravine Parkway				
80th Street to 70th Street	N/A	N/A	1190	850

*Daytime is defined to mean those hours from 7:00 am to 10:00 pm. Nighttime is defined to mean those hours from 10:00 pm to 7:00 am.

Results

Modeling results are shown as contours on Figures 2 and 3 of Appendix 4. Traffic noise levels between the roadway centerline and the contour line are predicted to exceed the corresponding MPCA Daytime L10 and L50 noise levels. Table 24.4 shows the distances from roadway centerline to the noise contour.

Table 24.4 - Distance to Contours

Location	Approximate Distance from CL in Feet			
	2005 MPCA Daytime		2020 MPCA Daytime	
	L10 (65 dBA)	L50 (60 dBA)	L10 (65 dBA)	L50 (60 dBA)
Keats Avenue (70th Street to Military Road)	197	164	262	262
Kimbro Avenue (US 61 to Lamar Avenue)	131	82	115	33
Jamaica Avenue (70th Street to Military Road)	262	203	197	190
80th Street (Jamaica Avenue to Keats Avenue)	108	69	135	85
70th Street (Jamaica Avenue to Keats Avenue)	115	59	152	150
Military Road (Ideal Avenue to Jamaica Avenue)	161	121	205	164
East Ravine Parkway (80th Street to 70th Street)	N/A	N/A	118	80

Residences located within the distances above, as measured from the roadway centerline, are predicted to experience roadway noise levels that exceed MPCA's maximum allowable noise levels.

The Nighttime peak hourly volumes are approximately 75% of the Daytime peaks. Due to the nominal reduction in traffic and the substantial reduction (10 dBA) of the allowable L10 and L50, the distance from the roadway centerline to the nighttime noise contour is approximately 700 feet. At the present time, existing noise levels at monitored locations exceed MPCA Nighttime criteria. The Tank monitoring site is located 150 feet north of 80th Street and exceeds the L10 during the 6:00 am to 7:00 am time period. The Washington County monitoring site is located 600 feet east of Keats Avenue (CSAH 19) and exceeds the L50 during the 6:00 am to 7:00 am time period.

Mitigation

Results of these analyses suggest that future traffic noise levels will exceed MPCA's maximum allowable noise levels near roadways in the project area. The City of Cottage Grove is required to comply with Minnesota Rules 7030.0030. This statute requires municipalities to ensure that existing noise levels comply with state noise limits prior to occupants moving into residences in the proposed development. Barriers such as earthen berms or landscaping can reduce traffic noise levels. Increasing the distance between the source and the receiver also reduces traffic noise levels (i.e. larger setbacks from arterial or collector roadways).

The information above continues to be valid. A component of the Walmart commercial development included the completion of Noise Impact Study that can be referenced by contacting the City. Findings of the study indicated that the planned commercial growth will not have a negative impact on the surrounding area. The City recently adopted Ordinance No. 923, which modifies the way the City monitors and addresses noise complaints within the community. The ordinance can be found on the City's website at ~~www.cottage-grove.org~~ https://www.cottagegrovemn.gov/ No Change in Statement.

25. SENSITIVE RESOURCES

A combination of existing resources and inventory reports were used to assess the impacts on sensitive resources in the East Ravine Area. These resources included the Old Cottage Grove Historic District Preservation Planning Report

(Vogel 2002), Preservation Planning Report: Documentation Supporting the Nomination of the Military Road Heritage Corridor to the City Register of Historic Sites and Landmarks (Historic Preservation Division, Department of Community Development, City of Cottage Grove, July 1999), the Comprehensive Plan (City of Cottage Grove, 2000), t***he Comprehensive Plan (City of Cottage Grove, 2030)*** the Natural Resource Inventory (BRA, 1998), South Washington Watershed District CD-P86 Natural Resource Management Plan (SWWD and EOR, 2002) and resource information from the State Historic Preservation Office.

Archeological, historic and architectural resources

The most notable resources are the Comprehensive Plan, The Old Cottage Grove Historic District Preservation Planning Report and the Documentation Supporting the Nomination of the Military Road Heritage Corridor on the City Register of Historic Sites and Landmarks. These reports present documentation emphasizing the City's commitment to historic preservation and supporting the nominations of the Old Cottage Grove Historic District and the Military Road Heritage Corridor to the City Register of Historic Sites and Landmarks. The intent of historic district designation is to provide a guide for future community development decision making that acknowledges need for change while providing protection for historically significant buildings and sites. The report also contains a comprehensive inventory of all the heritage resources within the district. Though the Old Cottage Grove Historic District and the Military Road Heritage Corridor have met the criteria to be on the City's Register of Historic Places they have not been nominated to the National Register of Historic Places.

Old Cottage Grove is in the NW part of the City and extends roughly from 70th Street (CSAH 22) south along Lamar Ave, including side streets, to 77th. The area is also known as Cottage Grove Village and East Cottage Grove. Most of the land and buildings in the area are private property. Lamar Ball fields, Old Grove Community Park, and Fire Station No.4 are publicly owned. The district has 9 sites of primary significance which are properties that have been individually listed or eligible for nomination to the City Register of Historic Sites and Landmarks. There are also 42 sites of secondary significance. This category consists of properties more than fifty years old and that contribute to the historic character of the district but lack individual distinction.

The village was platted with a linear plan and a clear distinction between the village and the surrounding countryside. Expansion of the town was constrained by the northern limit of the Cottage Grove Ravine. The original 40 acre plat in 1871 did not allow for a business district or town square, so some of the village's core functions were located outside of the plated area.

The heart of the historic district is Lamar Avenue, which is the old village main street. Traditional streetscape on Lamar Ave includes little or no setback from the street and narrow side yards. Trees were planted to define property edges and they continue to be one of the defining features of the district.

Today, Old Cottage Grove historic district is a mix of residential, commercial, funerary, religious and agricultural buildings. Several preserved architectural landmarks represent Greek Revival, Italian Villa, Queen Anne, Arts and Crafts, and Colonial Revival building styles. There are also modest homes built in the 19th and 20th Centuries. Architectural features include: 1-2 story facades; low to medium pitch gable roof shapes; formal entrances; and one-story porches. Most of the remaining buildings built prior to 1950 are residences as many of the non-residential buildings have been razed or converted. Wood agricultural outbuildings, detached garages, and sheds also contribute to the district's character.

Two properties are on the National Register of Historic Places. These include the Historic Mary and Cordenio Severance House/Cedarhurst Mansion at 6940 Keats Avenue South and the John Furber House at 7310 Lamar Avenue South. A number of additional sites have been placed on the City Register of Historic Sites. These locations are illustrated in Figure 25.1.

No archeological surveys have been conducted within the historic district but there are several potentially significant pioneer home, church, and school sites that need to be considered in development planning.

The Military Road Heritage Corridor through Cottage Grove is part of a larger historic military road that connected Point Douglas with Fort Ripley. The Point Douglas and Fort Ripley Military Road resources is designated WA-CGC-186 in the State Historic Preservation Office inventory database.

The Military Road Corridor incorporates all of Lehigh Road and Military Road within the city limits and that part of Lamar Avenue between Lehigh Road and 70th Street; CSAH 22 west of Lamar Avenue; and the abandoned roadway segment west of Old Cottage Grove village in Section 11, Township 27 North, Range 21 West. Military Road was laid out by the Federal government in 1851-1853. In 1914 it became a state aid road. The corridor was a popular place for early settlement (mid to late 1800s) and has long been a major transportation corridor connecting south Washington County to St. Paul and Minneapolis.

The Documentation Supporting the Nomination of the Military Road Heritage Corridor to the City Register of Historic Sites and Landmarks contains a greater account of the historical significance of the corridor and should be referenced for further details on the corridor.

Informational signage regarding the history of the Military Road/Trail Corridor was installed in conjunction with the 2019 Ravine Parkway construction project.

The referenced areas continue to be identified as being eligible to be listed on the City's Register of Historic Places but have not been registered to date.

The statements in this section remain unchanged.

Prime or unique farmland

It is not anticipated that existing farmlands will be protected through special programs, deed restrictions, conservation easements or other means. As anticipated in both the City's and County's Comprehensive Plans, it is expected that the project area will be developed over time.

The statements in this section remain unchanged.
The statements in this section remain unchanged.

The 2014 East Ravine residential development, the 2013 East Point Douglas Road improvement project, and the construction of the Ravine Parkway Civic Campus provided a key link in the local and regional trailway system of south Washington County with the Cottage Grove Ravine Regional Park. Since the adoption of the original AUAR, the Mississippi River Trail (USBR #45) was established and also provides a connection to the region, state, and nation. http://www.mississippirivertrail.org/index.html . With the new residential developments within the East Ravine, the City created several neighborhood parks developed that conform to the East Ravine Park Master Plan.

Designated parks, recreation areas or trails

A major feature of the project area is the Cottage Grove Ravine Regional Park. This regional park provides an abundance of passive natural areas, picnic areas and trail corridors. The development scenario for the East Ravine project includes the addition of a number of park and open space features that provide connections to Cottage Grove Ravine Regional Park. The park features include a variety of community and neighborhood parks with active and passive play areas.

The 2014 East Ravine residential development, the 2013 East Point Douglas Road improvement project, and the construction of the Ravine Parkway Civic Campus provided a key link in the local and regional trailway system of south Washington County with the Cottage Grove Ravine Regional Park. Since the adoption of the original AUAR, the Mississippi River Trail (USBR #45) was established and also provides a connection to the region, state, and nation. http://www.mississippirivertrail.org/index.html . With the new residential developments within the East Ravine, the City created several neighborhood parks developed that conform to the East Ravine Park Master Plan.

In 2017, a major park infrastructure and amenity improvement project was completed in the Ravine Regional Park by Washington County and the South Washington Watershed District.

26. ADVERSE VISUAL IMPACTS

The AUAR anticipates a development pattern similar to those uses in the surrounding area and does not anticipate any adverse visual impacts as a result of the development scenario.

The statements in this section remain unchanged.

27. COMPATIBILITY WITH PLANS

The City of Cottage Grove completed a ***previous*** comprehensive plan update in October of 2000. This plan update identified the East Ravine area as a future development phase (or MUSA expansion area) that was dependent upon completion of the South Washington County Interceptor. The plan established a strategy for detailed master planning of the East Ravine as an implementation initiative. This project implements that initiative. The 2000 Comprehensive Plan update included the necessary components to comply with the requirements set out in 4410.3610, subpart 1. ~~A comprehensive plan amendment will be completed as part of this project to update land use and infrastructure systems according to the East Ravine Development Scenario.~~

In March of 2011, the City adopted the 2030 Comprehensive Plan which succeeded the 2000 plan that implemented the East Ravine master planning process.

The 2040 Comprehensive Plan modified the land use in the quadrant located at 70th Street and Keats Avenue and in the Cottage View Site. Commercial districts were changed to mixed use and the low, medium, and high density districts were reconfigured.

~~***The current Washington County land use plan has not been updated to reflect the land uses in the East Ravine approved by the City and the Metropolitan Council. Future updates should be updated to current information.***~~

~~The Washington County Comprehensive Plan guides the project area as long term agriculture with a density of 1 unit per 40 acres. This plan is illustrated in Figure 27.2.~~

~~The Metropolitan Land Planning Act requires Comprehensive Plans to be updated by 2008. Future plan updates will need to take into consideration the various land use patterns established in the development scenario master plan.~~

The City's 2030 Comprehensive Plan was adopted by the City Council on March 2, 2011. This document reflects the development scenarios identified in the AUAR. Future updates will reassess and reflect development scenarios that have occurred or are to be modified in the East Ravine. The City has been working closely with the City of Woodbury as land use and transportation changes related to development occur or are planned.

The adoption of the 2040 Comprehensive Plan kept the majority of neighborhood, transportation, and infrastructure guidance established in the 2030 Plan and AUAR, with the exception of some land use classification changes from Commercial to Mixed Use and the location reconfiguration of some Medium and High Density Residential designated properties.

28. IMPACT ON INFRASTRUCTURE AND PUBLIC SERVICES

Water—~~See Appendix 1~~ Appendix 1A – 2006 Water Supply and Distribution Plan

Sewer—~~See Appendix 2~~ Appendix 2A – Sanitary Sewer System, Cottage Grove 2040 Comprehensive Plan

Electricity

Electric utilities will be provided by local electric utility companies as guided by current codes and ordinances. Where possible, electric utility lines will be buried under ground. Easements will be integrated into the system of open space networks and road rights-of-way.

As development and road projects have been occurring since the adoption of the AUAR, the City has been working with utility companies to place infrastructure underground. In some instances, this action is not cost feasible. No change in statement.

Storm Water Management—See Appendix ~~5~~ 5A – 2019 Surface Water Management Plan

Transportation—See Appendix 3

Transit—See Appendix 3

Police and Fire Services

Police and fire service will be adequate to serve this area with the addition of employees in conjunction with added population and commercial services.

The statements in this section remain unchanged. No change in statement.

School District

School districts will face added population as a result of this growth and will need to plan accordingly for added school capacity. Areas within the development scenario do not specifically identify school sites but do provide opportunities to incorporate elementary and secondary school facilities into future subdivisions.

The school district added the East Ridge High School and campus in Woodbury since the adoption of the AUAR. This school serves portions of Cottage Grove including the East Ravine. Additional planning on school needs is currently being completed by the school district. No change in statement.

Telephone and Cable

It is assumed that telephone and cable services would be extended to the area consistent with current services and expansion policies. These would be underground services most likely placed in public right-of-way.

The statements in this section remain unchanged. No change in statement.

29. CUMULATIVE IMPACTS

No response required.

The statements in this section remain unchanged. No change in statement.

30. OTHER POTENTIAL ENVIRONMENTAL IMPACTS

There are no other environmental impacts to note.

The statements in this section remain unchanged. No change in statement.

31. SUMMARY OF ISSUES

See the Executive Summary.

The statements in this section remain unchanged. No change in statement.

MITIGATION INITIATIVES

INTENT OF MITIGATION PLAN

The development of the AUAR project area could have impacts on the environment and existing development. This plan identifies existing tools and policies that the City of Cottage Grove has in place, as well as additional initiatives that will need to be implemented to mitigate potential impacts. There are multiple ways in which Mitigation Initiatives may be implemented such as:

- Enforcing existing zoning and subdivision ordinances and other development regulations at the time of development concept submittals, preliminary and final platting, and during construction monitoring activities
- Referencing and implementing policy directions provided in the Comprehensive Plan and the East Ravine Master Plan during the review and approvals of development projects
- Planning and building public infrastructure (local roads, parks, trunk sewer and water systems) in conjunction with private development initiatives
- Maintaining and updating existing plans and studies for the community
- Requiring additional field work/investigation as part of pre-development planning where potential environmental or cultural resources may exist but have not been verified or where more detailed air quality testing or noise monitoring may be needed.

The statements in this section remain unchanged. No change in statement.

GENERAL MITIGATION INITIATIVES

This section identifies a series of mitigation initiatives that are general in nature and apply to all public and private development within the AUAR.

1. All permits identified in the AUAR (see Question 8), as well as other necessary permits that may be required will be secured by private parties, or the City as appropriate, for all development activities within the project area.
2. The City will follow its own regulations, ordinances, plans, and policies currently in place in the review and approval of all development activities within the project area. These items include the *Comprehensive Plan*, the *East Ravine Master Plan*, and the official *zoning* and *subdivision ordinances*.
3. The City will extend public sewer and water services in a manner consistent with existing plans and policies. The City will monitor capacities, update plans, and extend services as necessary to ensure sufficient supply and quality of services.

4. The City will implement a development tracking mechanism to monitor development within the AUAR project area and its conformance with the development scenario using Geographic Information System (GIS) Software and mapping.

5. The City will enforce its parkland dedication policies consistent with the goals and policies of the Comprehensive Plan and Growth Area Plan, as well as the requirements of the subdivision ordinance.

The statements in this section remain unchanged. No change in statement.

FOCUSED MITIGATION INITIATIVES

Mitigation initiatives that are explicitly intended to mitigate or minimize impacts on a particular resource or action are outlined by topic in this section.

Natural and Physical Resources

Historical and Cultural Resources: follow guidance in Comprehensive Plan and existing codes and ordinances.

The Documentation Supporting the Nomination of the Military Road Heritage Corridor to the City Register of Historic Sites and Landmarks contains a greater account of the historical significance of the Military Road Heritage Corridor and should be referenced for further details on the corridor. The report also contains a number of recommendations that lend support to mitigation initiatives for the Cottage Grove East Ravine Pre-Design project. Those recommendations include:

The Military Road Heritage Corridor that are currently active roadways should be retained and preserved as an historic route within the existing city-county roadway system. The segment that is no longer a roadway cutting diagonally across Section 11 should be preserved as a rural historic landscape.

The Military Road Heritage Corridor has important heritage values that should be interpreted as part of the City's heritage education program. Possible interpretive resources include publications, wayside exhibits, bicycle tour cassette tapes and guides, and school programs.

Maintain, whenever possible, the alignment, width, and grad of existing roadways that comprise the Military Road Heritage Corridor. Roadway maintenance and reconstruction should comply with highway safety standards in such a manner that the essential historic character of the Military Road corridor is preserved intact, respecting the existing shape, slope, elevation, aspect and contour of the historic route.

Minimize disturbance of terrain in the abandoned segment of the corridor through Section 11 to reduce the possibility of destroying unknown archeological features. When this area is developed, archeological surveys should be carried out in accordance with the City's design review and compliance policies.

The statements in this section remain unchanged. No change in statement.

Land Use Management

The city will continue to implement its Comprehensive Plan policies, as well as zoning and subdivision regulations to ensure a development pattern consistent with the East Ravine Master Plan. New and existing Comprehensive Plan and City Code regulations will be used to incorporate the design objectives of the Master Plant. These include:

Existing Subdivision Ordinance requirements for preservation of natural features

New requirements for establishing landscaped buffer areas along major roadways.

New requirements for residential and commercial landscaping which provide sufficient green space which minimizing irrigation requirements.

New residential design standards which ensure a variety of housing design.

New requirements on screening requirements between commercial and residential areas. Particular emphasis will be places on providing adequate screening between the existing residential areas and the future Cottage View commercial area.

The statements in this section remain unchanged. No change in statement.

Erosion Control and Sedimentation

The city will enforce existing erosion control regulation for all new developments. These regulations are based on current "best management practices" outlined by the Minnesota Pollution Control Agency and other resources. These measures greatly reduce erosion and sedimentation during and after construction.

The statements in this section remain unchanged. No change in statement.

Water Supply and Appropriation

The East Ravine Master Plan includes a Public Water Supply Plan, which describes trunk watermain improvements necessary to extend municipal water service to the area. The city will apply its *Wellhead Protection Plan* to new and existing wells in the East Ravine area. This plan calls for abandonment and sealing existing residential and agricultural irrigation wells to reduce the likelihood of future contamination of groundwater supplies. Measures are also included in the plan for protecting future municipal well in the area from contamination and to ensure regular testing of water supplied by these municipal wells.

~~***The statements in this section remain unchanged.***~~
The 2006 Water Supply and Distribution Plan incorporates the East Ravine area and describes the trunk watermain improvements necessary to provide municipal water service. Since the adoption of the AUAR, Well #12 was drilled in Sunnyhill Park near Ideal Avenue.

Wastewater System

The East Ravine Master Plan includes a Sanitary Sewer Plan which describes trunk sanitary sewer improvements necessary to serve the area. The city through its development review process will monitor and verify estimated wastewater flows for conformance to the Sanitary Sewer Plan and treatment capacities of the Metropolitan Council Environmental Services facilities.

~~***The statements in this section remain unchanged.***~~
The 2040 Comprehensive Plan includes a section on sanitary sewer which describes ultimate service areas, trunk sewer lines, and connection points to the South Washington County Interceptor.

Storm Water Management

Development within the project area will increase the amount of storm water runoff. The City will ~~ensure~~ ***require*** the development of a storm water management system which limits flooding and negative impacts on water quality within the watershed. Key strategies will include:

Maintaining discharge rates at or below current levels***, or as required in the City's Surface Water Management Plan or by the South Washington Watershed District. No change in statement.***
Water quality treatment in conformance with the City's Surface Water Management Plan or the requirements of the South Washington Watershed District No change in statement.
Pre-treatment of runoff prior to discharge ~~***into the Mississippi River***~~ ***to a downstream natural receiving water***

~~*Adoption and enforcement of a Storm Water Ordinance*~~
Cooperation with MPCA and other partners in development and implementation of strategies to meet the Total Maximum Daily Load (TDML) standard yet to be determined
Design ~~*ponds*~~ *the stormwater management system based on principles of MPCA's Minnesota Stormwater Manual* ~~Protecting Water Quality in Urban Areas – Best Management Practices for Dealing with Storm Water Runoff from Urban, Suburban and Developing Areas of Minnesota~~
~~*Conformance to National Urban Runoff Pond (NURP) standards*~~
Conformance to National Pollution Discharge Elimination System (NPDES) Phase II requirements as outlined in the ~~*EPA Clean Water Act*~~ *City's Municipal Separate Storm Sewer System (MS4) Permit.*

Developments within the AUAR project area which impact wetlands will be subject to regulation under the Wetland Conservation Act, Chapter 103G Waters of the State (i.e. Department of Natural Resources), and possibly Section 404 of the Clean Water Act (i.e. Army Corps of Engineers). The City of Cottage Grove will work with the ~~*Washington County Soil and Water Conservation District*~~ *South Washington Watershed District,* the local government unit responsible for administering the MN Wetlands Conservation Act, on any development impacting wetlands. Should wetland impacts be part of a development within the project area, these regulatory programs have sequencing requirements which require applicants to demonstrate that wetlands impacts have been avoided and minimized to the extent practical and, if impacts cannot be avoided, these programs require replacement of wetlands impacted by fill or excavation.

The City recently completed a 2019 update of the City's Surface Water Management Plan, which includes constructed and future/ultimate storm sewer facilities. New Atlas-14 rainfall depths were analyzed and incorporated into the plan. The City will apply its Wellhead Protection Plan to new stormwater facilities in the East Ravine area, limiting infiltration where applicable.

Traffic
Traffic will continue to grow as development occurs within the project area and as regional growth continues to add traffic to the system. Appendix 3 contains a number of roadway and intersection improvements that will serve to mitigate future congestion levels associated with growth in the region.

Results of noise analyses suggest that future traffic noise levels have potential to exceed MPCA's maximum allowable noise levels near major arterial and collector roadways in the project area. The City of Cottage Grove is required to comply with Minnesota Rules 7030.0030. This statute requires municipalities to ensure that existing noise levels comply with state noise limits prior to occupants moving into residences in the proposed development. Barriers such as earthen berms or landscaping can reduce traffic noise levels. Increasing the distance between the source and the receiver also reduces traffic noise levels (i.e. larger setbacks from arterial or collector roadways). The Master Plan includes areas along major roadways that serve as buffers that will offer separation between the noise source and the receivers.

The statements in this section remain unchanged.

Monitoring of Development and Future Updates to the AUAR

The AUAR assumes a hypothetical development scenario. Since it is based on assumptions it is important that actual development be monitored and compared to the development that was assumed in the development of the AUAR. Tracking of this development will be done through the City's existing GIS system. As part of the final plat process the developer will submit electronic plats consistent with city development requirements in a compatible form to the City's GIS system. This data will enable to the City to maintain an ongoing inventory

of platted lots and the ability to tie building permits to the lots so that occupied housing units could be tracked in the development area. The City's existing GIS system has the capacity to perform this task.

As required by Minnesota Rule 4410.3610 Subpart 7, to remain valid, the AUAR must be updated if any of the following events should occur:

Five years have passed since the AUAR and mitigation plan were adopted and all development within the project area has not been given final approval.

A comprehensive plan amendment is proposed that would allow an increase in development than what was assumed in the development scenario.

Total development within the area would exceed the maximum levels assumed in the environmental analysis document.

Development within any subarea delineated in the AUAR would exceed the maximum levels assumed for that subarea in the document.

A substantial change is proposed in public facilities intended to service development in the area that may result in increased adverse impacts on the environment.

Development or construction of public facilities will occur differently than assumed in the development scenario such that it will postpone or alter mitigation plans or increase the development magnitude.

New information demonstrates that important assumptions or background conditions used in the analysis presented in the AUAR are substantially in error and that environmental impacts have consequently been substantially underestimated.

The RGU determines that other substantial changes have occurred that may affect the potential for, or magnitude of, adverse environmental impacts.

The AUAR is being updated because it has been over five years since the adoption of the document. None of the other triggering events detailed above have been met.

The 2020 AUAR Update is being completed because the last update was approved on April 15, 2015.

East Ravine Pre-Design
City of Cottage Grove

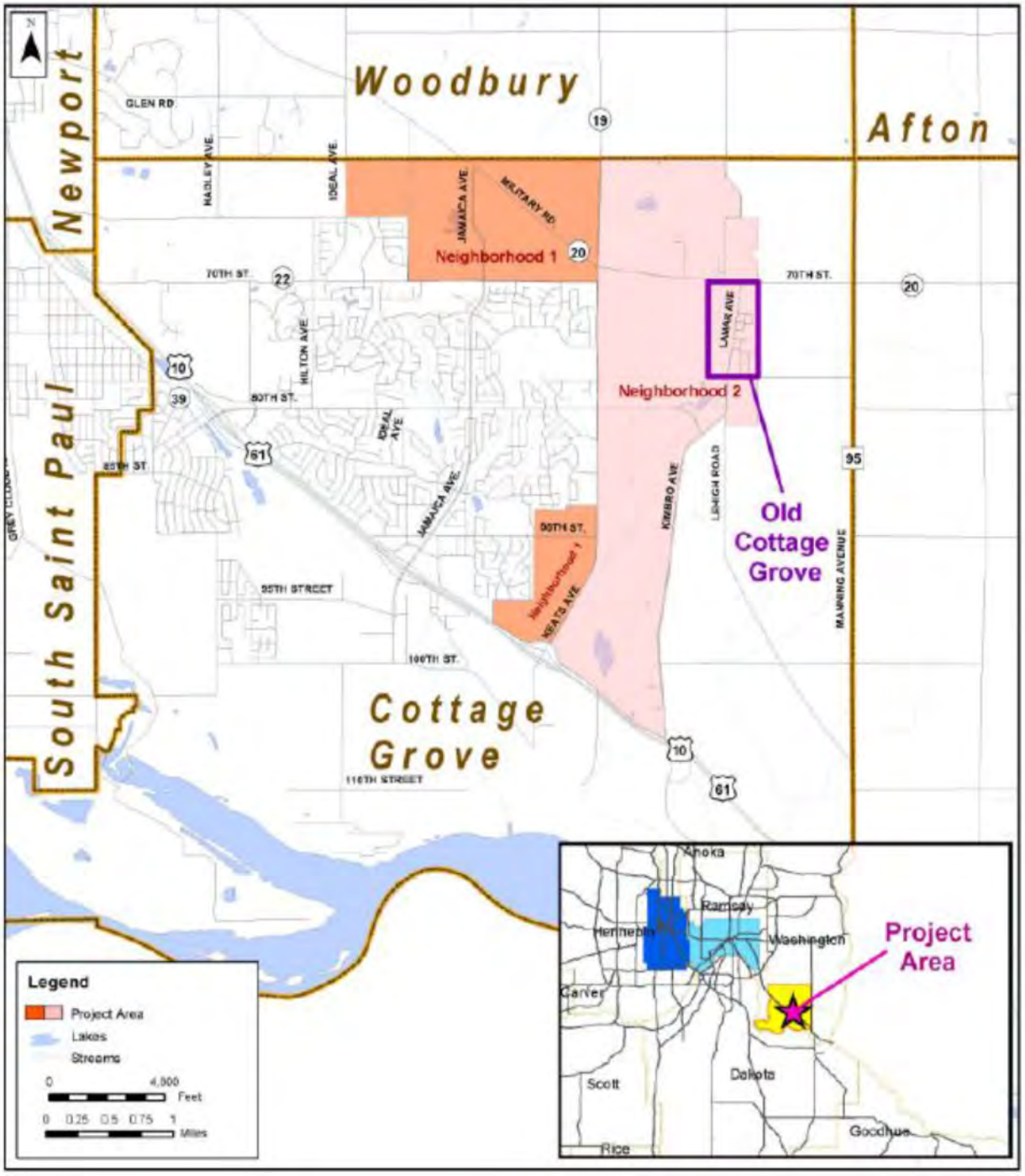


Figure 5.1
Project Location

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

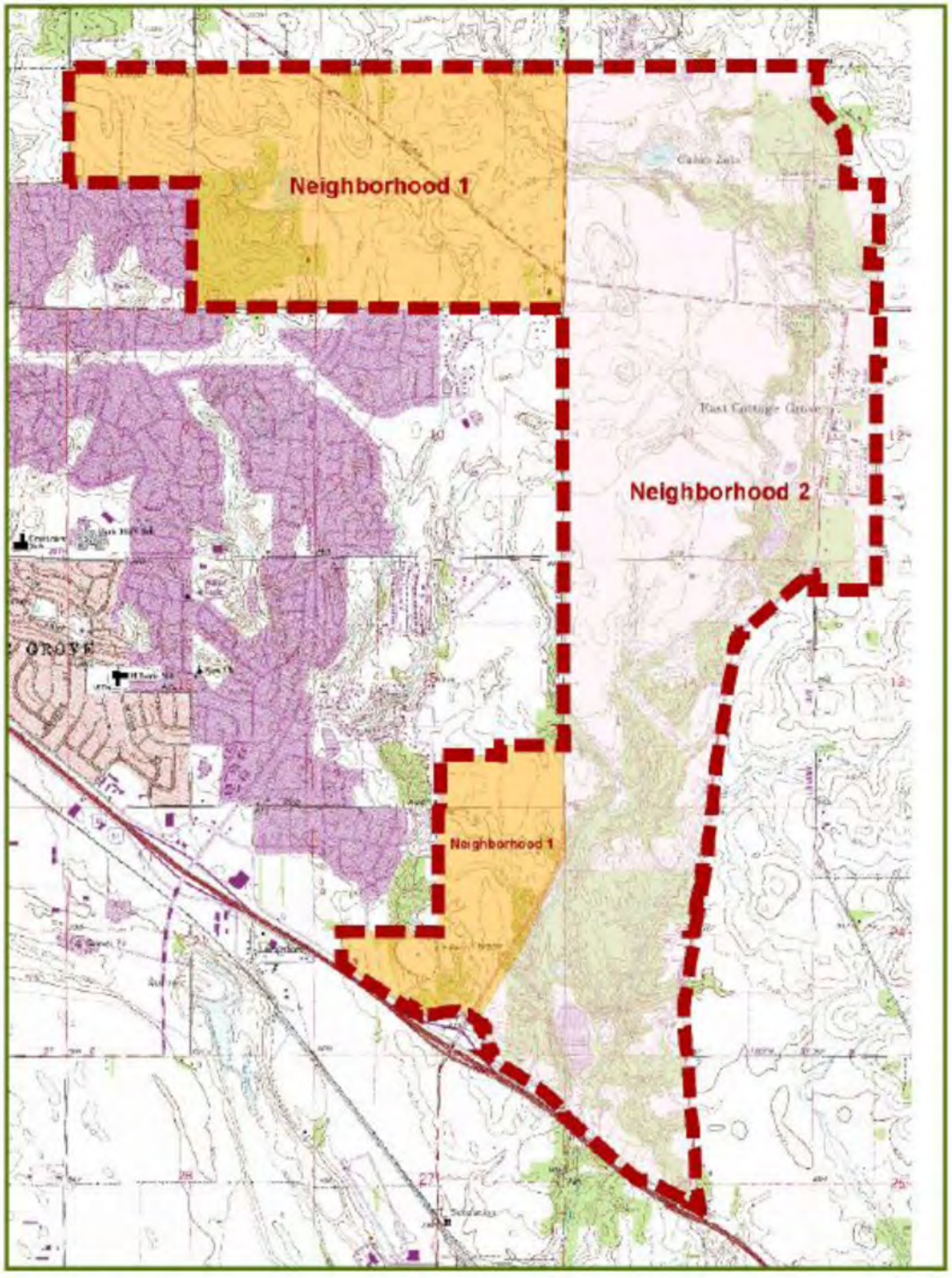


Figure 5.2
AUAR Boundary / USGS Map

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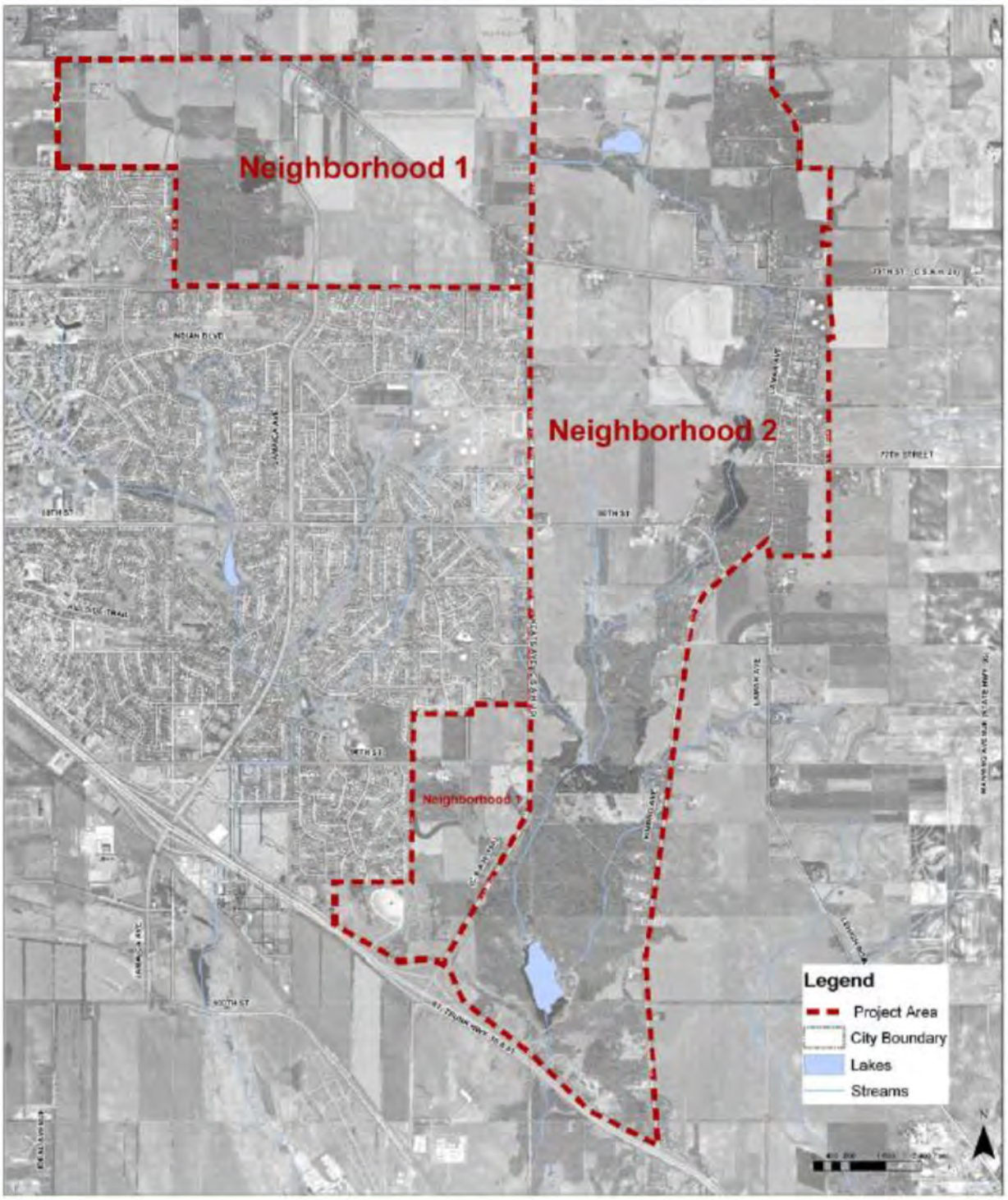


Figure 5.3
Cottage Grove East Ravine Districts

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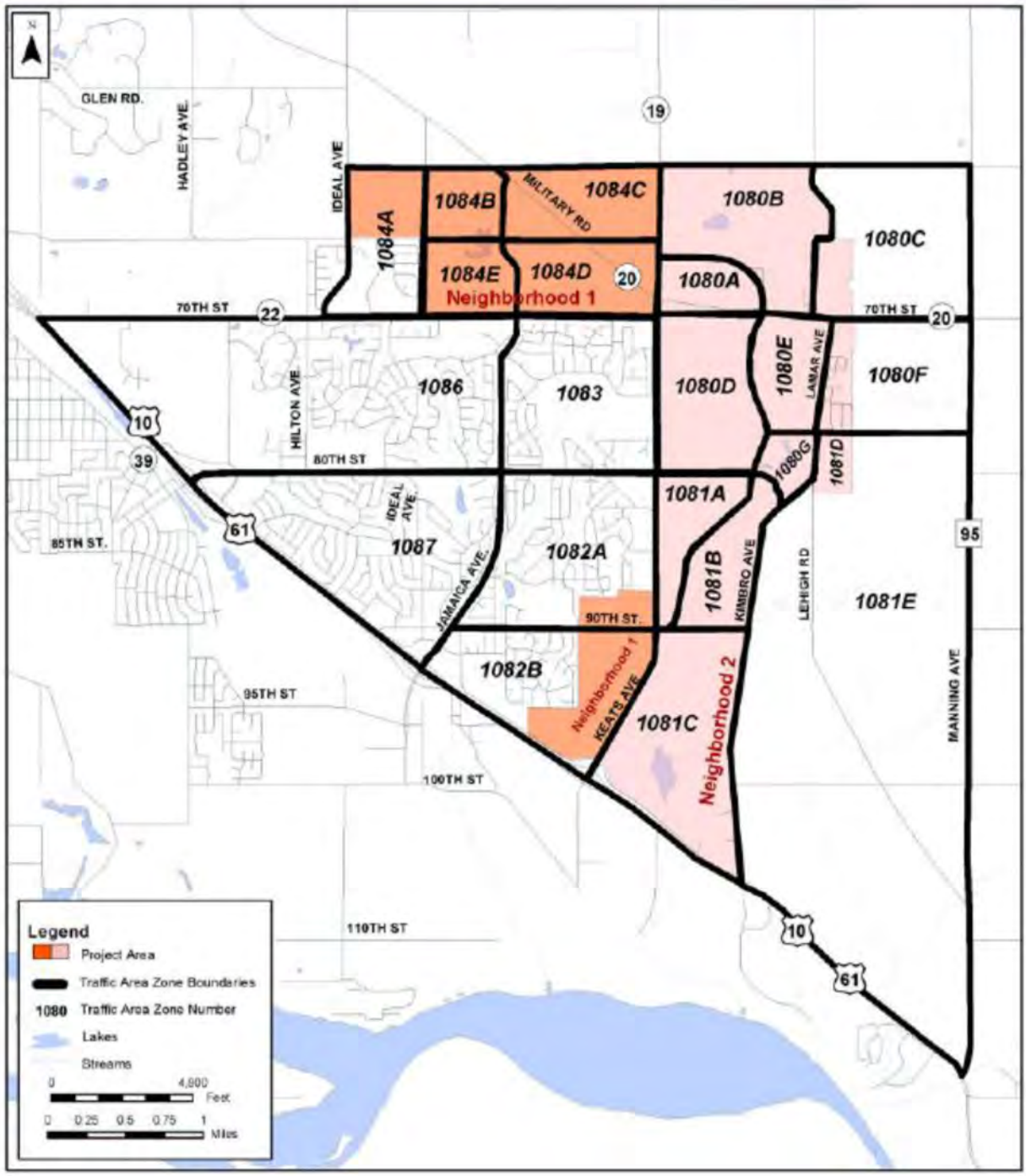


Figure 5.4
Traffic Analysis Zones (TAZ)

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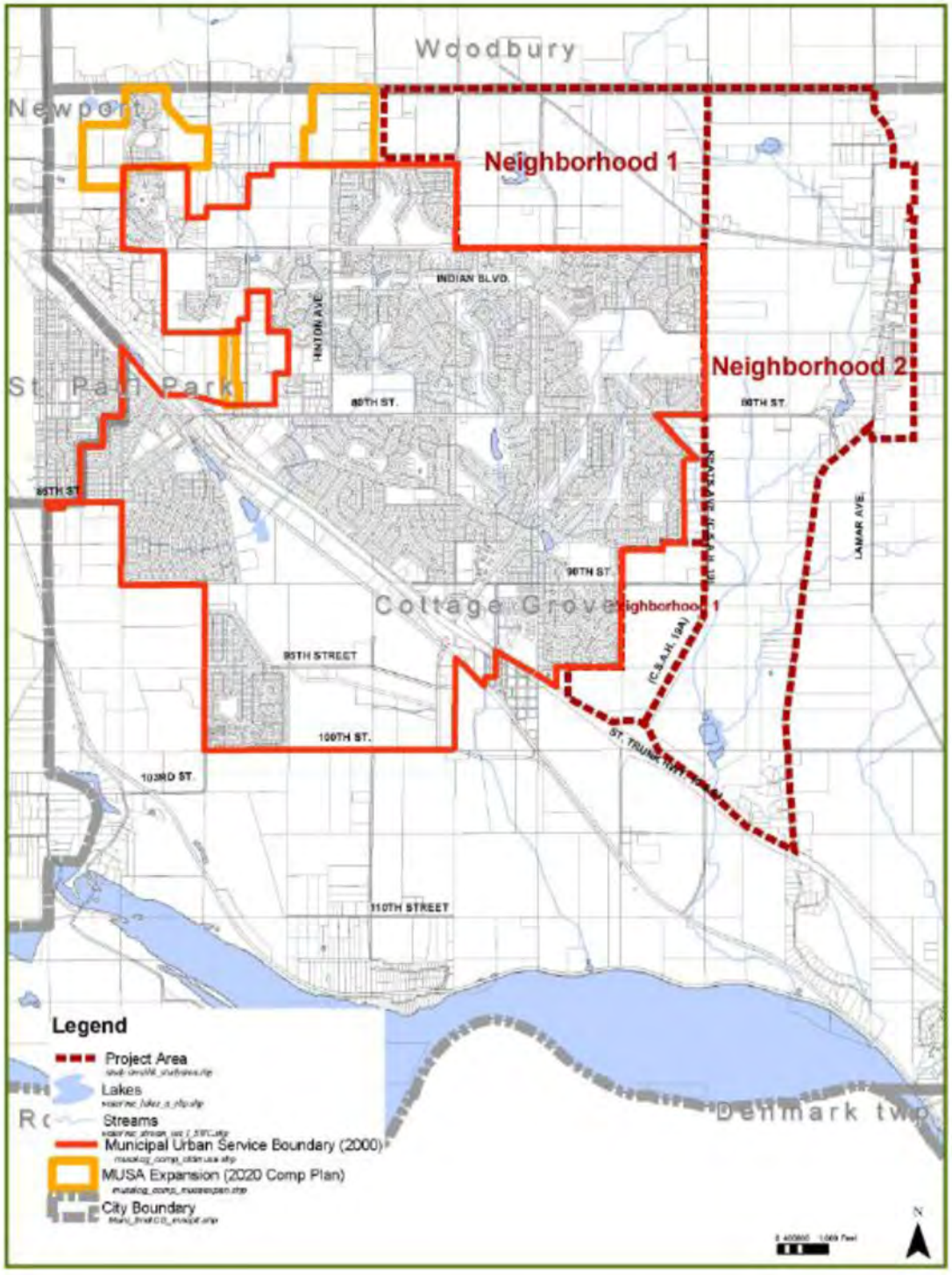


Figure 5.5
Existing Municipal Urban Service Area (MUSA) and 2020 MUSA expansion

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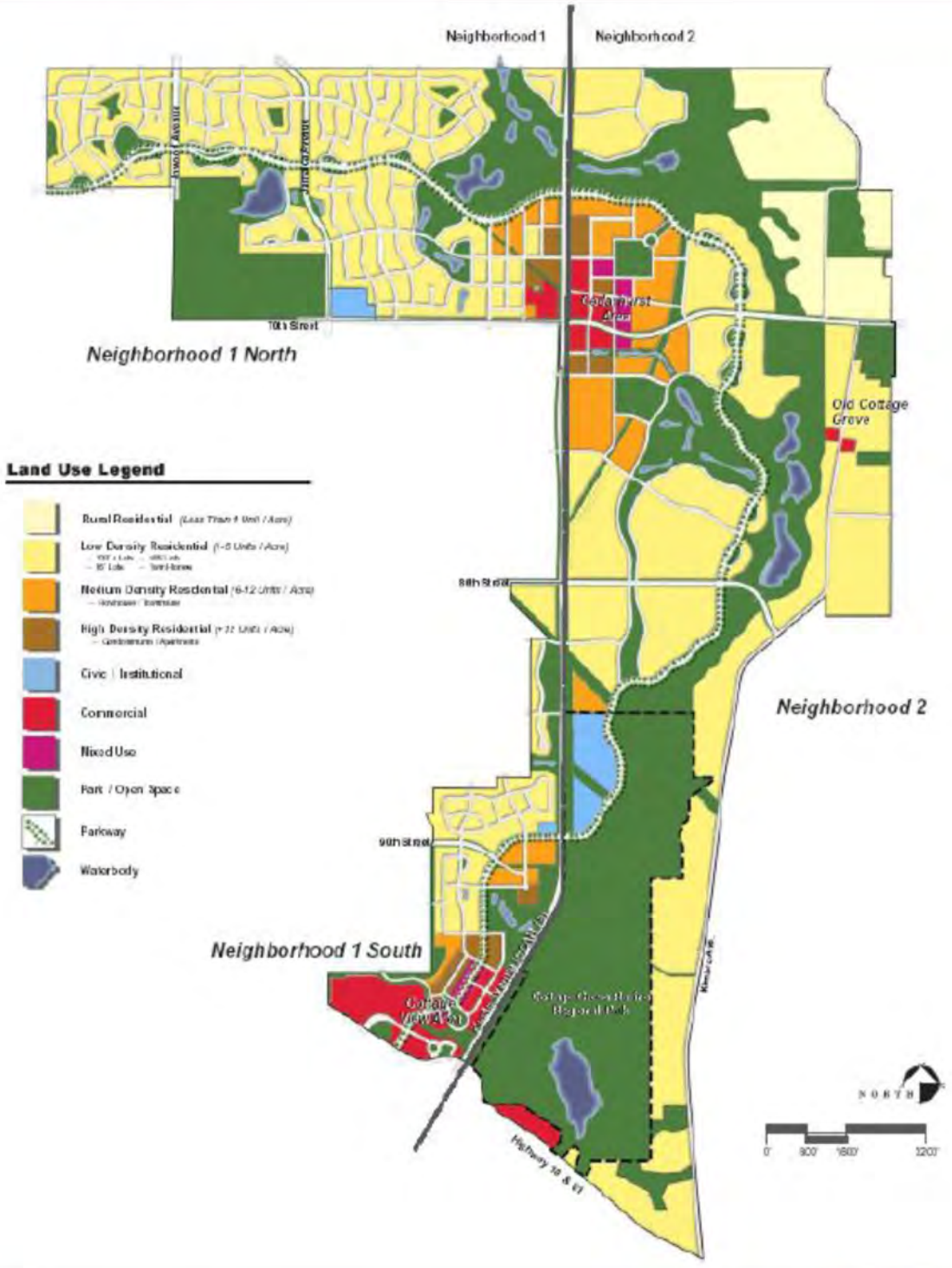


Figure 6.1
Development Scenario / Master Plan

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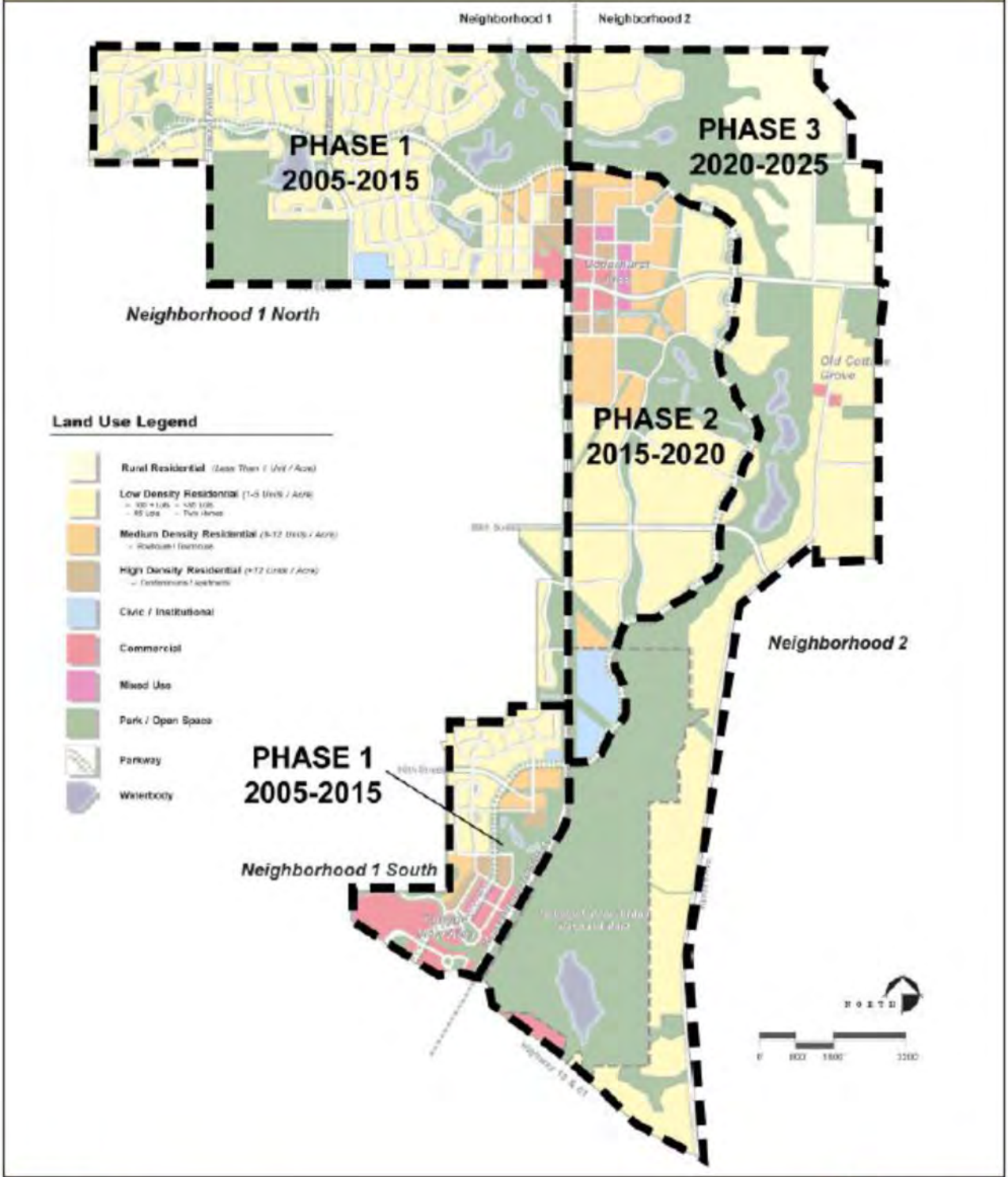


Figure 6.2
Preliminary Phasing Plan

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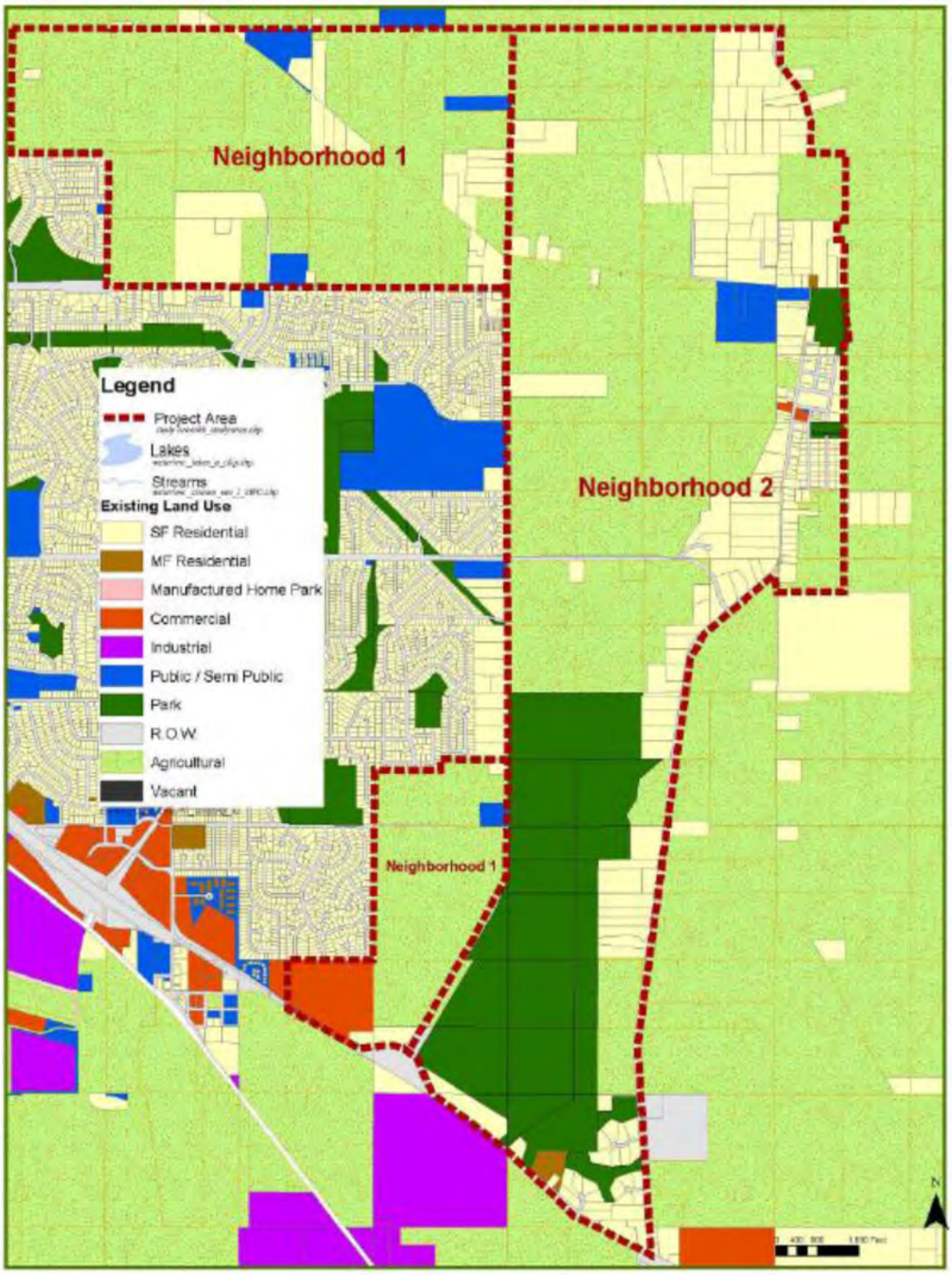


Figure 9.1
Existing Land Use

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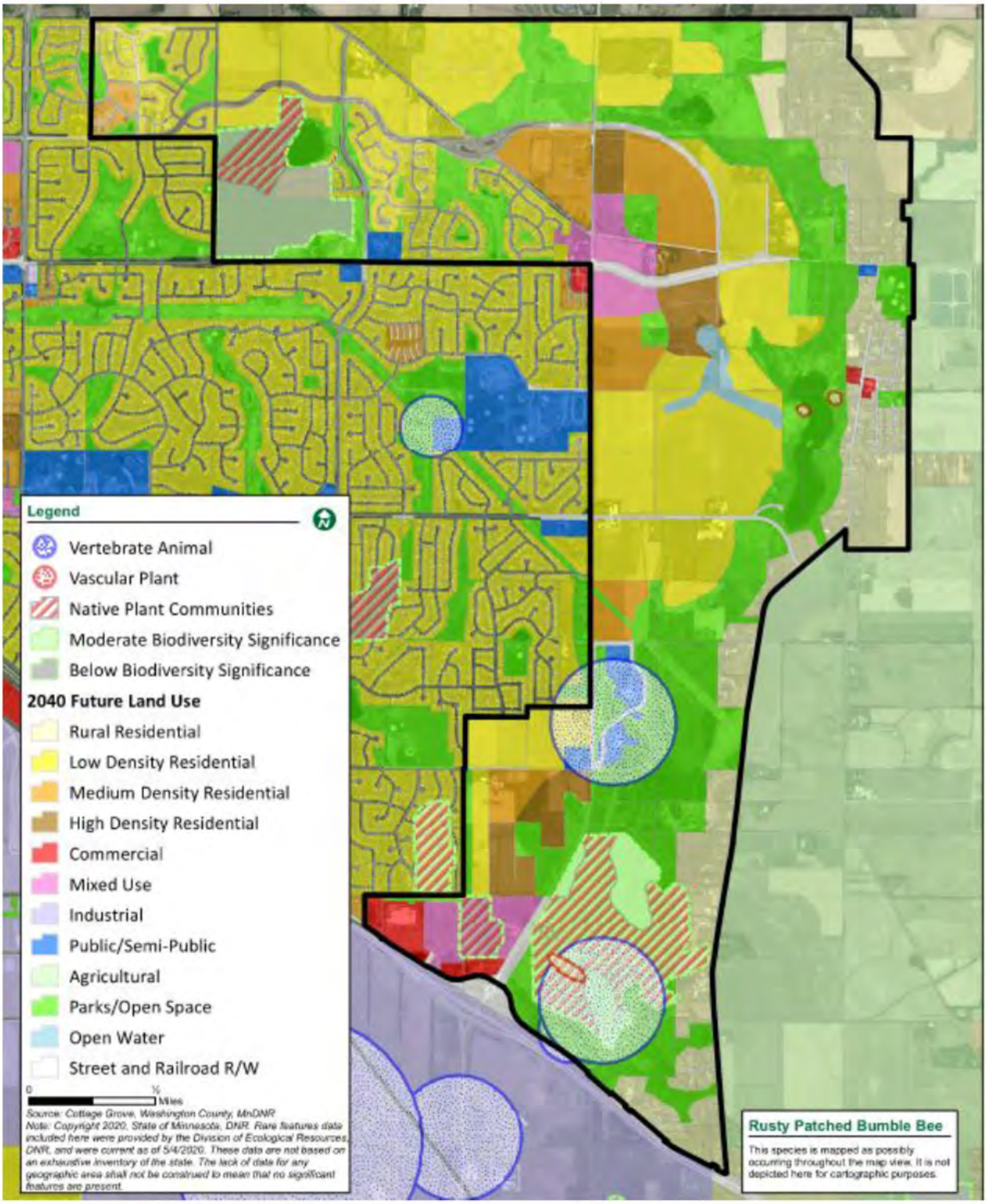


Figure 10.1
Natural Resources Inventory

East Ravine Pre-Design
City of Cottage Grove

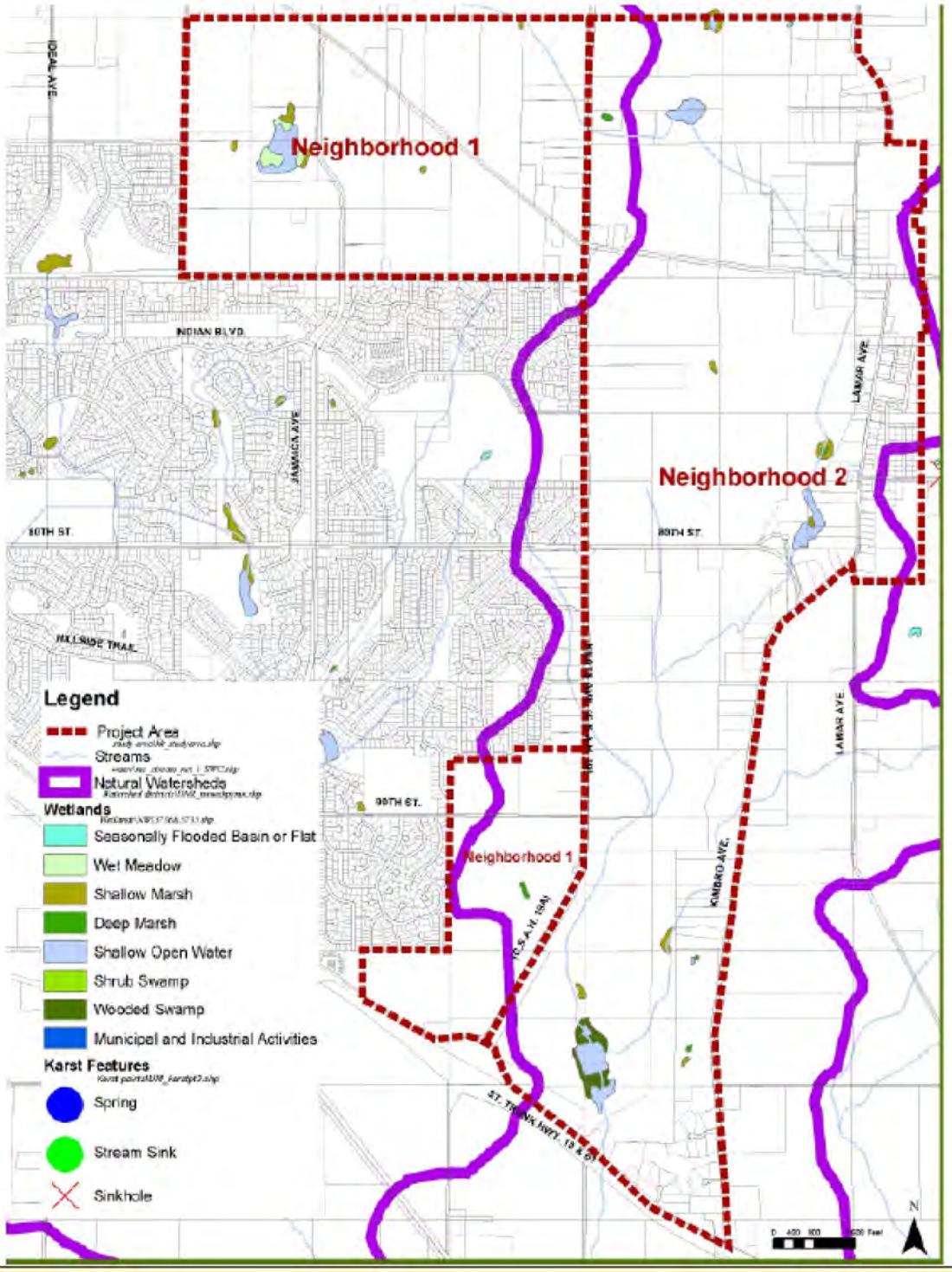


Figure 10.2
Watercourses, Wetlands, Lakes and Streams

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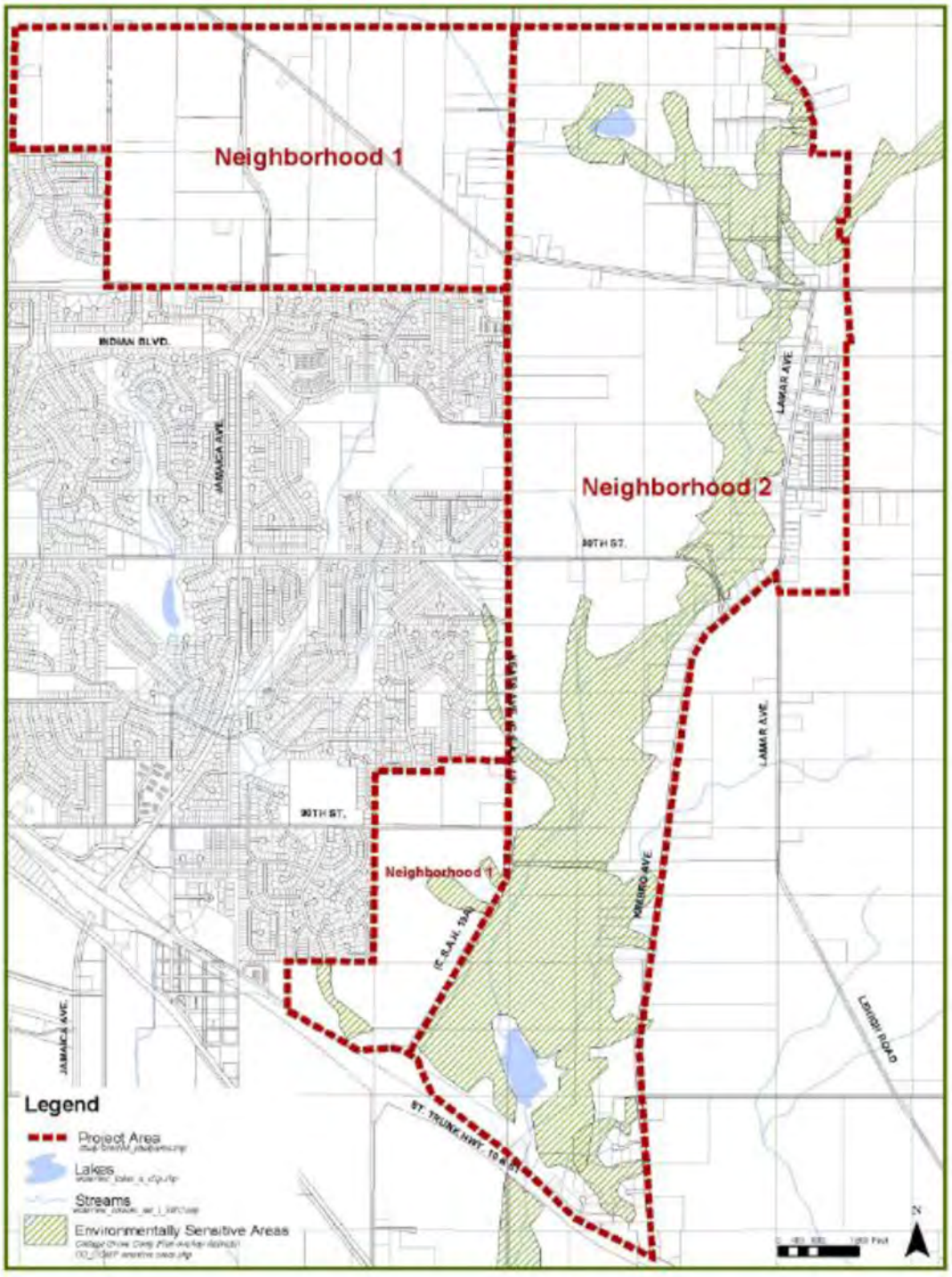


Figure 10.3
Natural Resources Overlay

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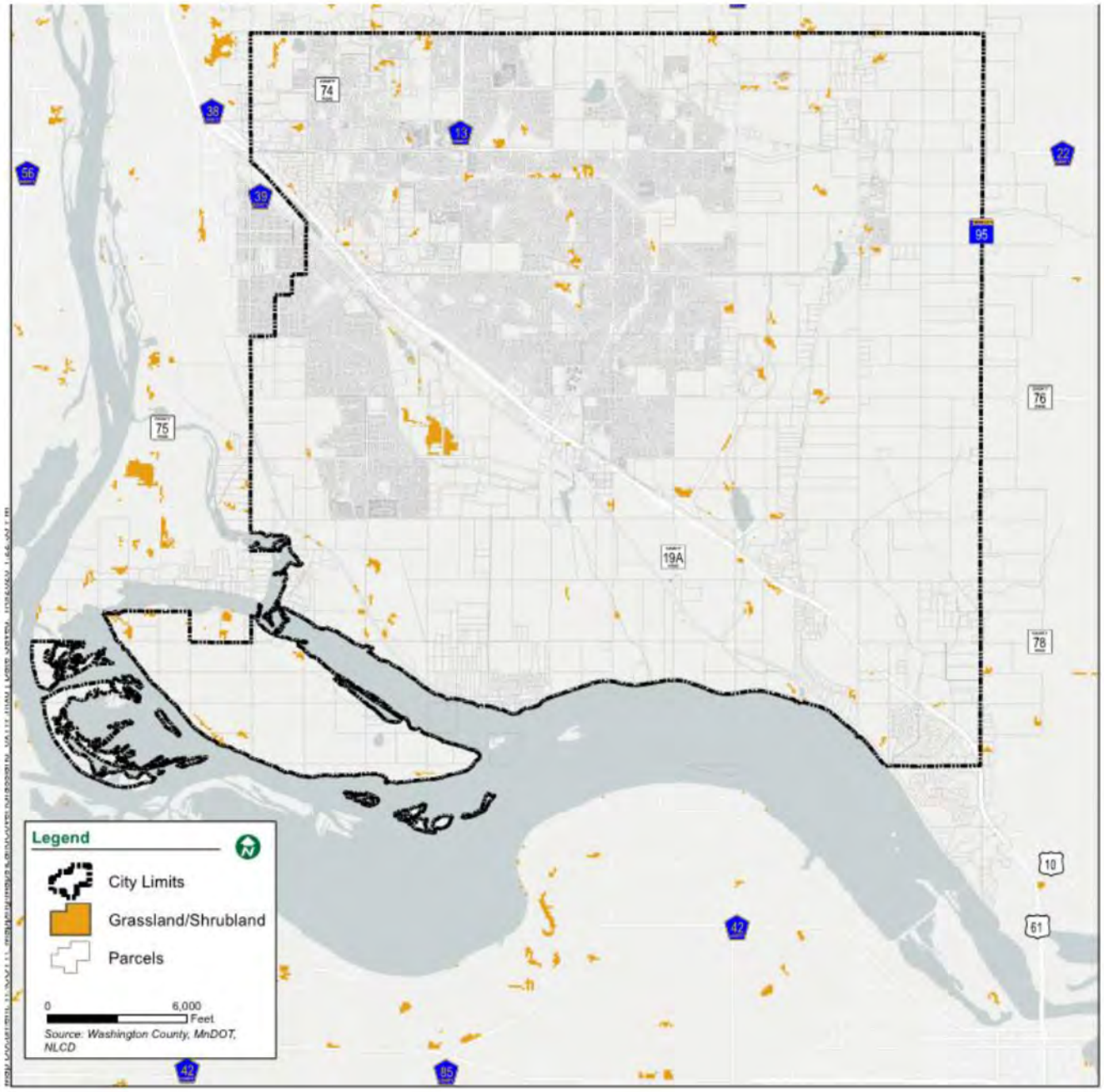


Figure 10.3A
Grassland/Shrubland Map

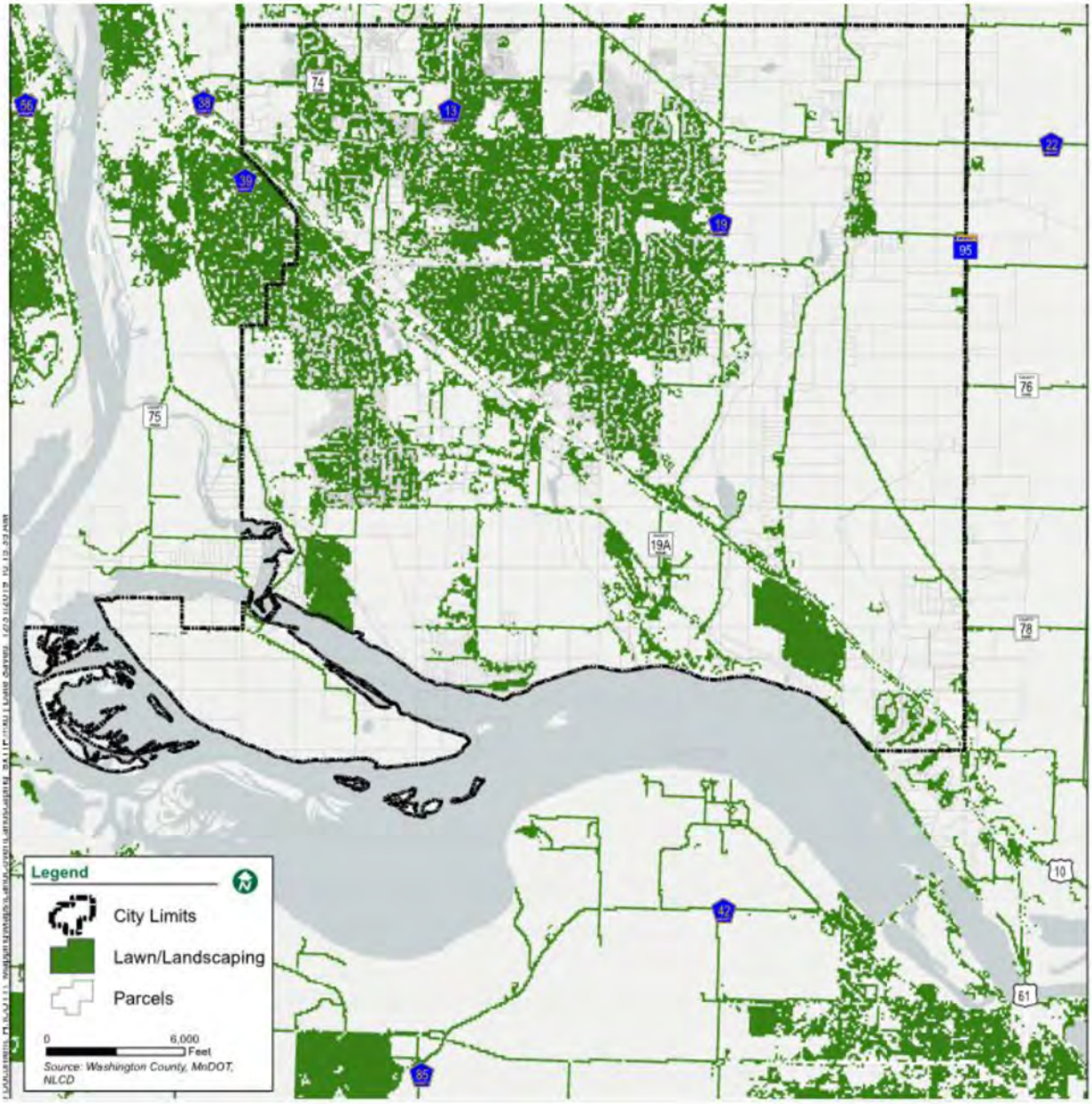


Figure 10.3B
Lawn/Landscape Map

East Ravine Pre-Design
City of Cottage Grove

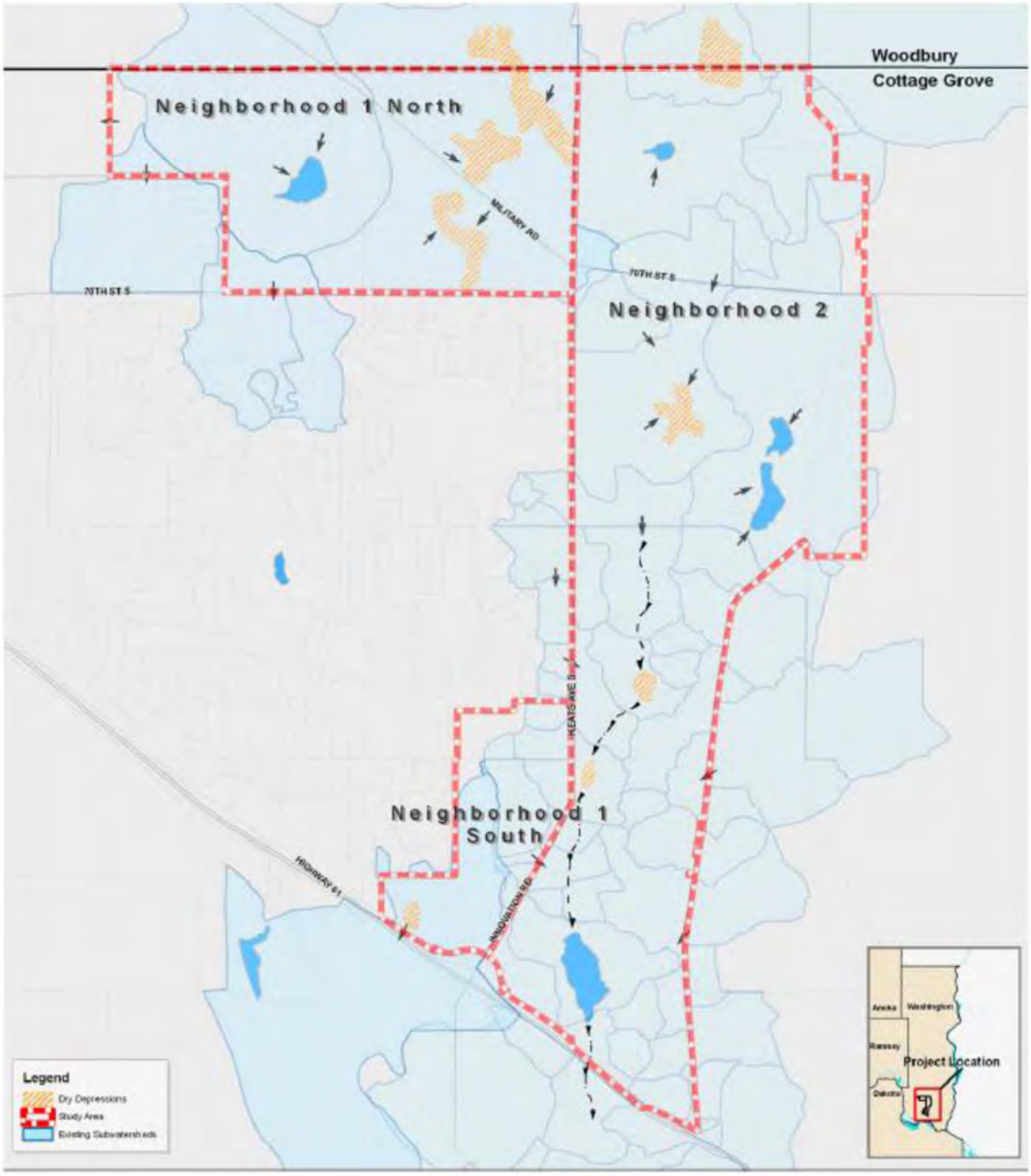


Figure 17.1
Existing Storm Water System

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McComb Group, Ltd.

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City of Cottage Grove

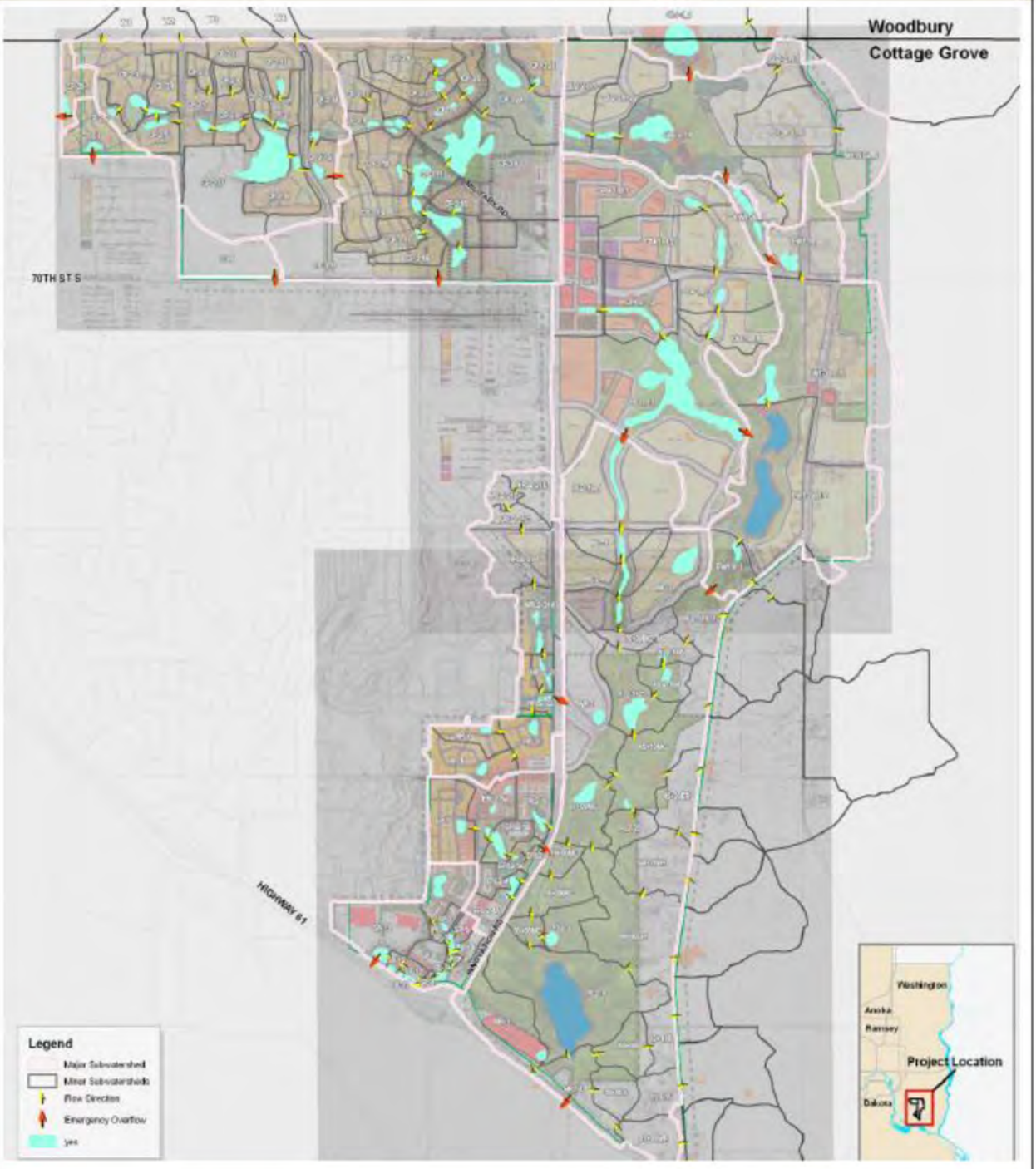


Figure 17.2
Proposed Storm Water System

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IBI Group
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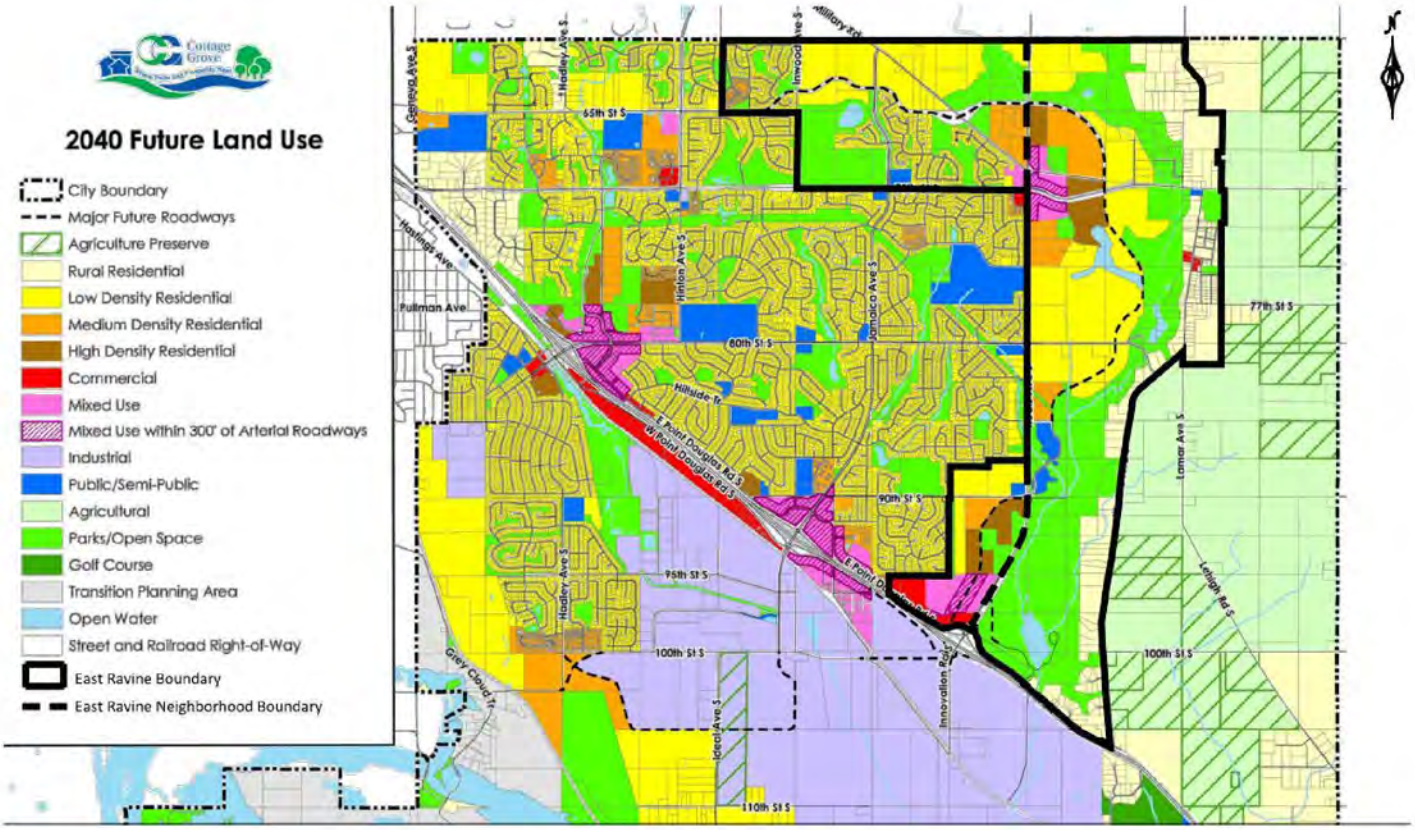


Figure 18.1
Land Use with Ravine Boundary

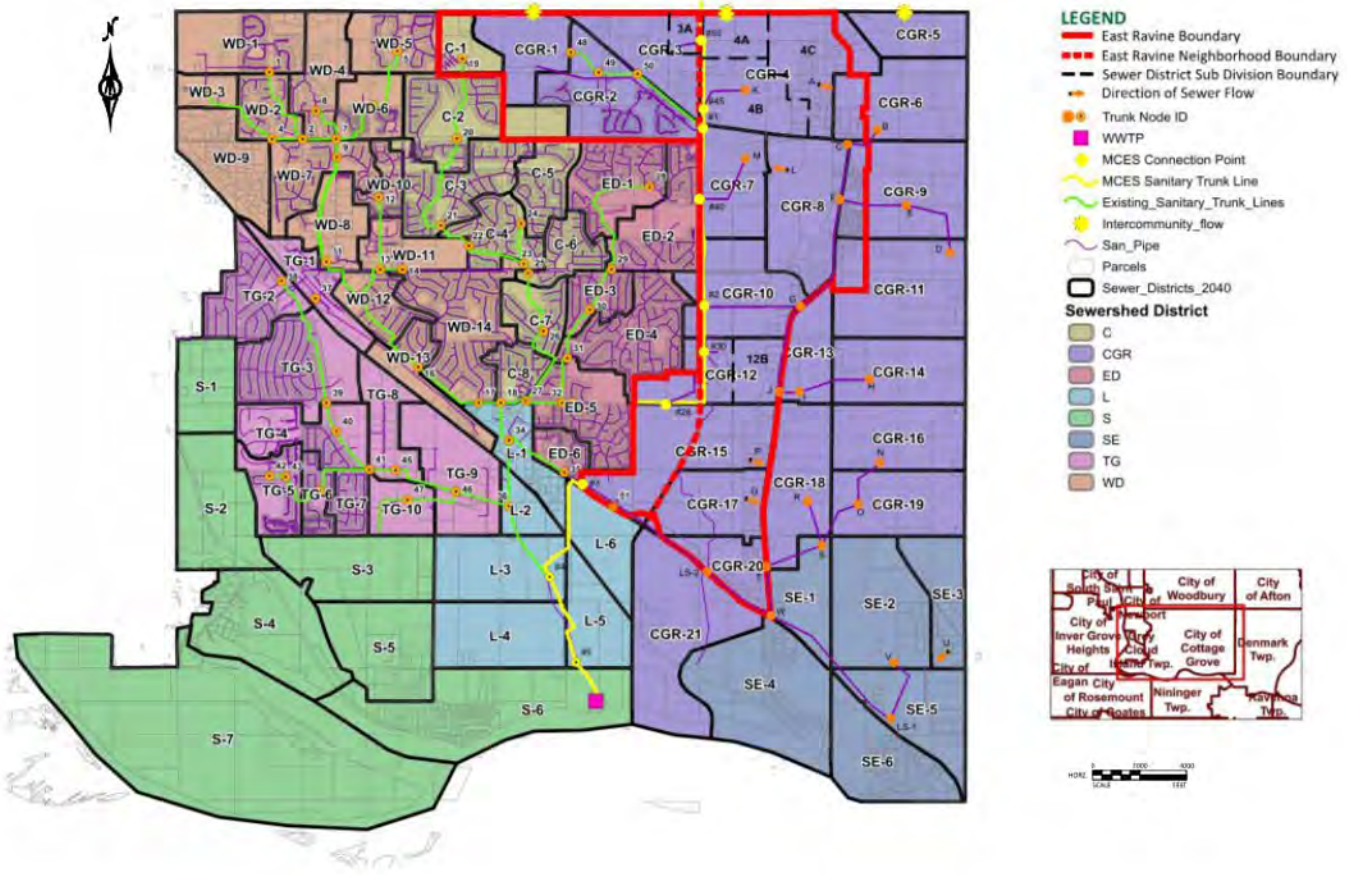


Figure 18.2
Sewer Districts and East Ravine Boundary

East Ravine Pre-Design
City of Cottage Grove

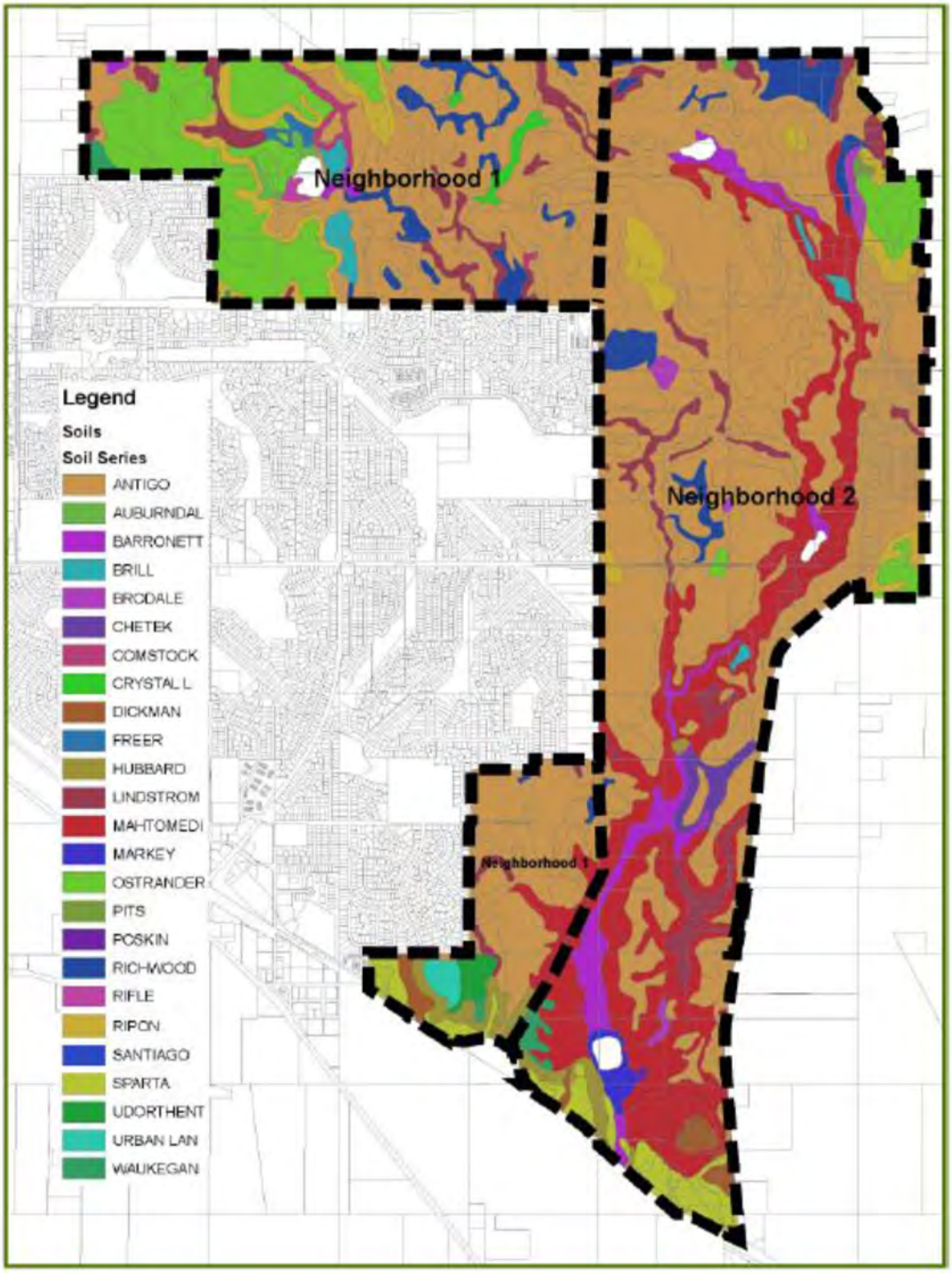


Figure 19.1
Soils Map

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

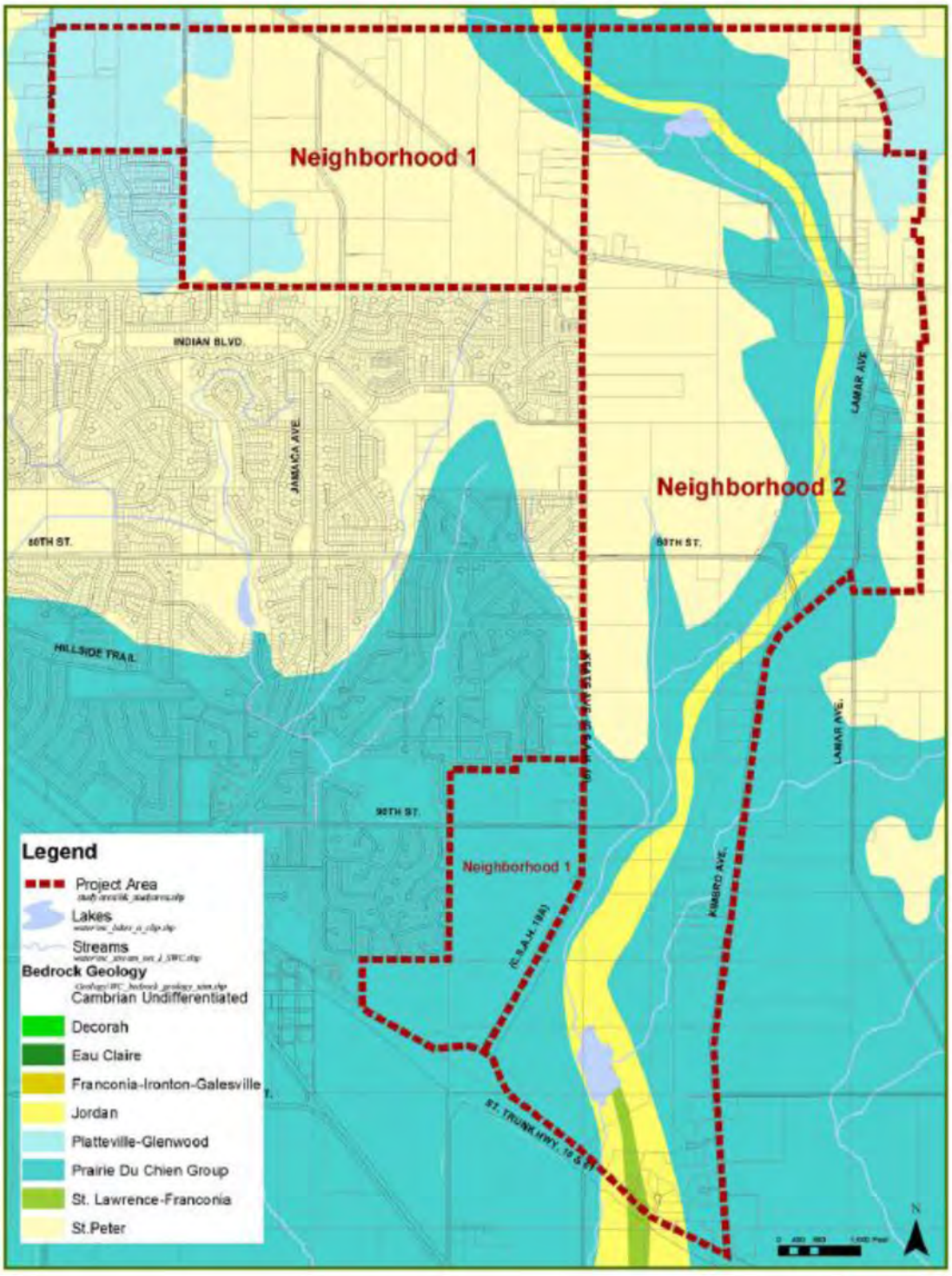


Figure 19.2
Bedrock Geology

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

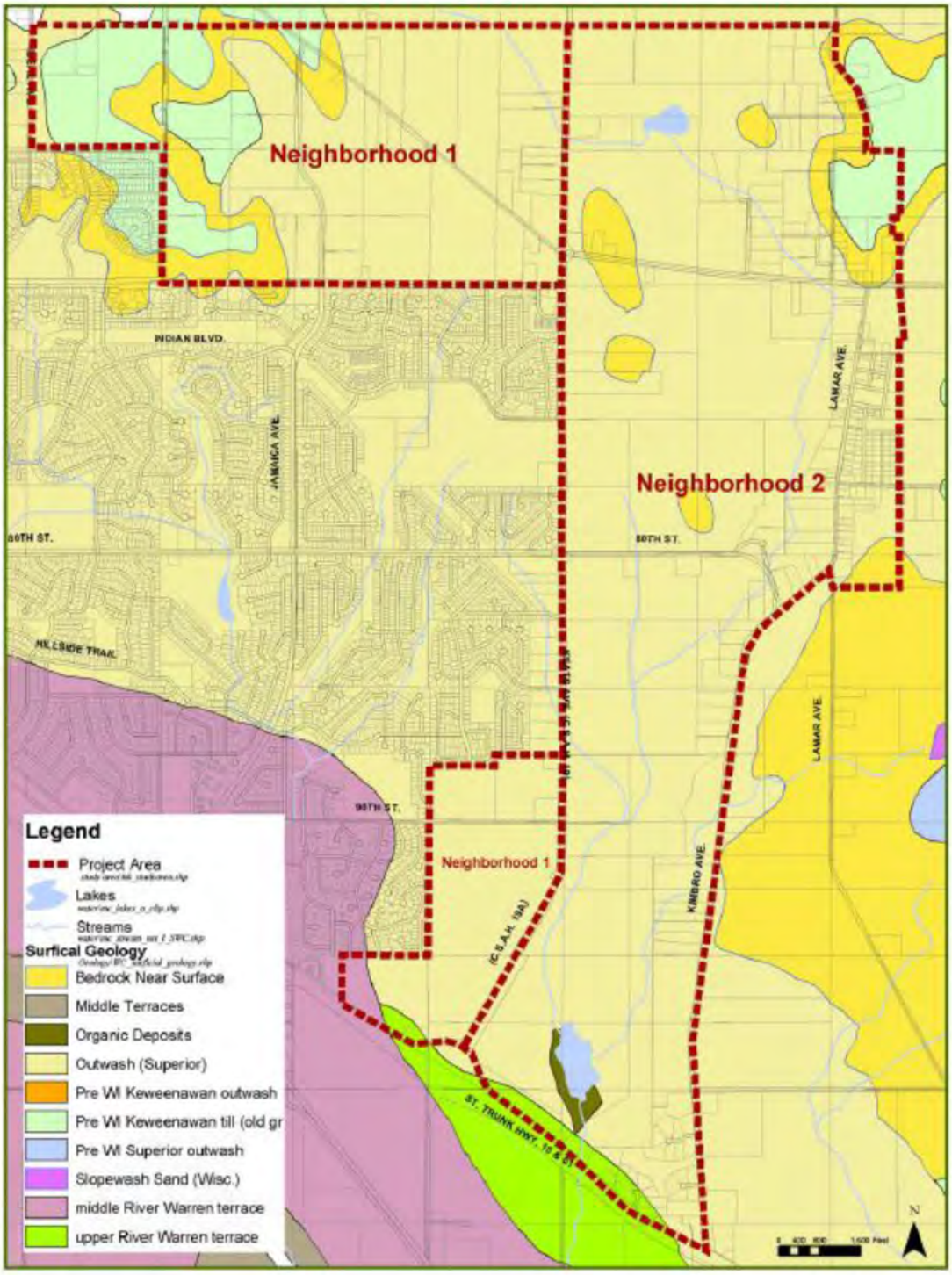


Figure 19.3
Surficial Geology

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

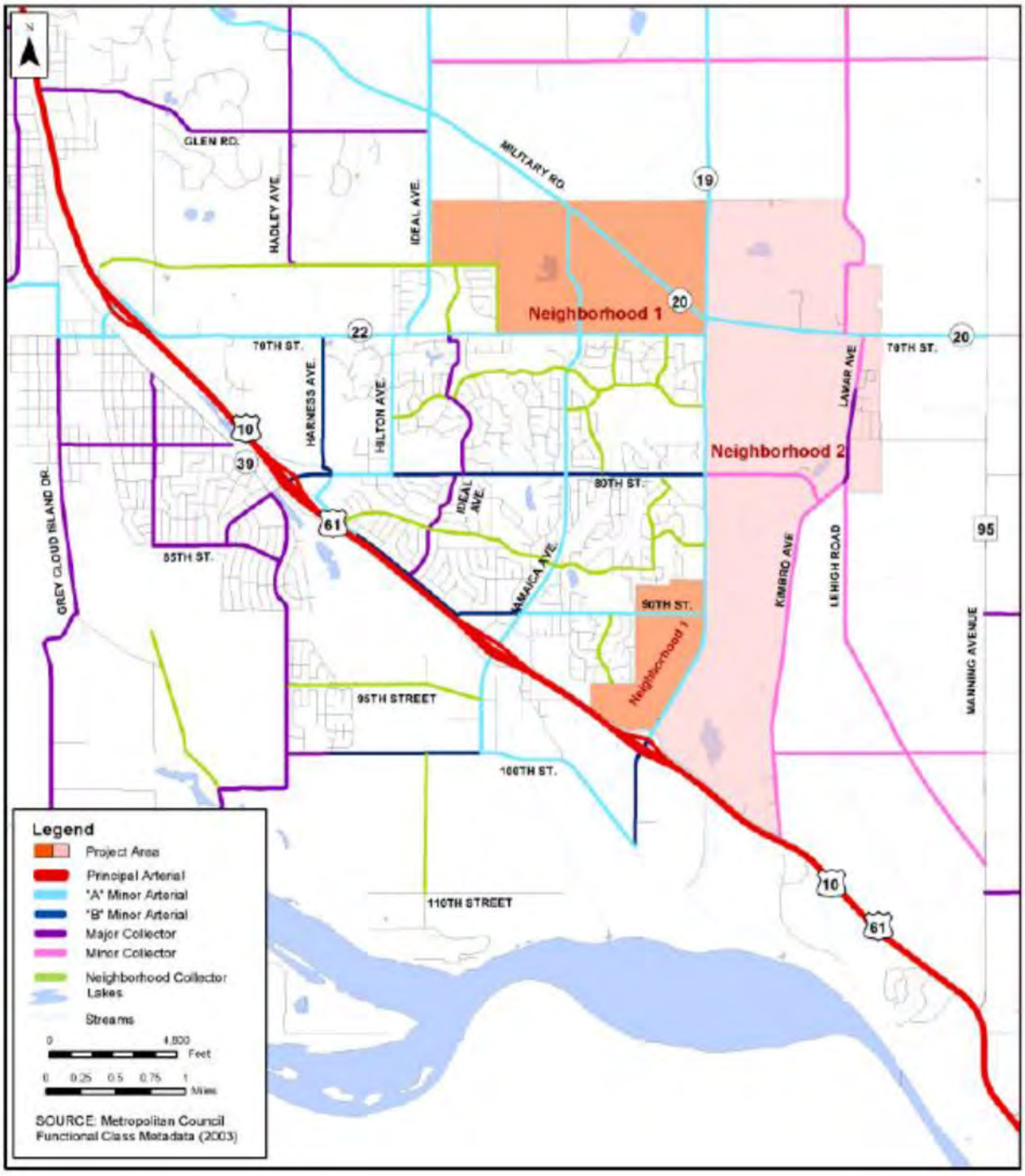


Figure 21.1
Existing Roadway System (2003) Functional Classification

Houston Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McCombs Group, Ltd.

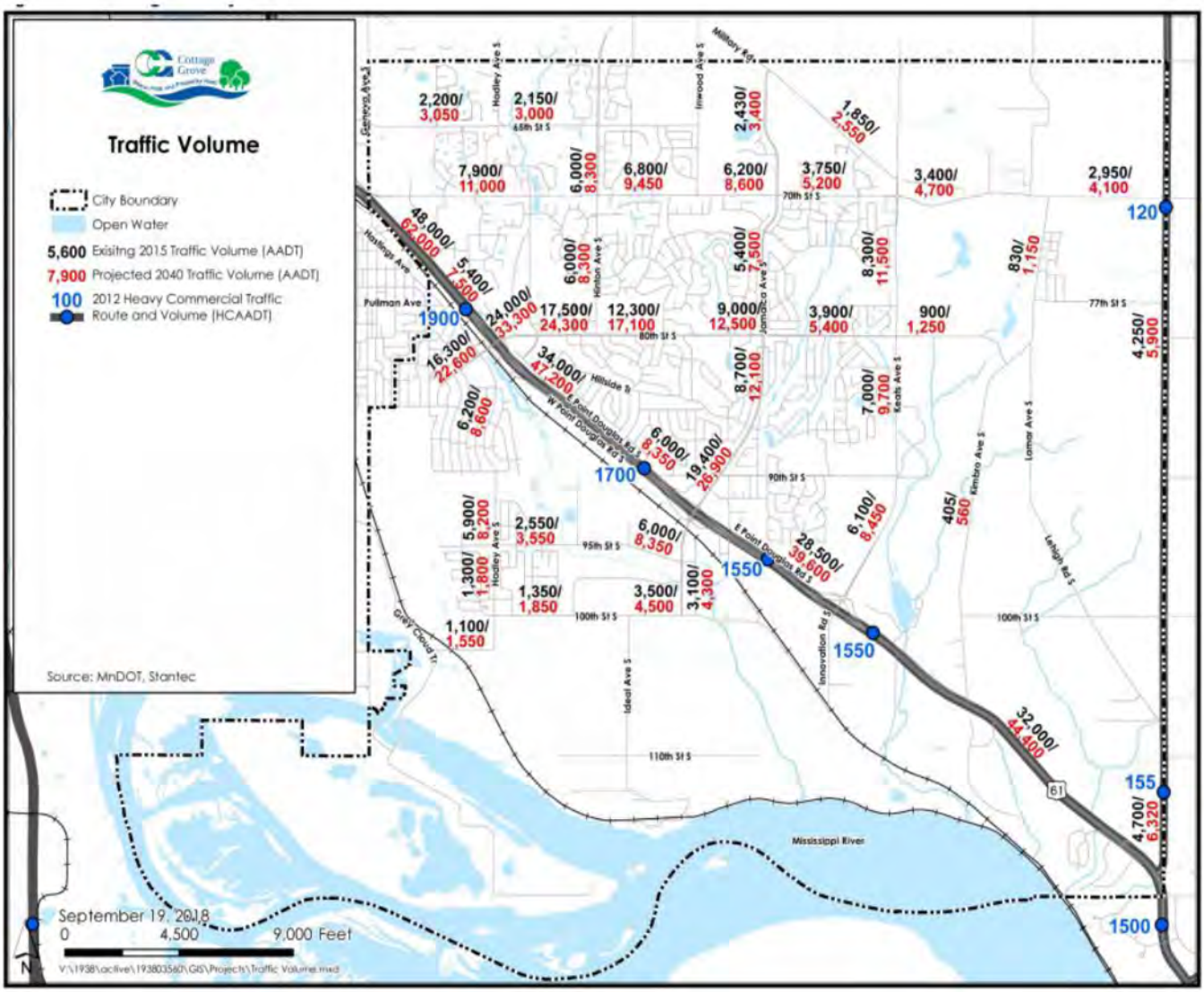


Figure 21.2
~~2014~~ 2015 and 2040 Traffic Volume Map

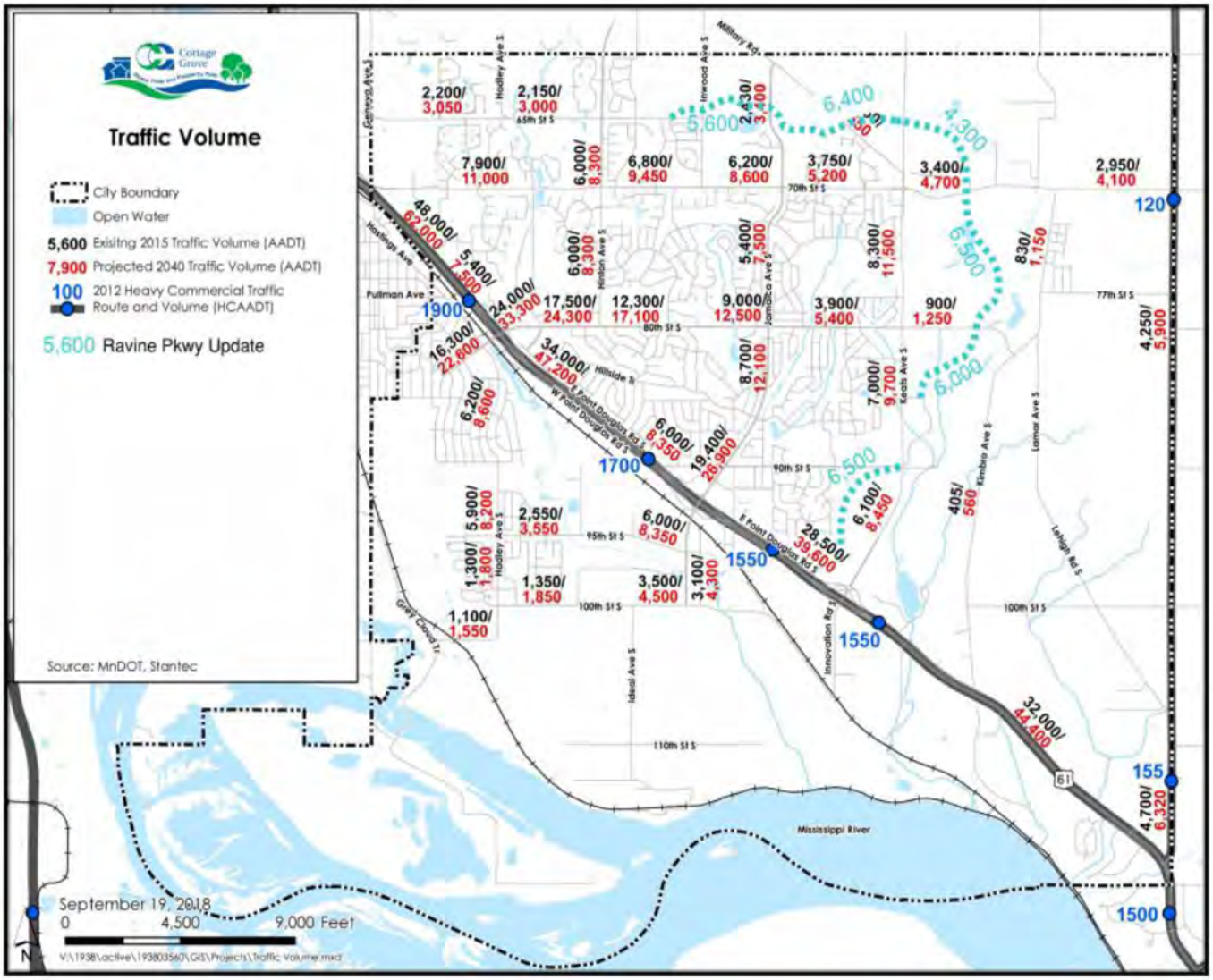


Figure 21.3
2040 Traffic with Ravine Parkway

East Ravine Pre-Design
City of Cottage Grove

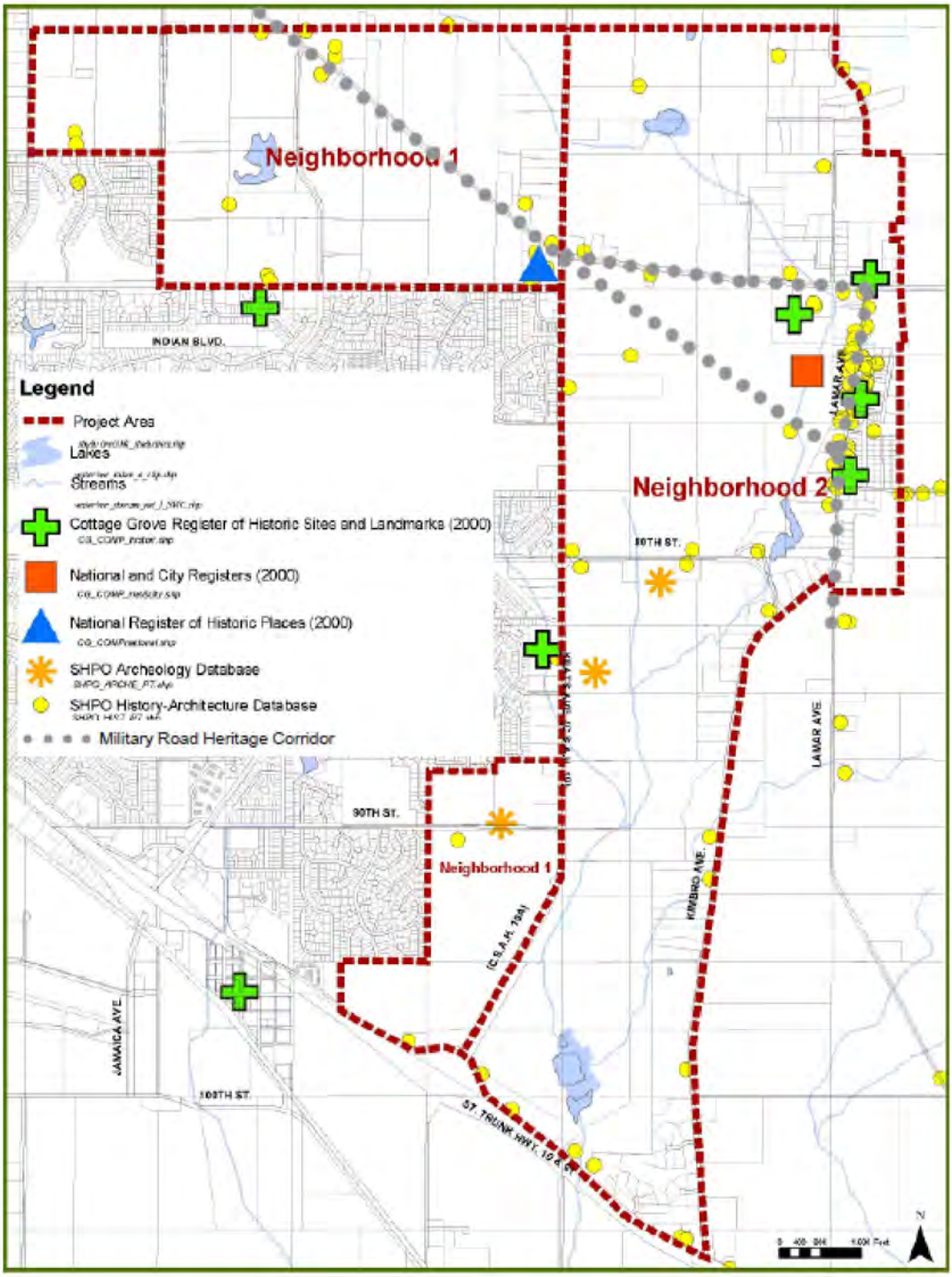


Figure 25.1
Cultural Resources Overlay

Houston Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

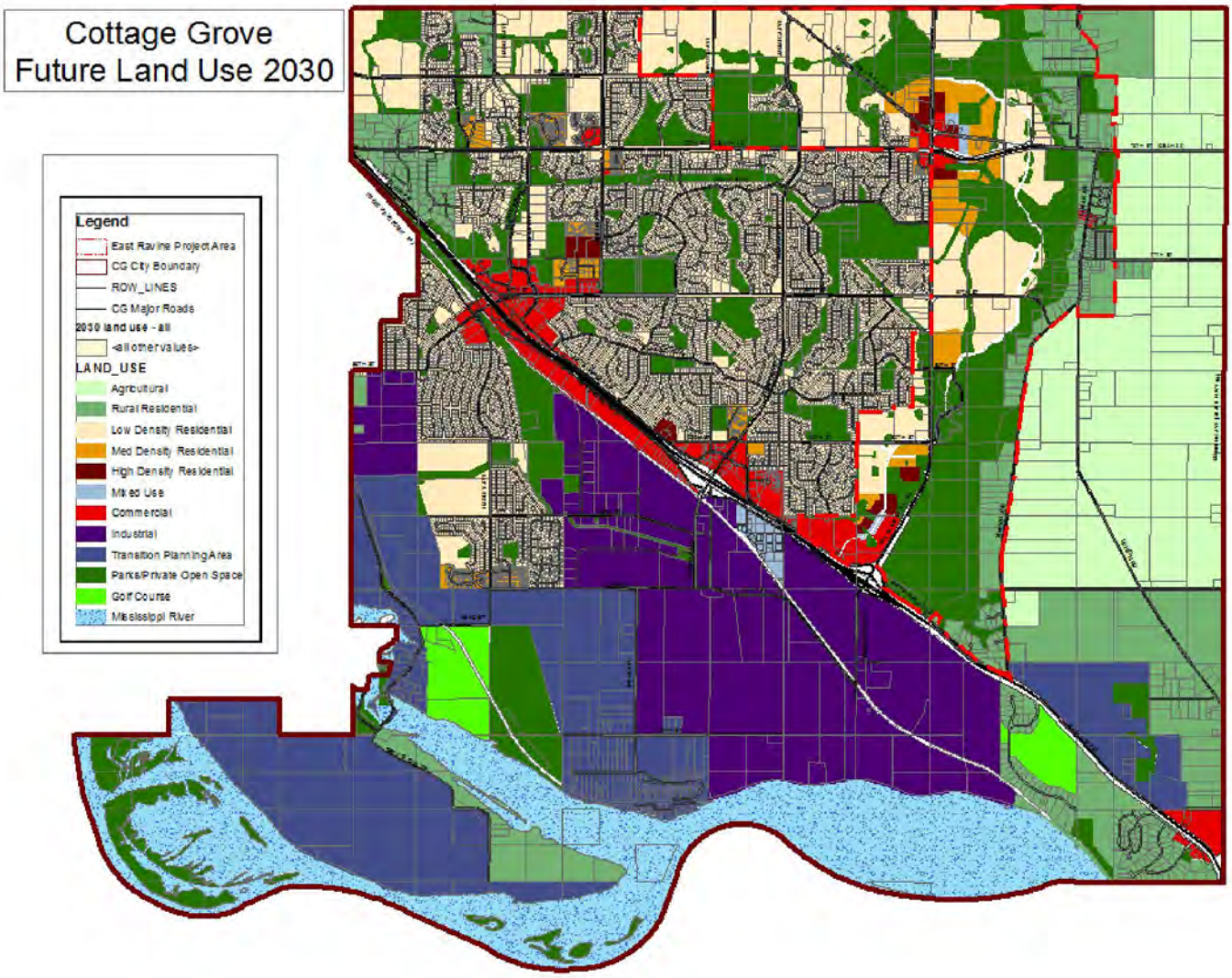


Figure 27.1
2030 Land Use Plan

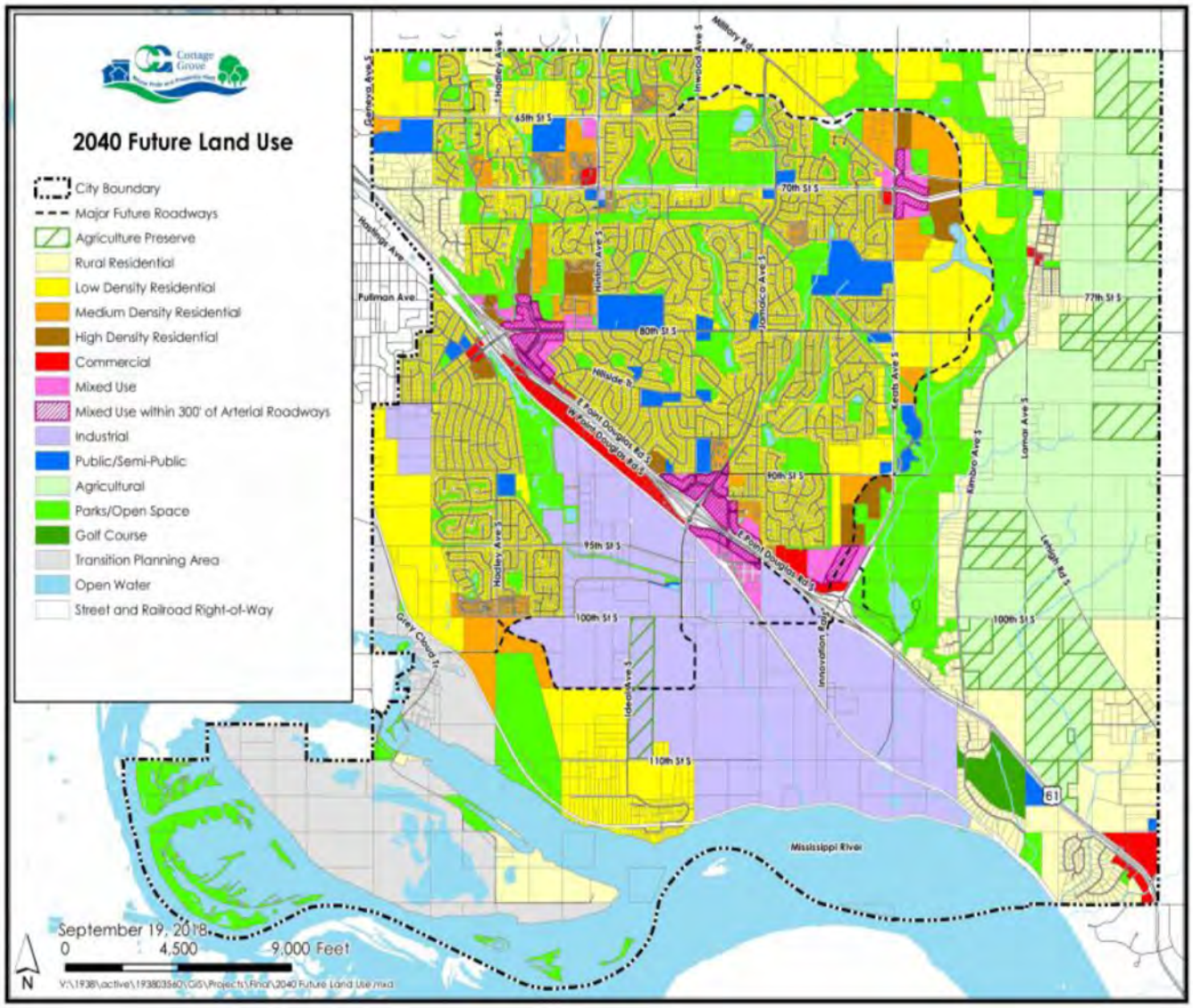


Figure 27.1A
2040 Land Use Plan

East Ravine Pre-Design
City of Cottage Grove

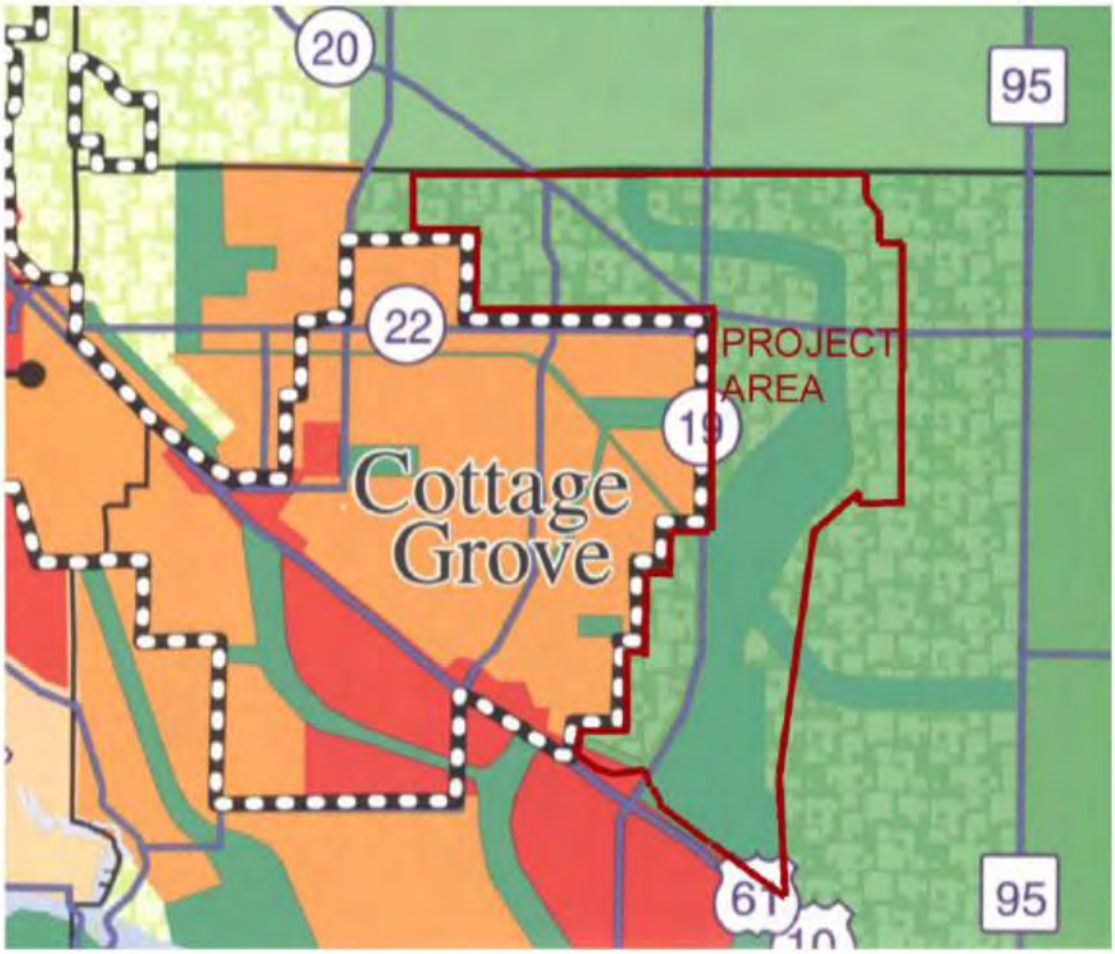
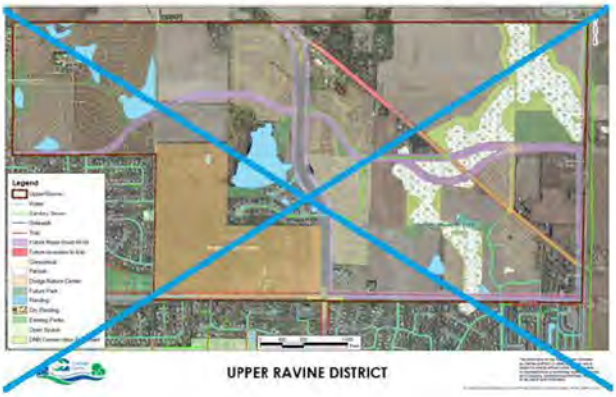
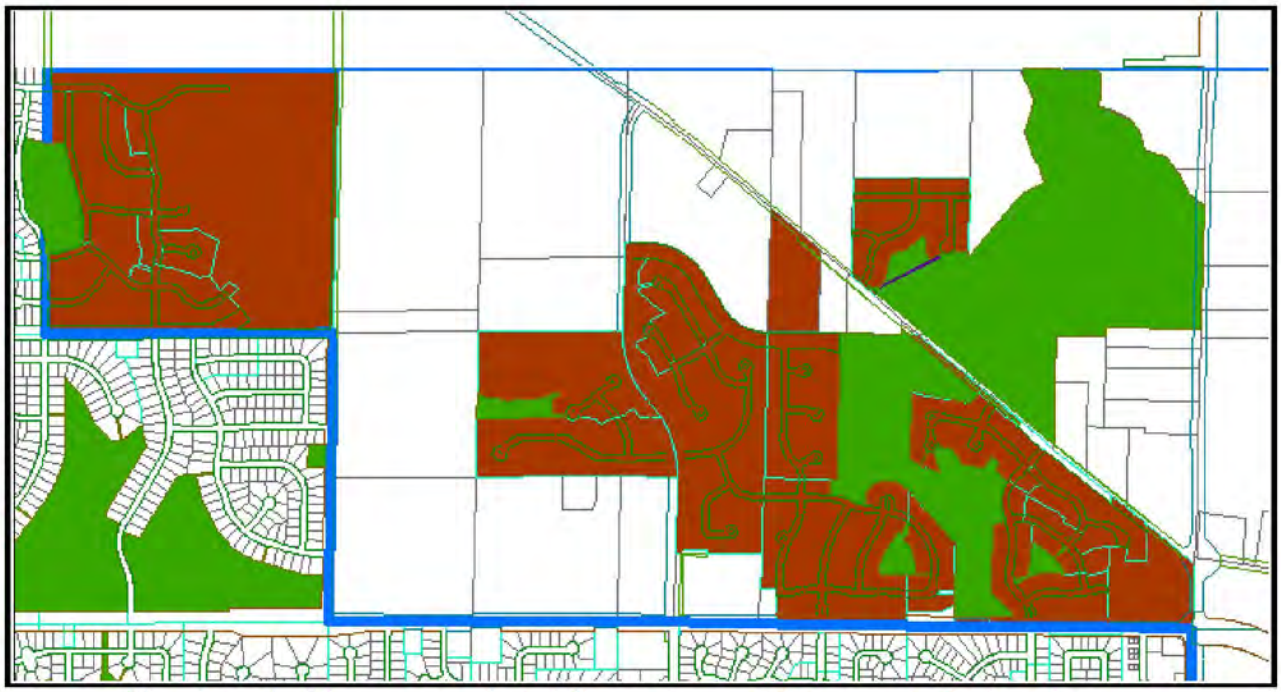


Figure 27.2
Washington County Comprehensive Plan

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.





The Areas in Maroon are platted Properties, and the green is Park and open space

Figure 27.3
Upper Ravine District Development Update Detail

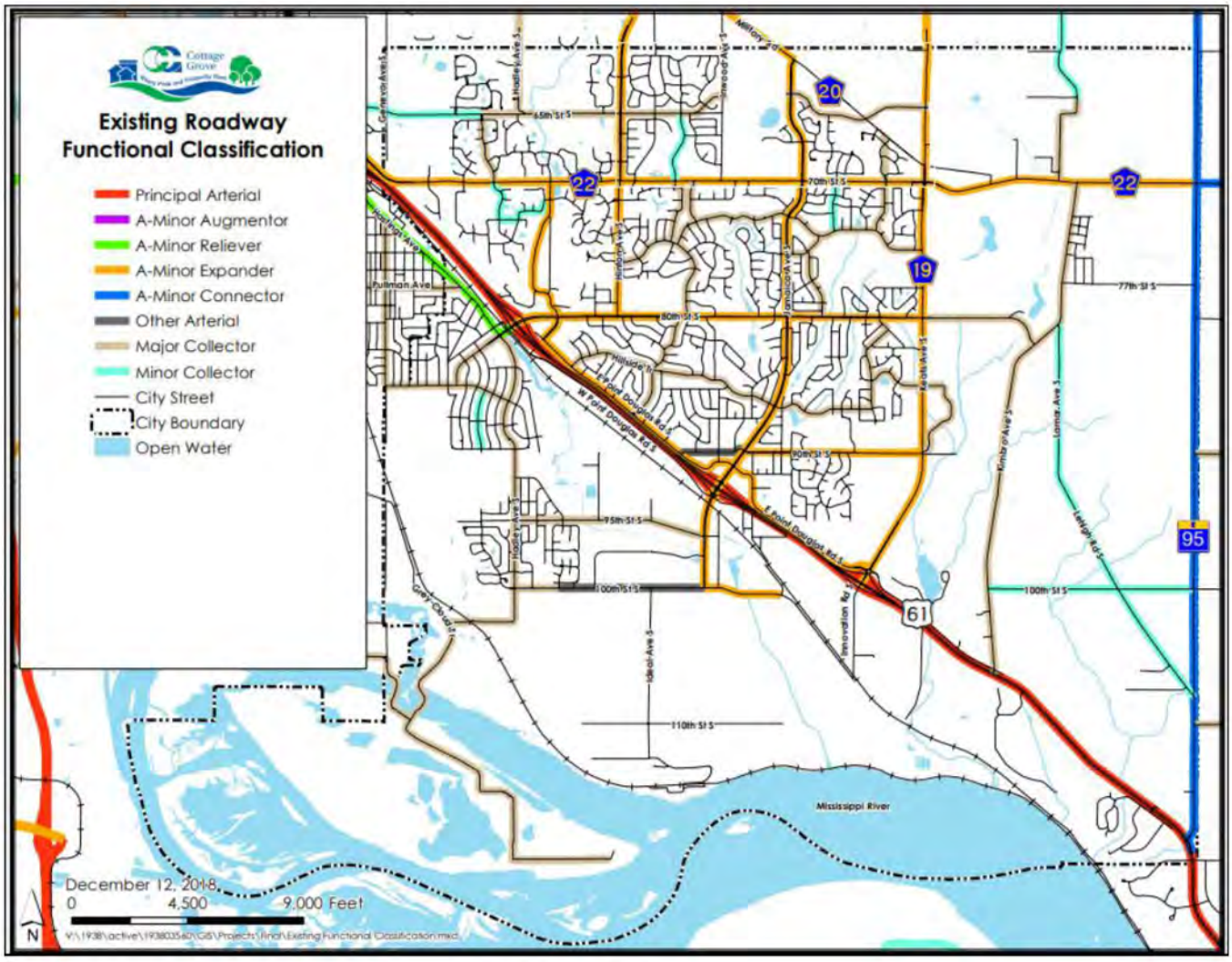


Figure 27.4
2018 Roadway Functional Classification Map

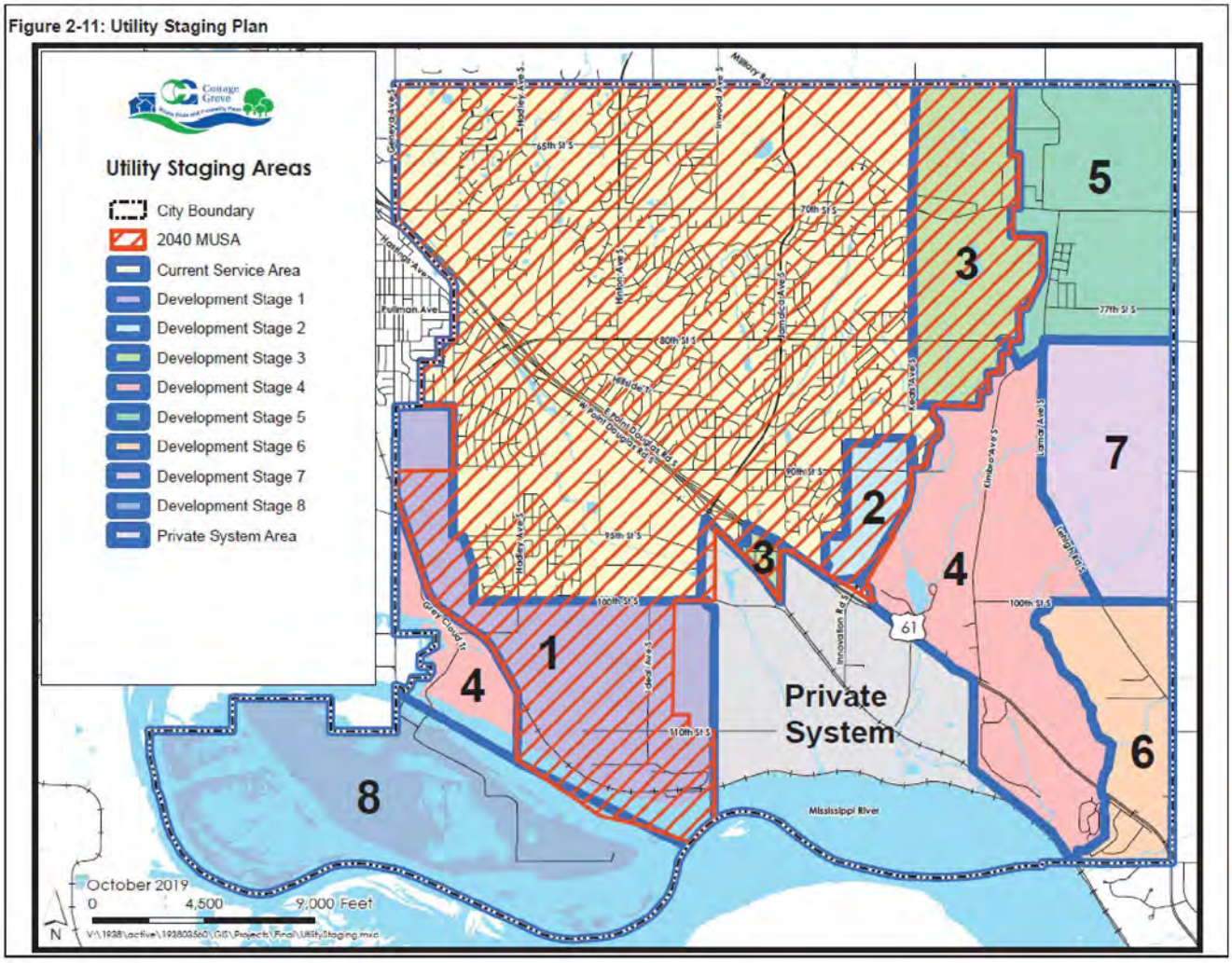


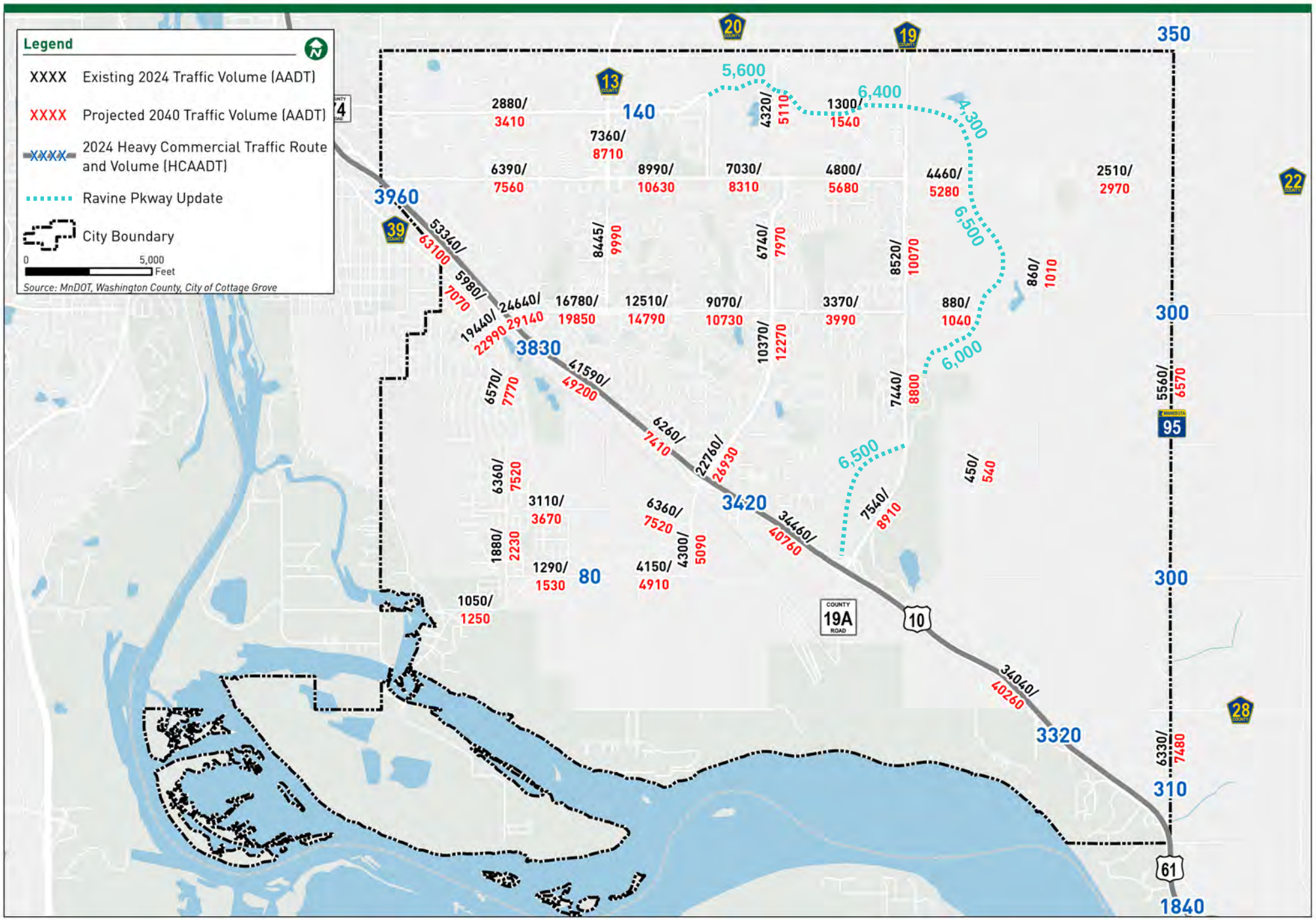
Figure 27.5
2040 Development Staging Plan

Cottage Grove East Ravine AUAR

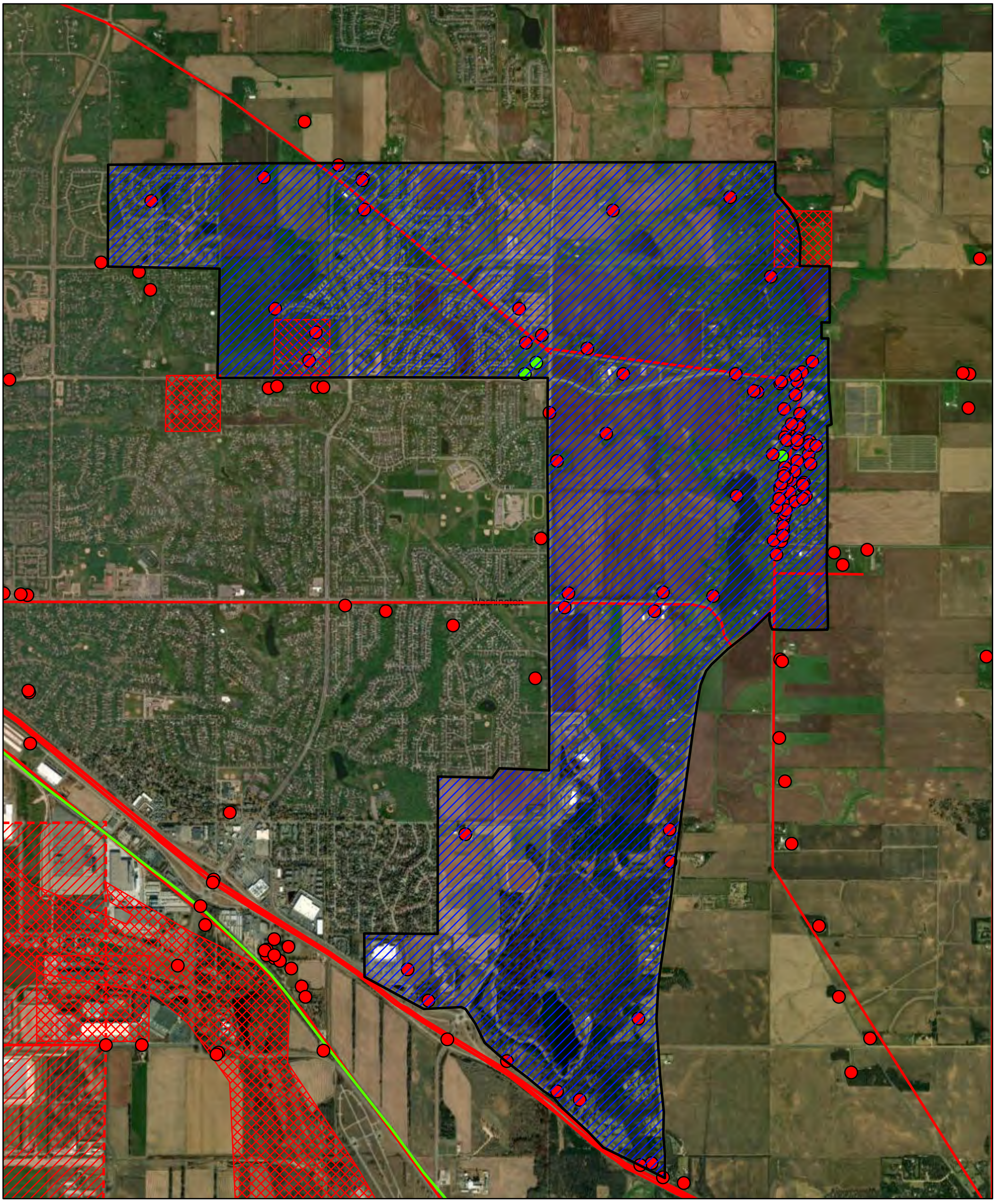
City of Cottage Grove, MN

Existing and Projected AADT

August 2025



AUAR Study Area



9/10/2025

MnSHIP Points
- NR Listed or Eligible
- Inventoried

MnSHIP Lines
- NR Listed or Eligible
- Inventoried

MnSHIP Polygons
- Inventoried
- Restricted
- County Boundaries

World Imagery
Low Resolution 15m Imagery
High Resolution 60cm Imagery
High Resolution 30cm Imagery
Citations

1:36,500

0 0.3 0.6 1.2 mi

0 0.5 1 2 km

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

East Ravine Pre-Design
City of Cottage Grove

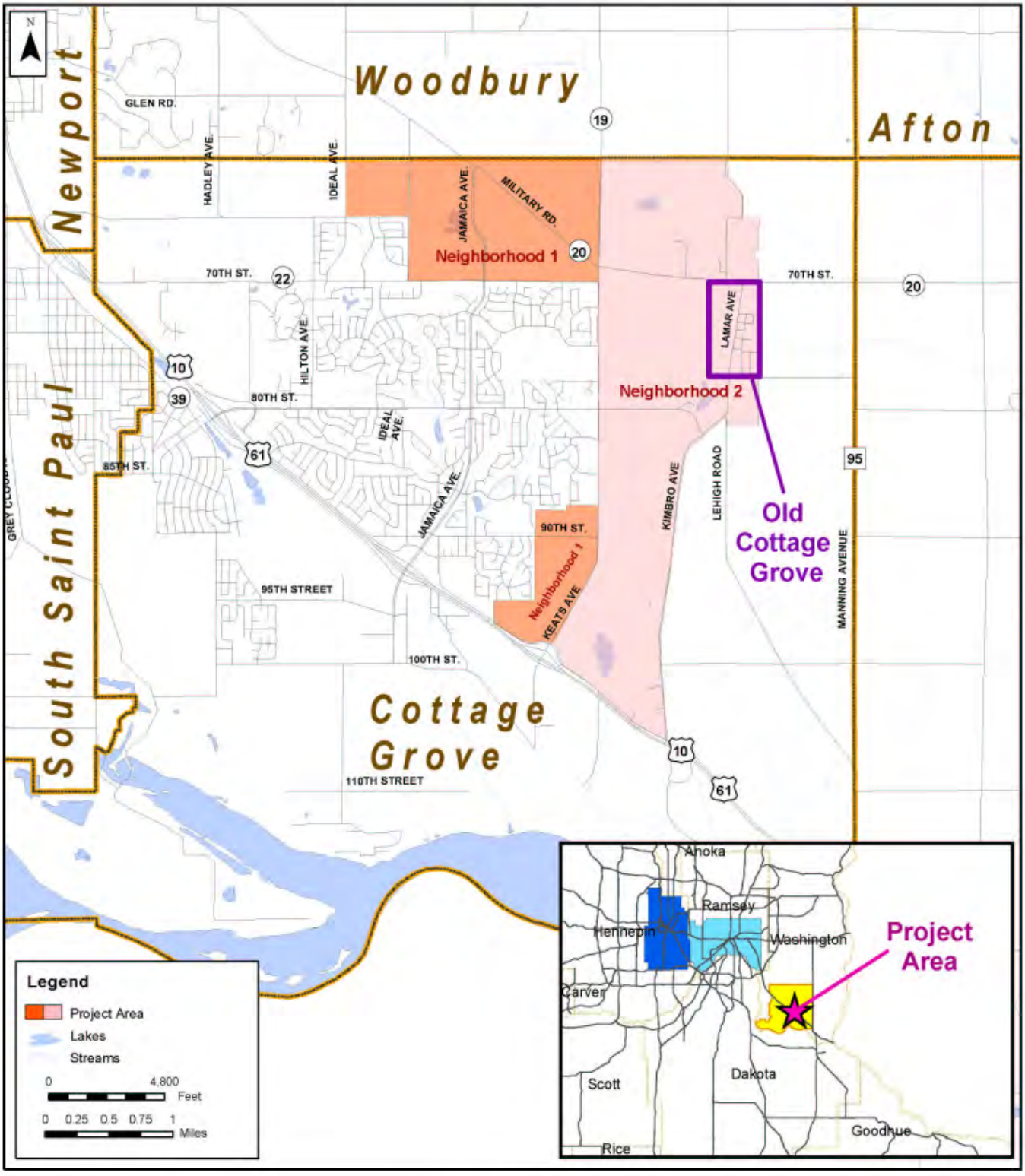


Figure 1
Project Location

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

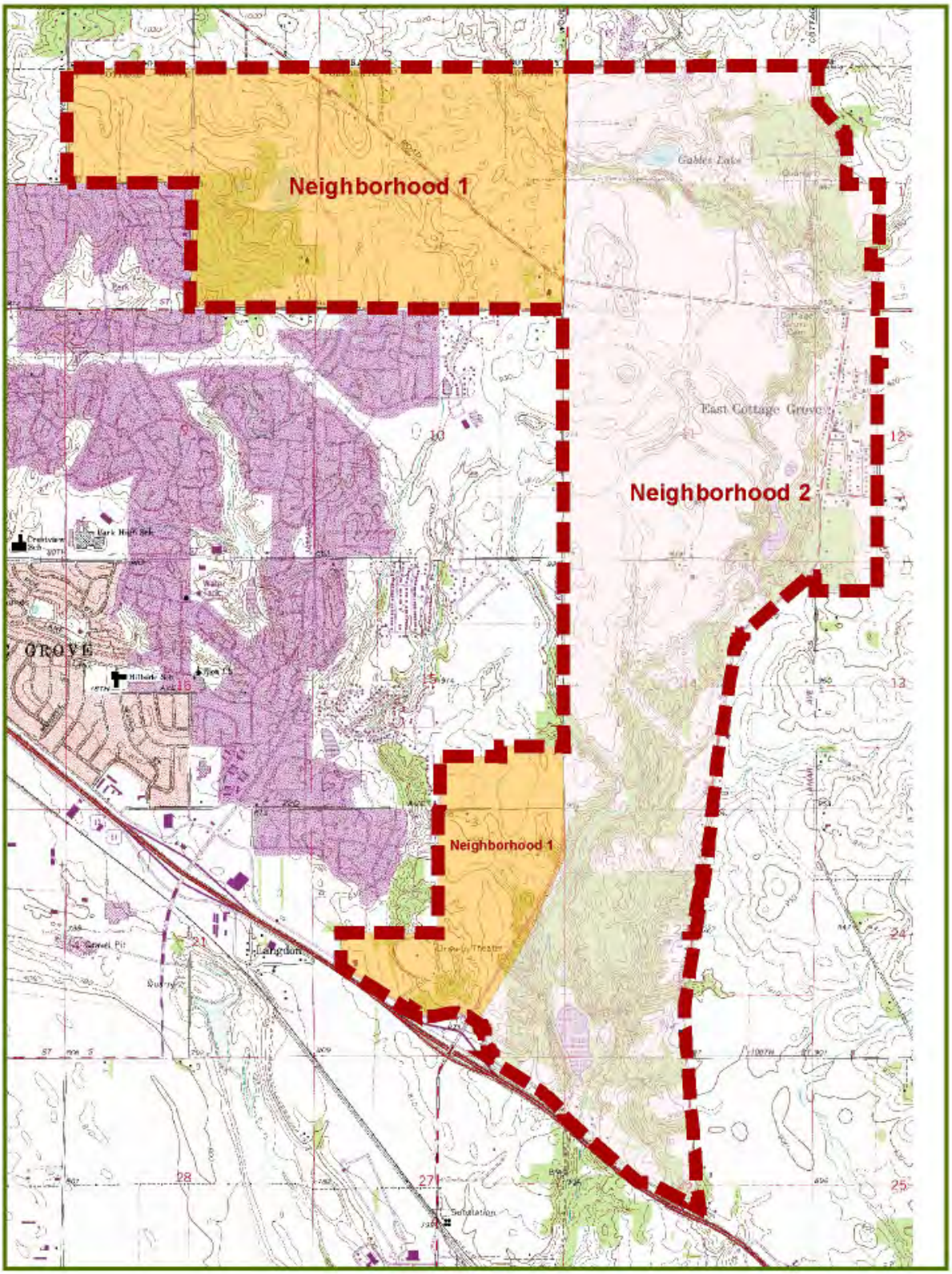


Figure 2
AUAR Boundary / USGS Map

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

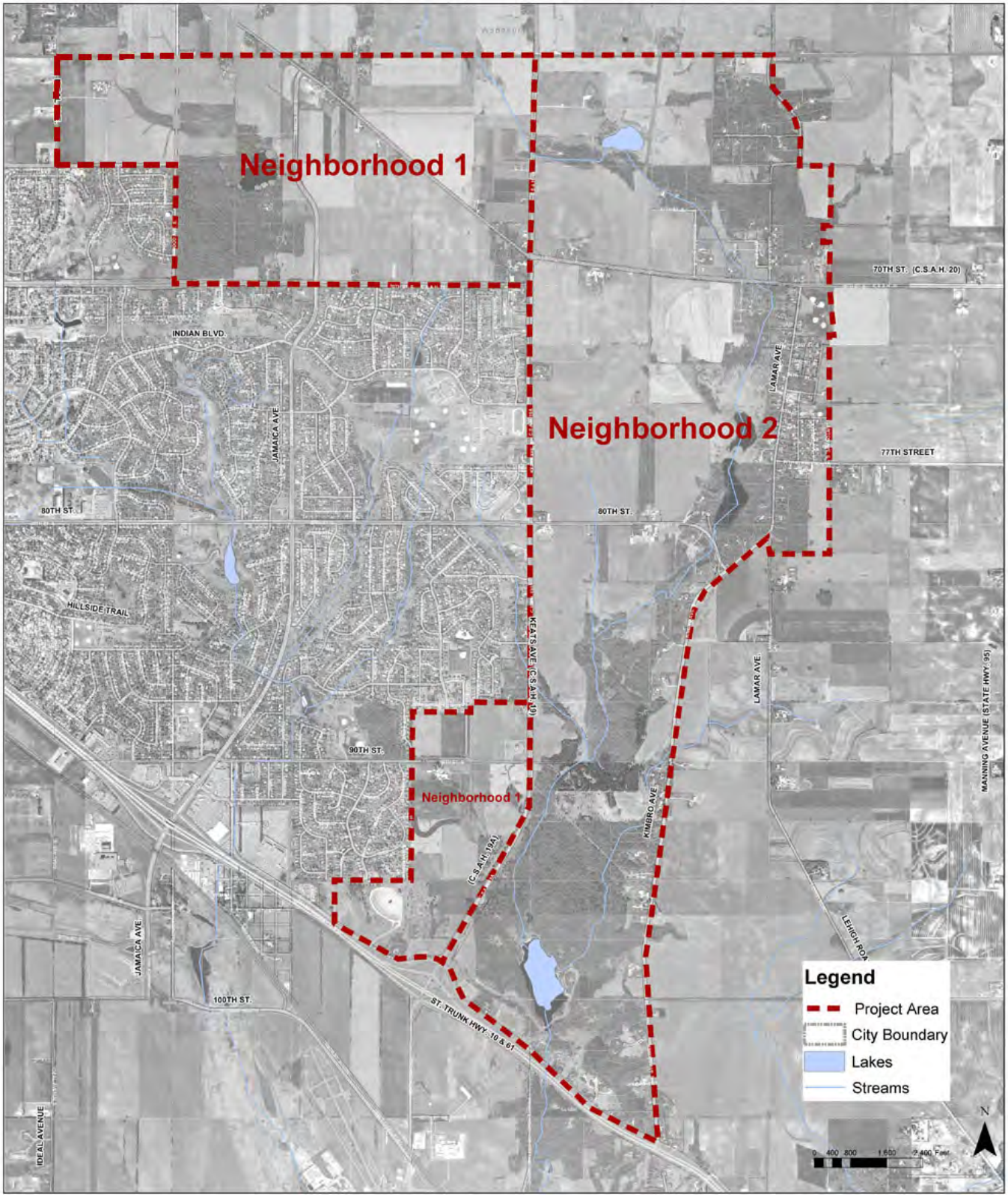


Figure 3
Cottage Grove East Ravine Districts

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

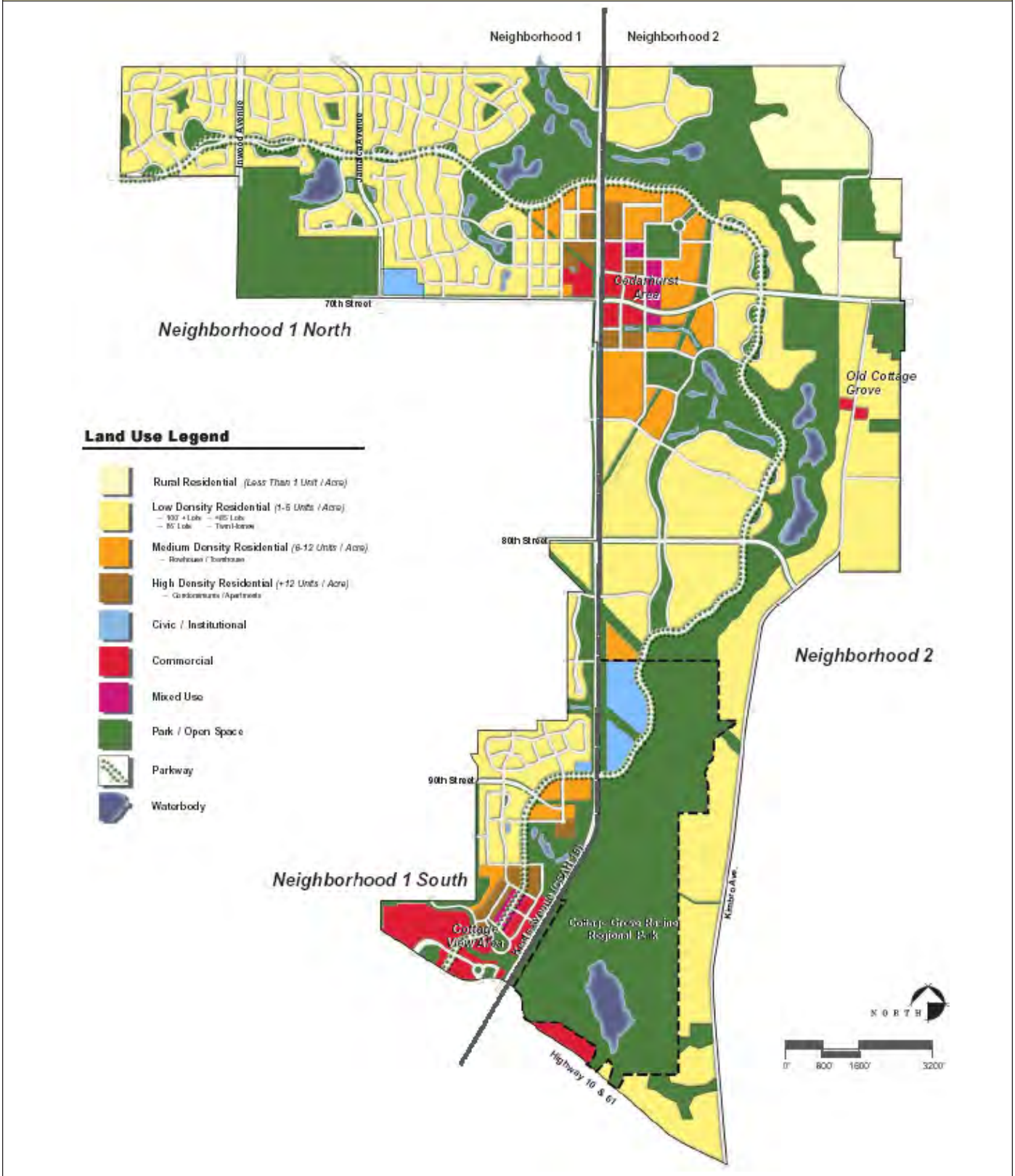


Figure 4
Development Scenario / Master Plan

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

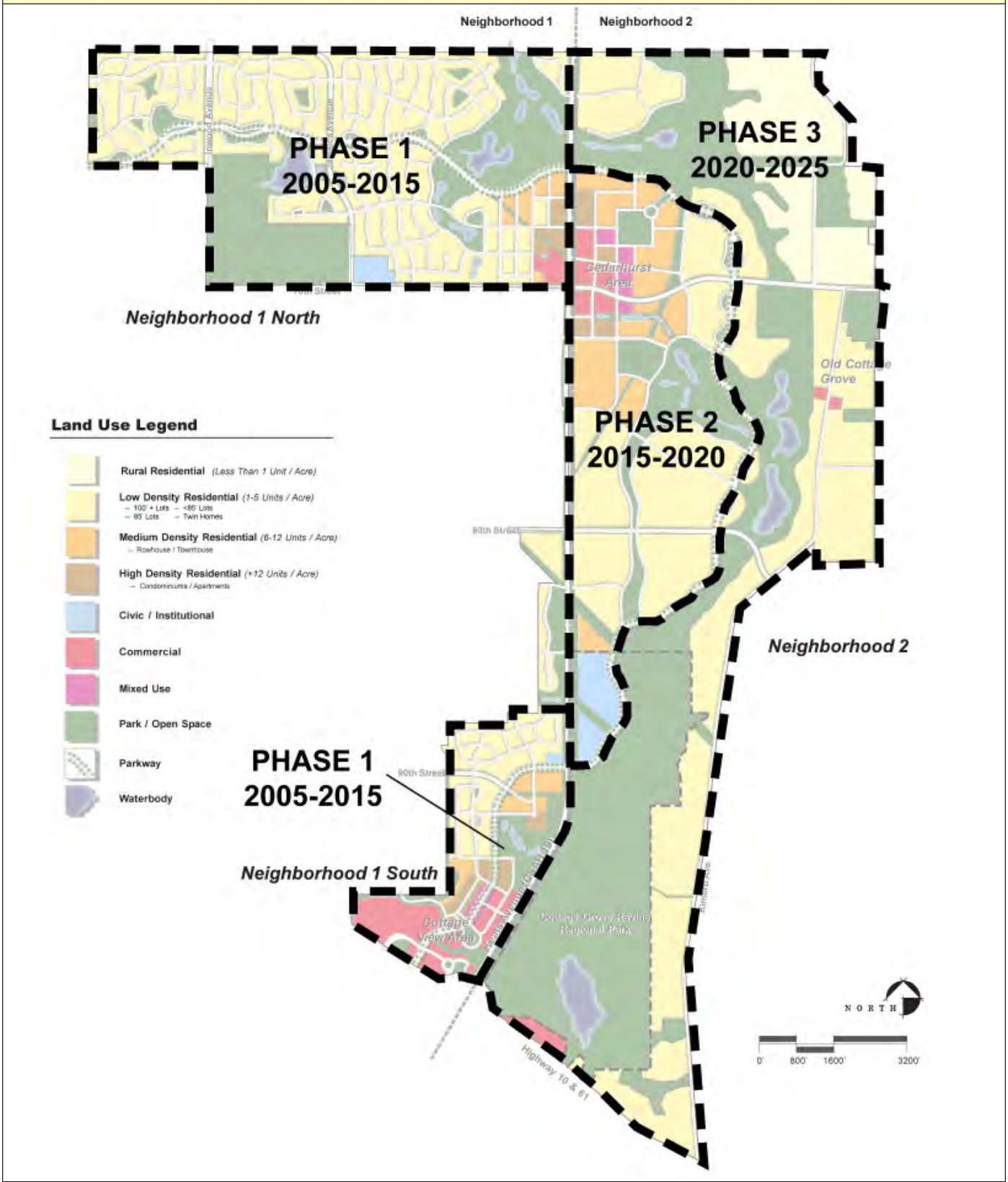


Figure 5
Preliminary Phasing Plan

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

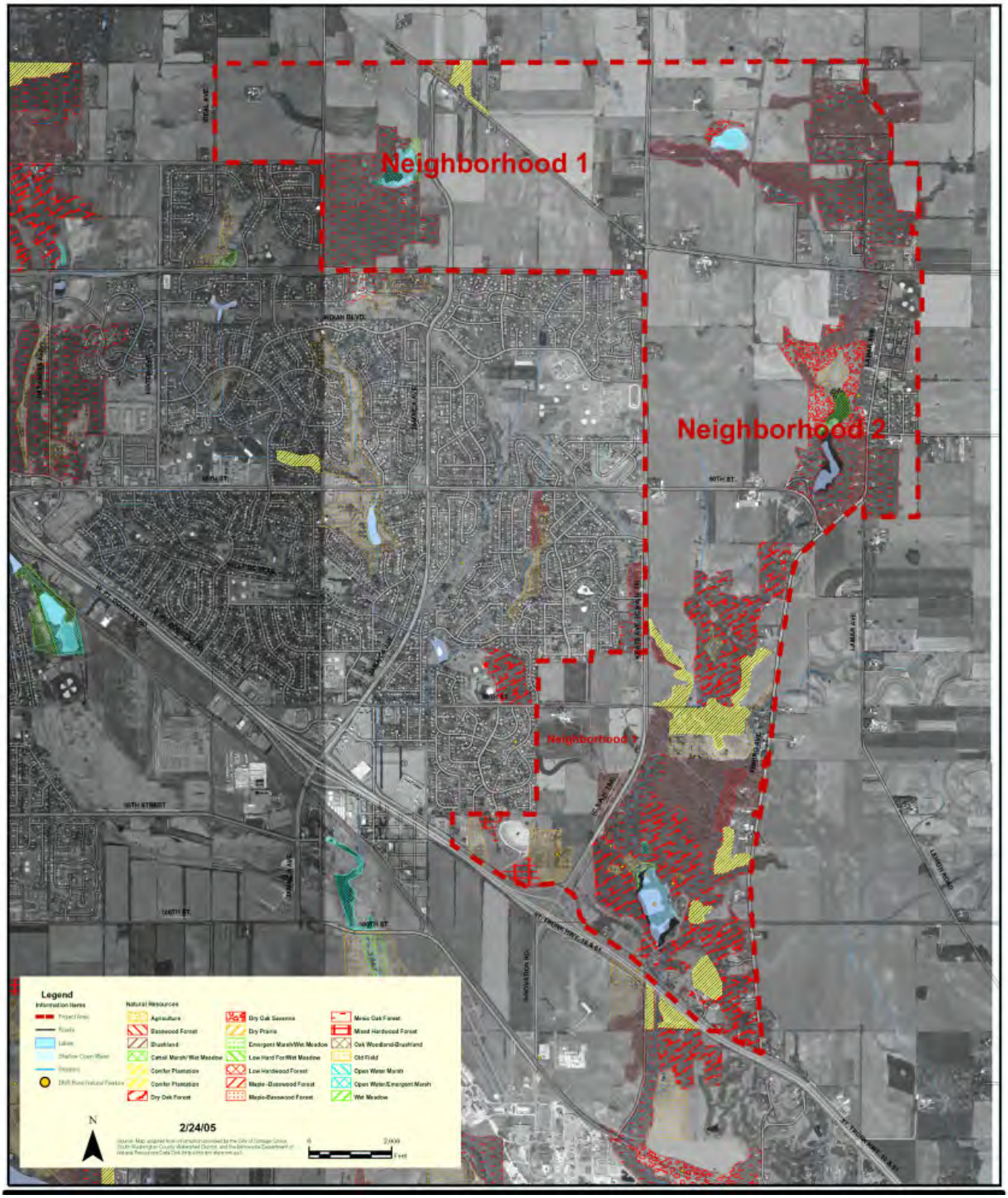


Figure 6
Land Cover - Natural Resource Inventory

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

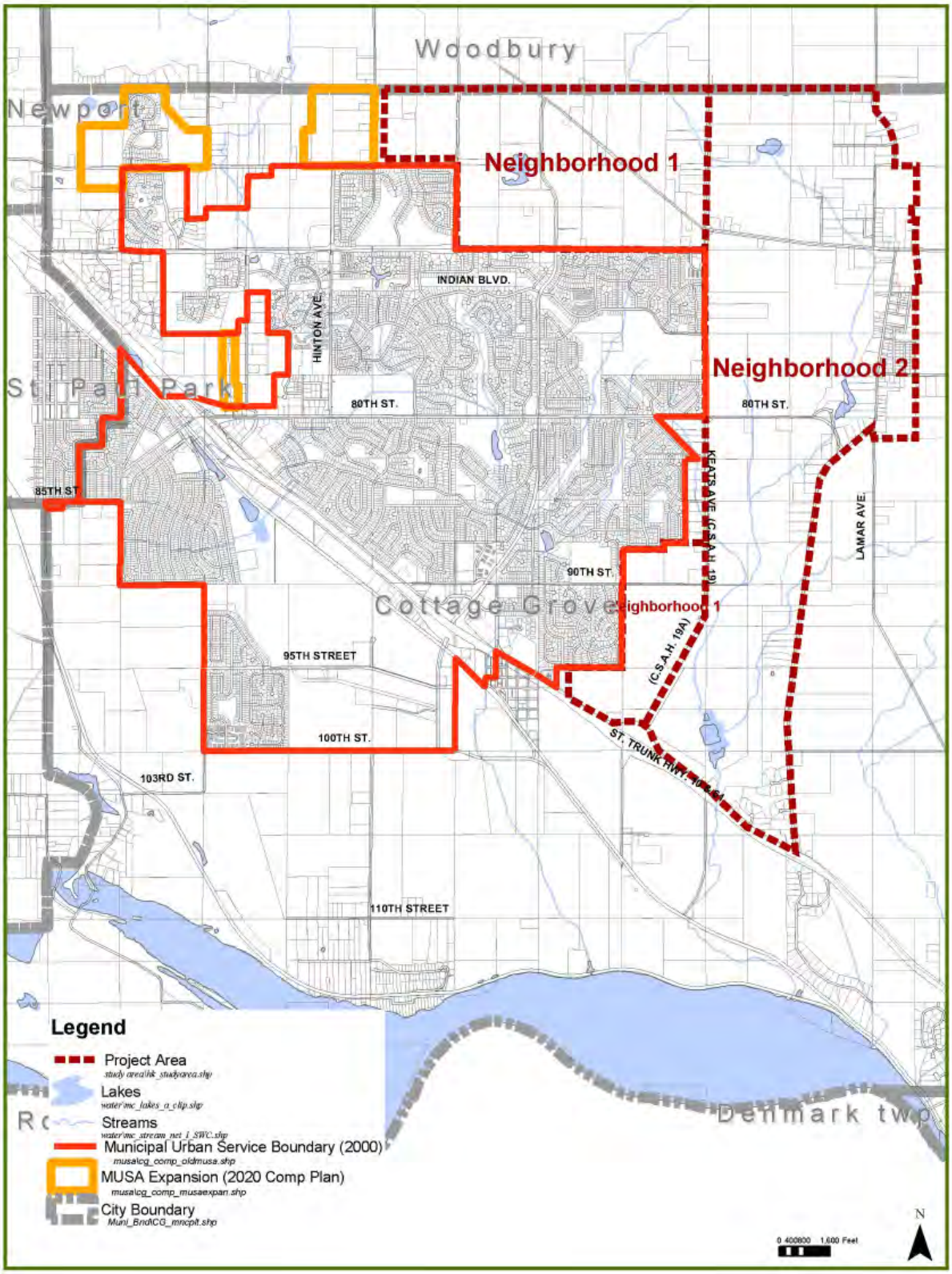


Figure 7
Existing Municipal Urban Service Area (MUSA) and 2020 MUSA expansion

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

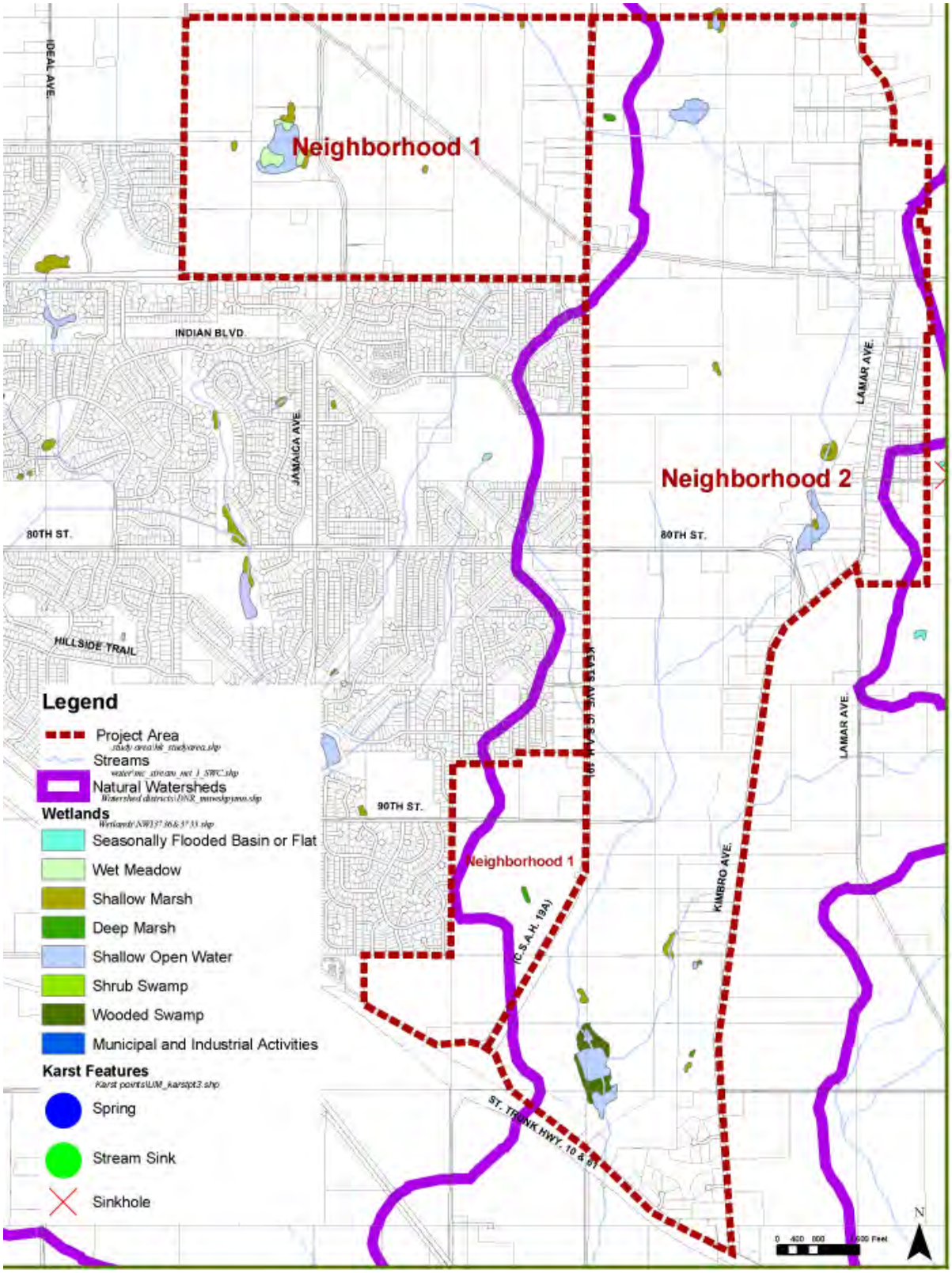


Figure 8
Watercourses, Wetlands, Lakes and Streams

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

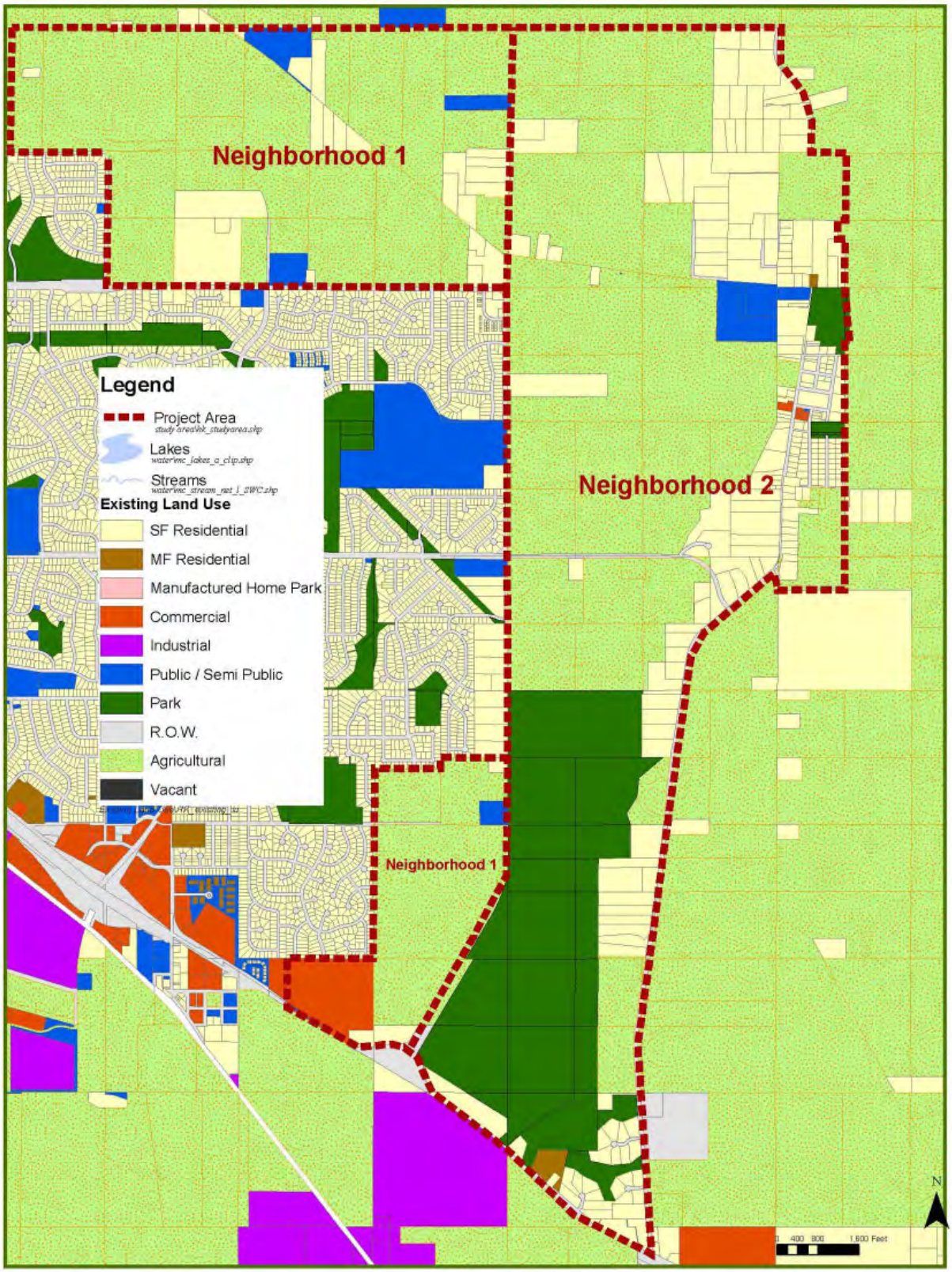


Figure 9
Existing Land Use

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

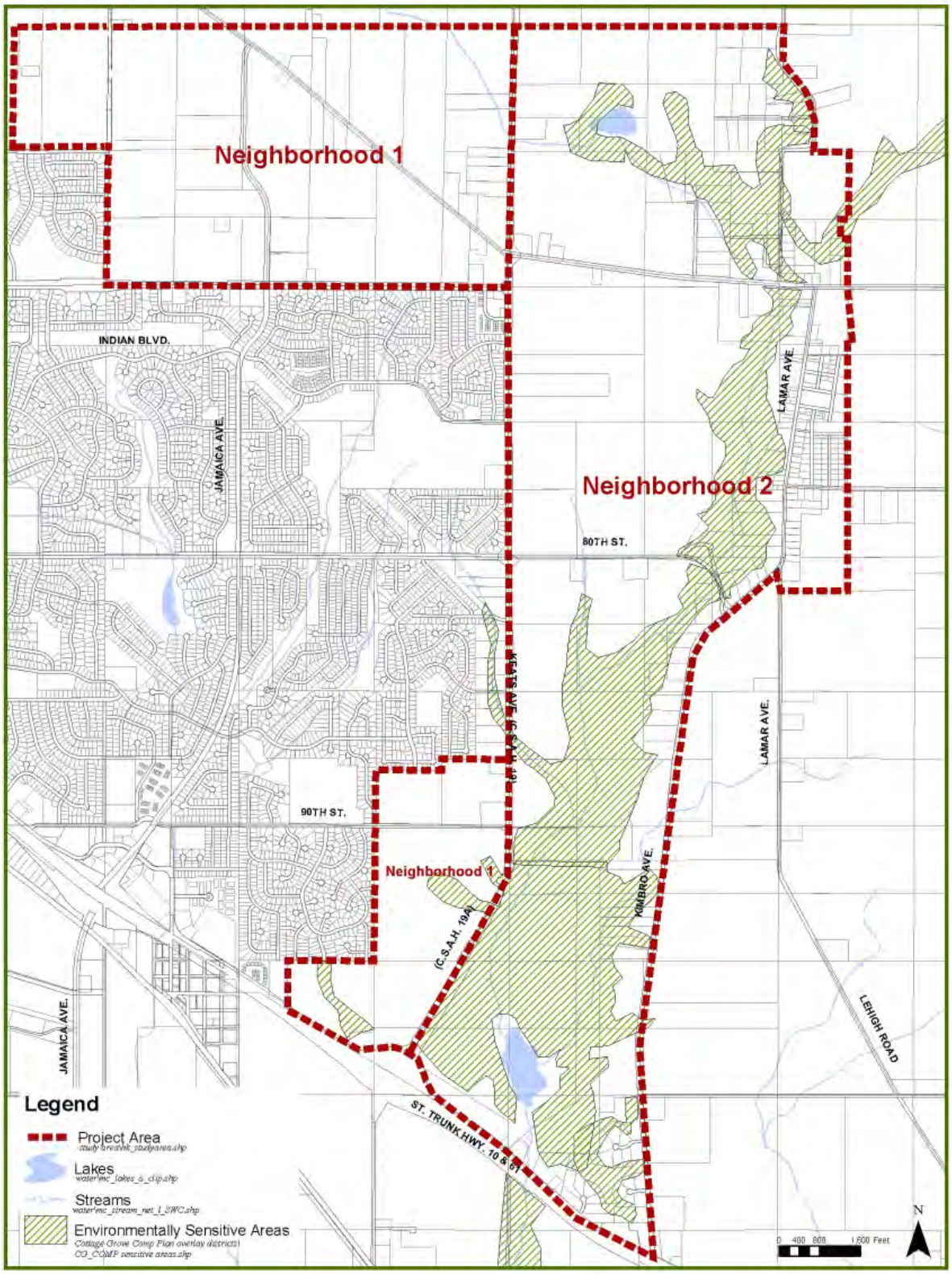


Figure 10
Natural Resources Overlay

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

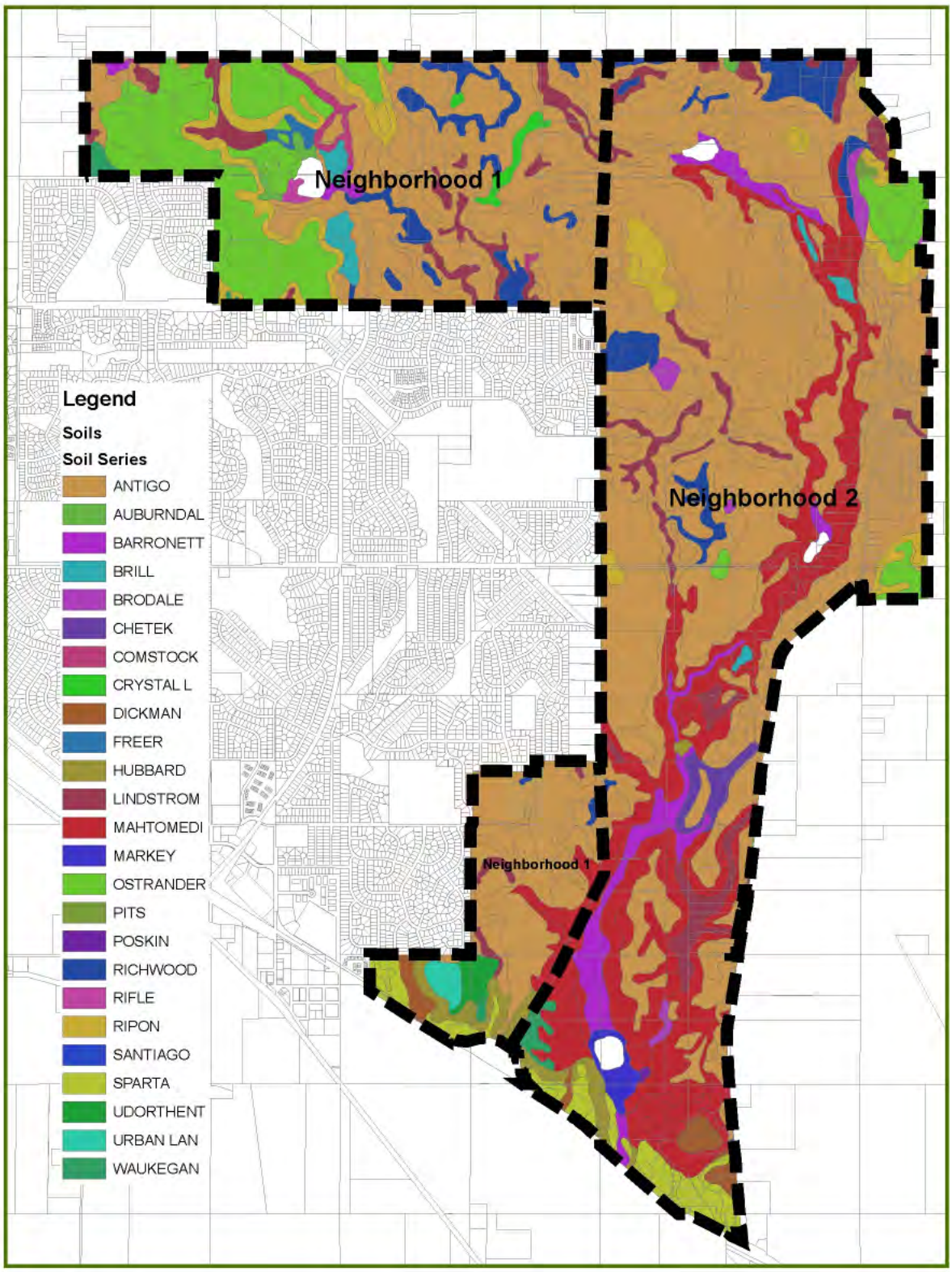


Figure 11
Soils Map

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

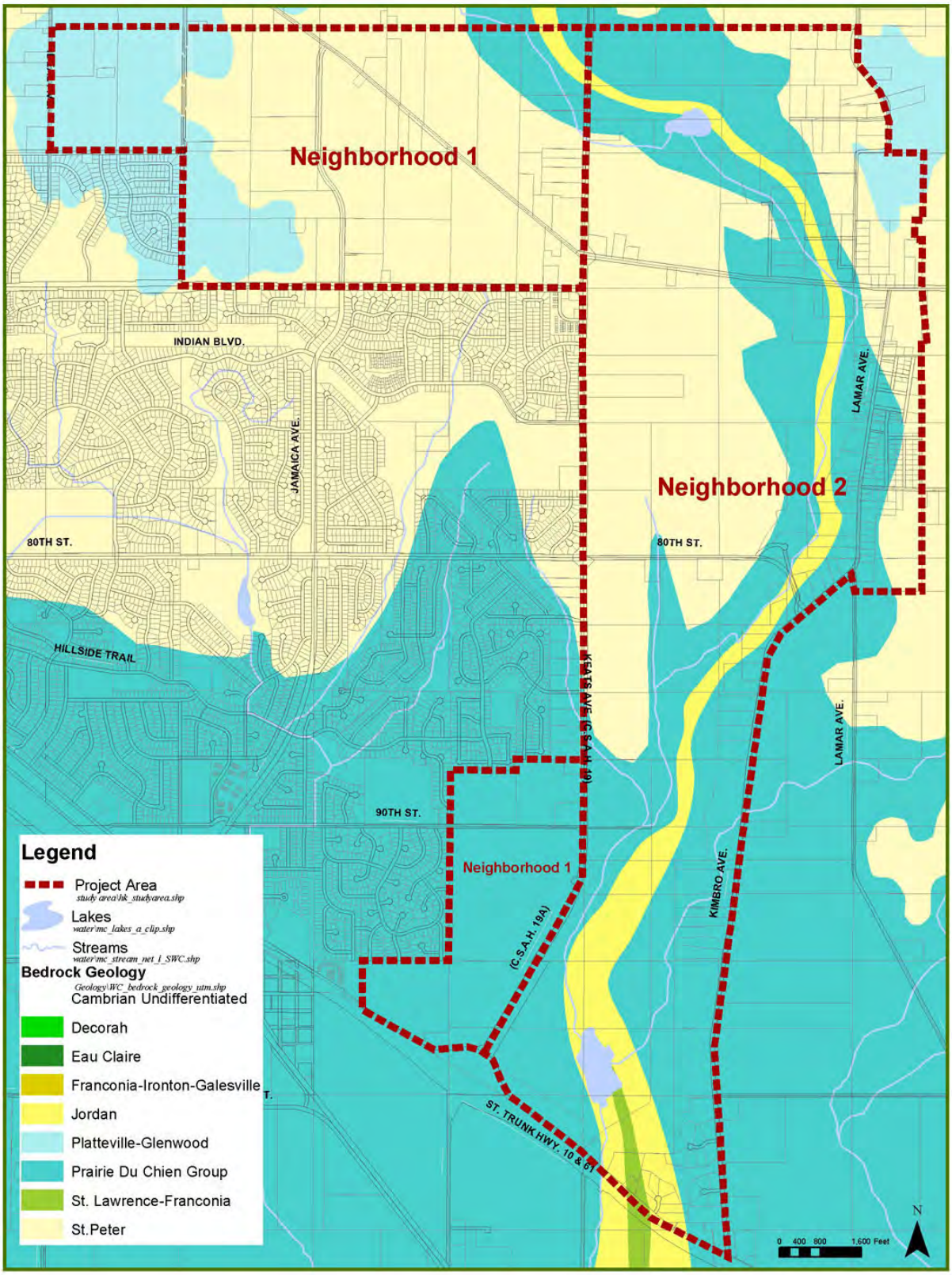


Figure 12
Bedrock Geology

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

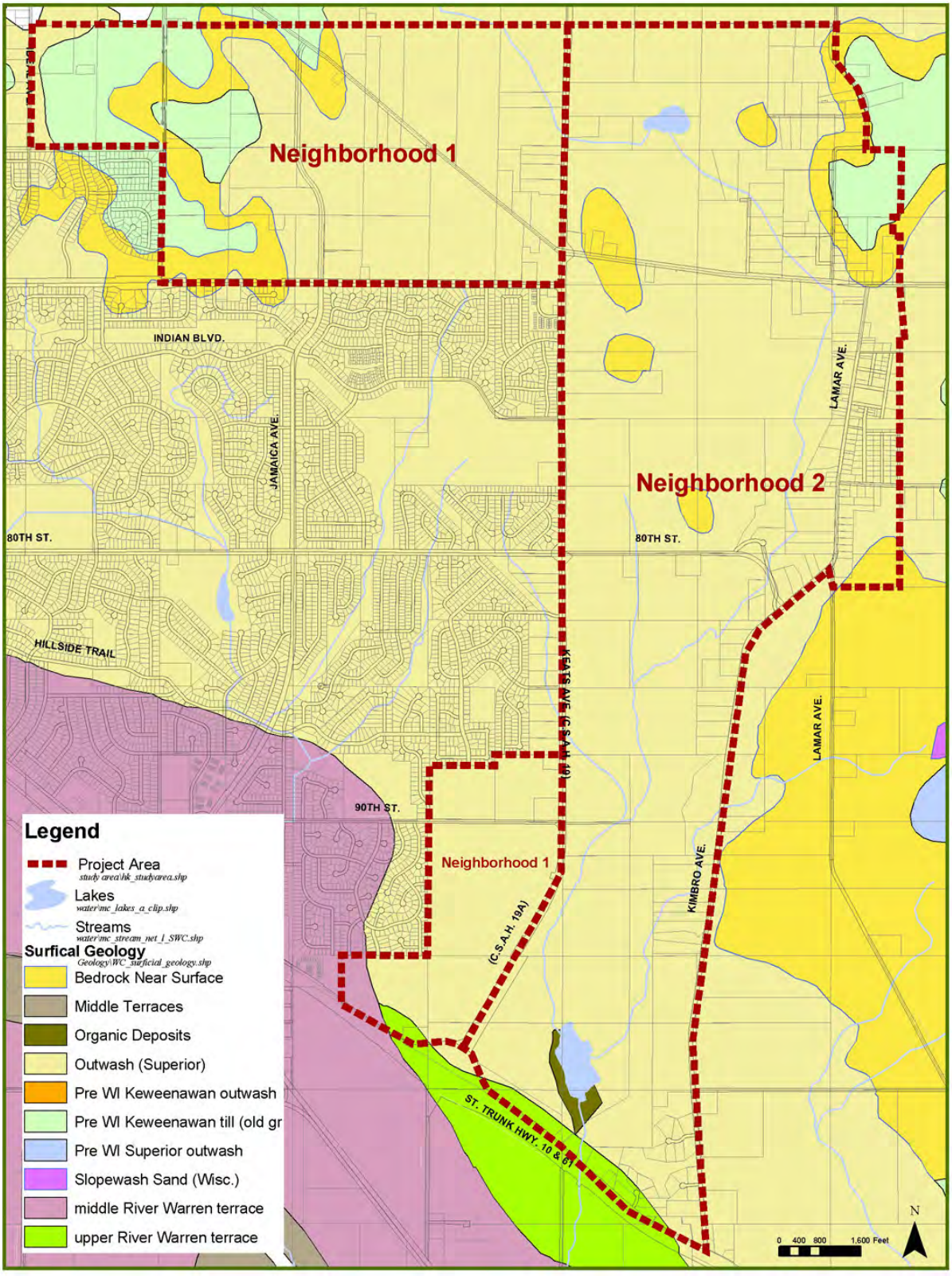


Figure 13
Surficial Geology

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

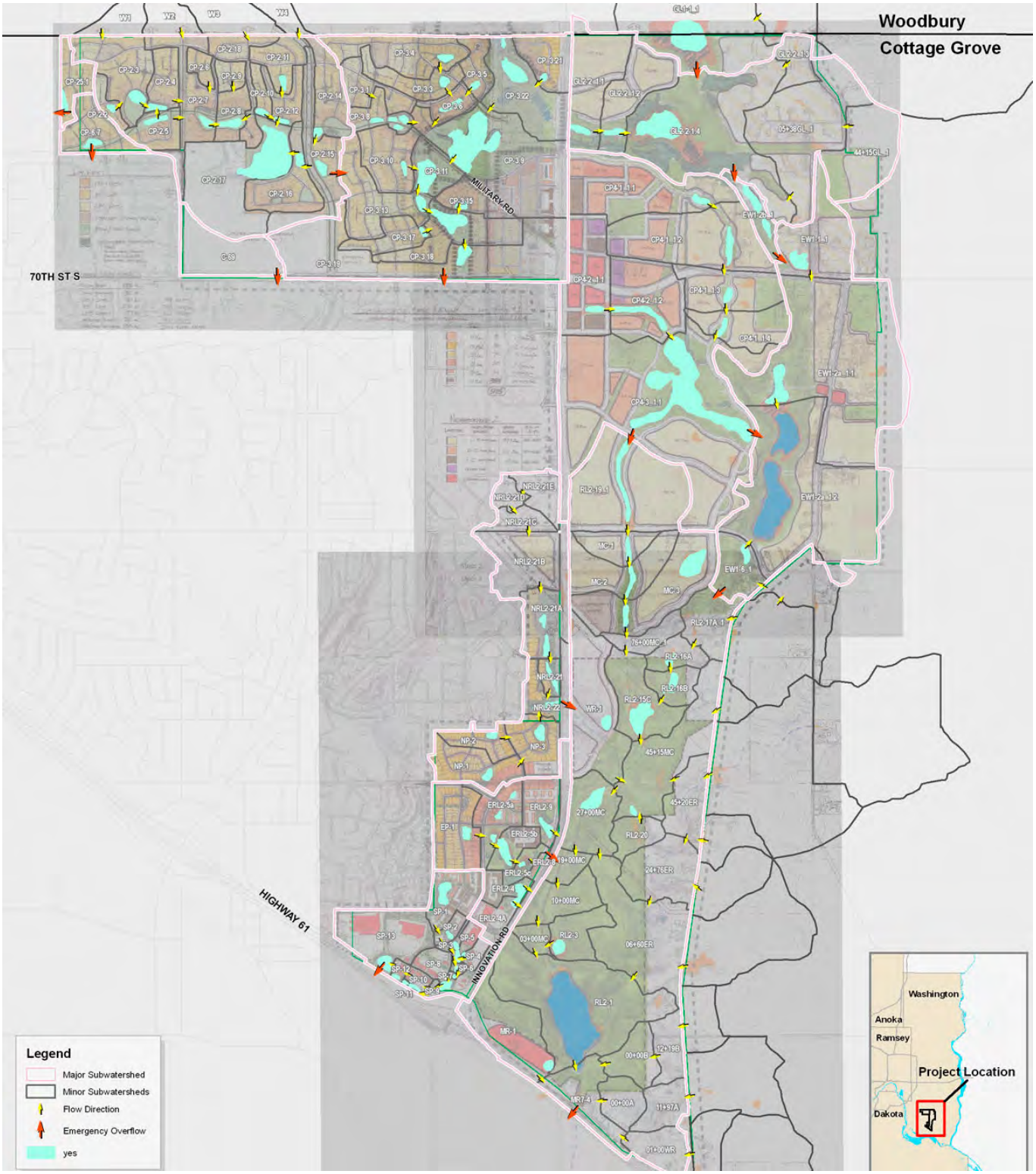


Figure 14
Proposed Storm Water System

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

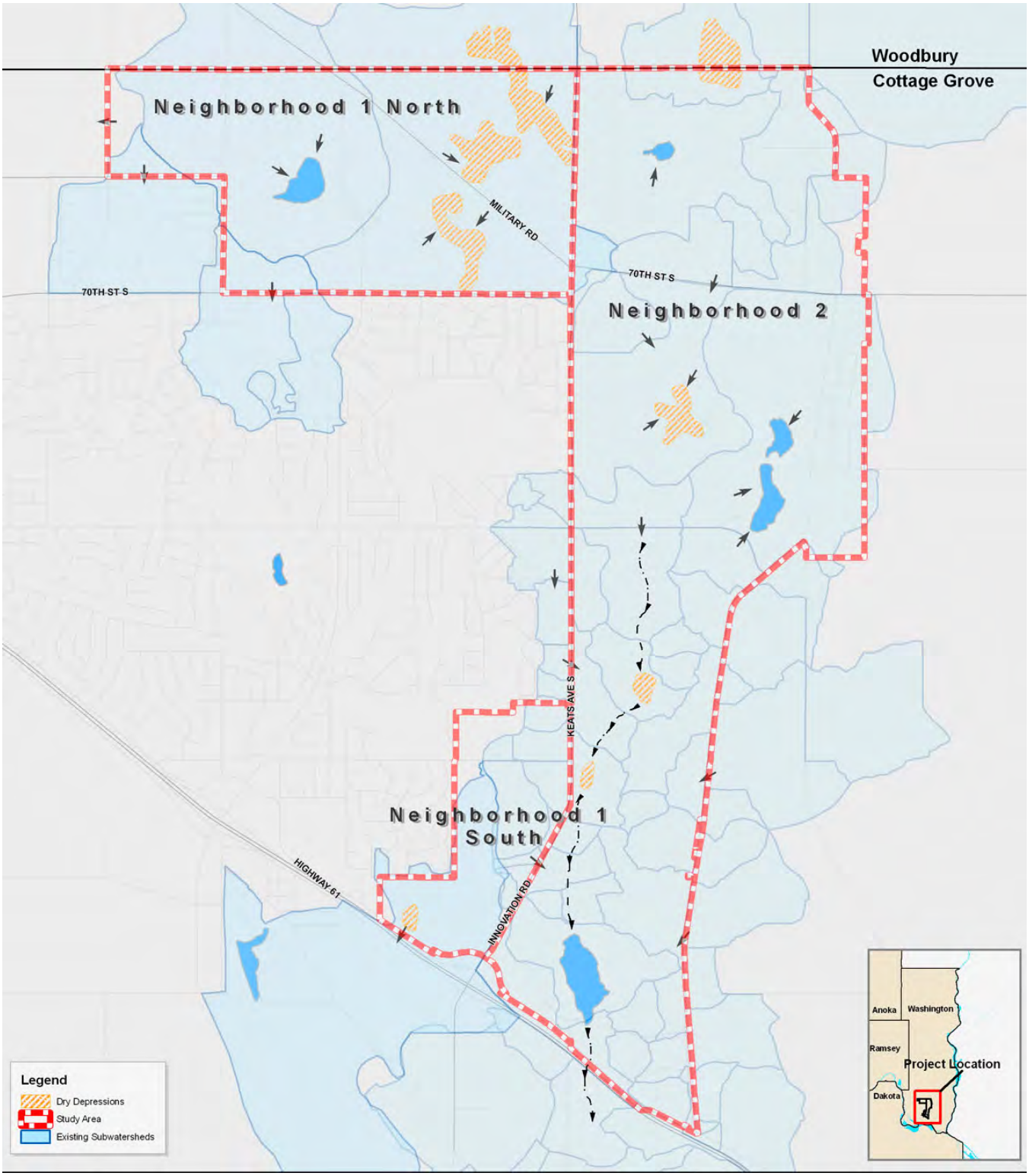


Figure 15
Existing Storm Water System

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

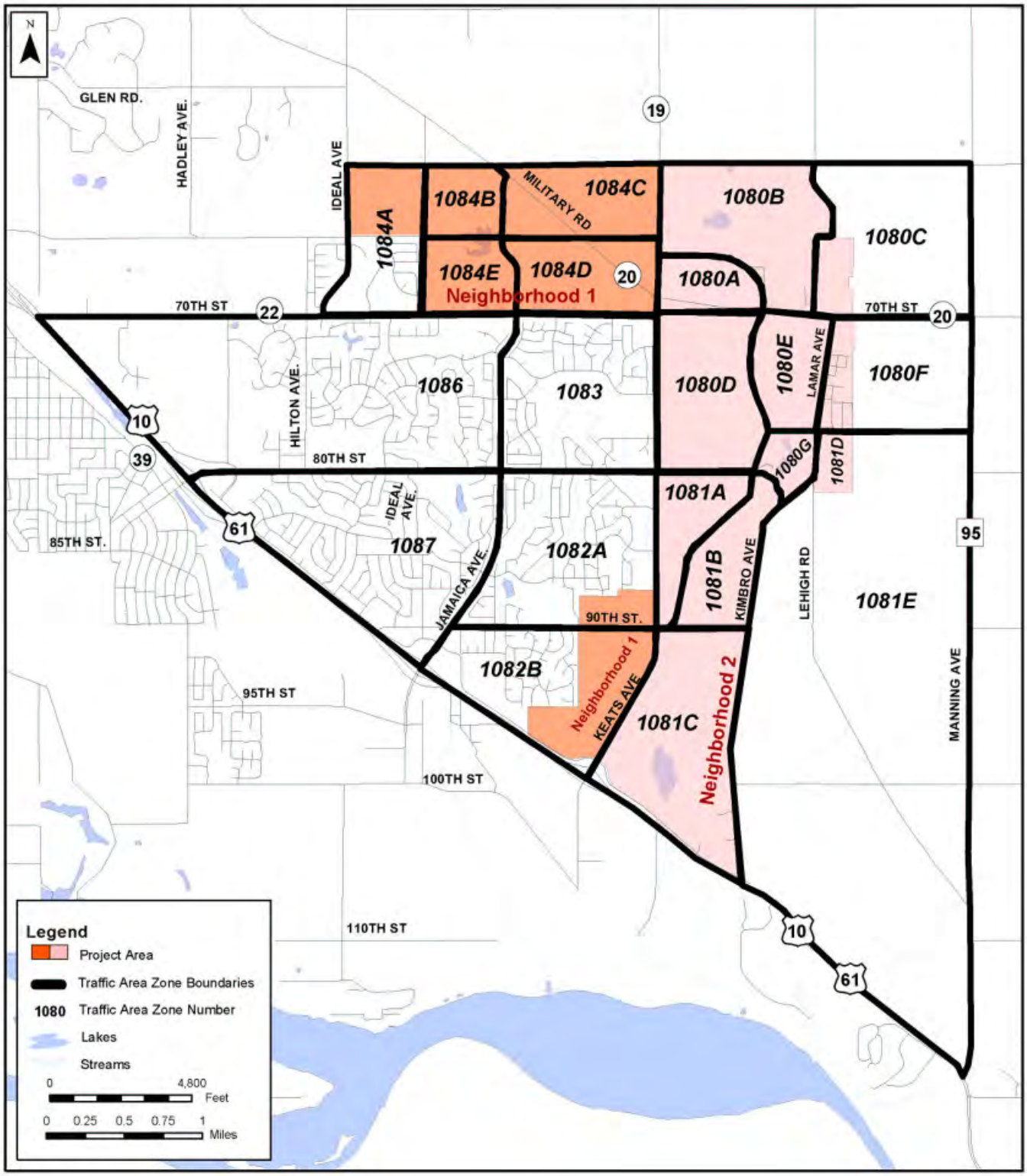


Figure 16
Traffic Analysis Zones (TAZ)

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

East Ravine Pre-Design
City of Cottage Grove

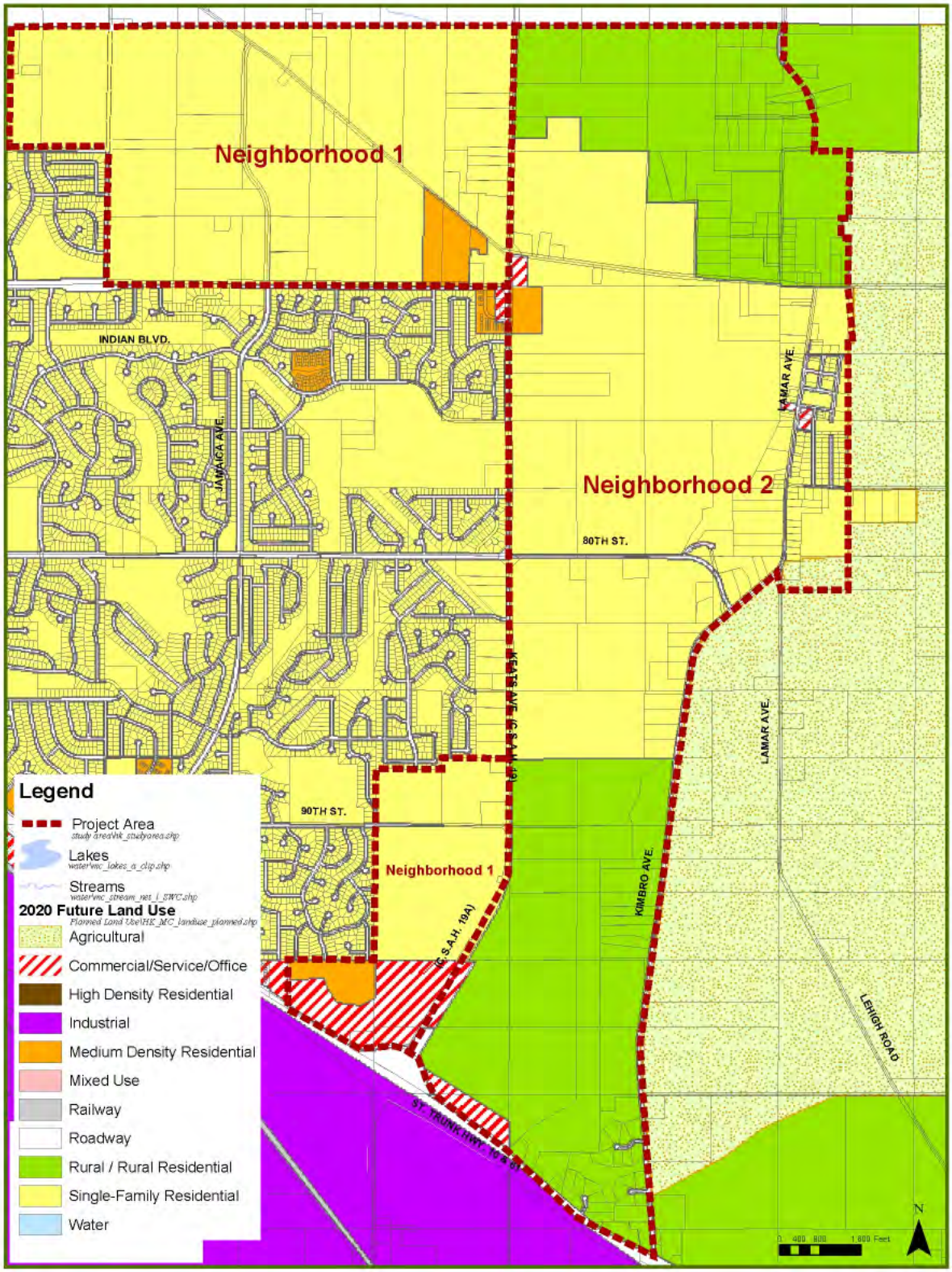


Figure 17
City of Cottage Grove Comprehensive Plan

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

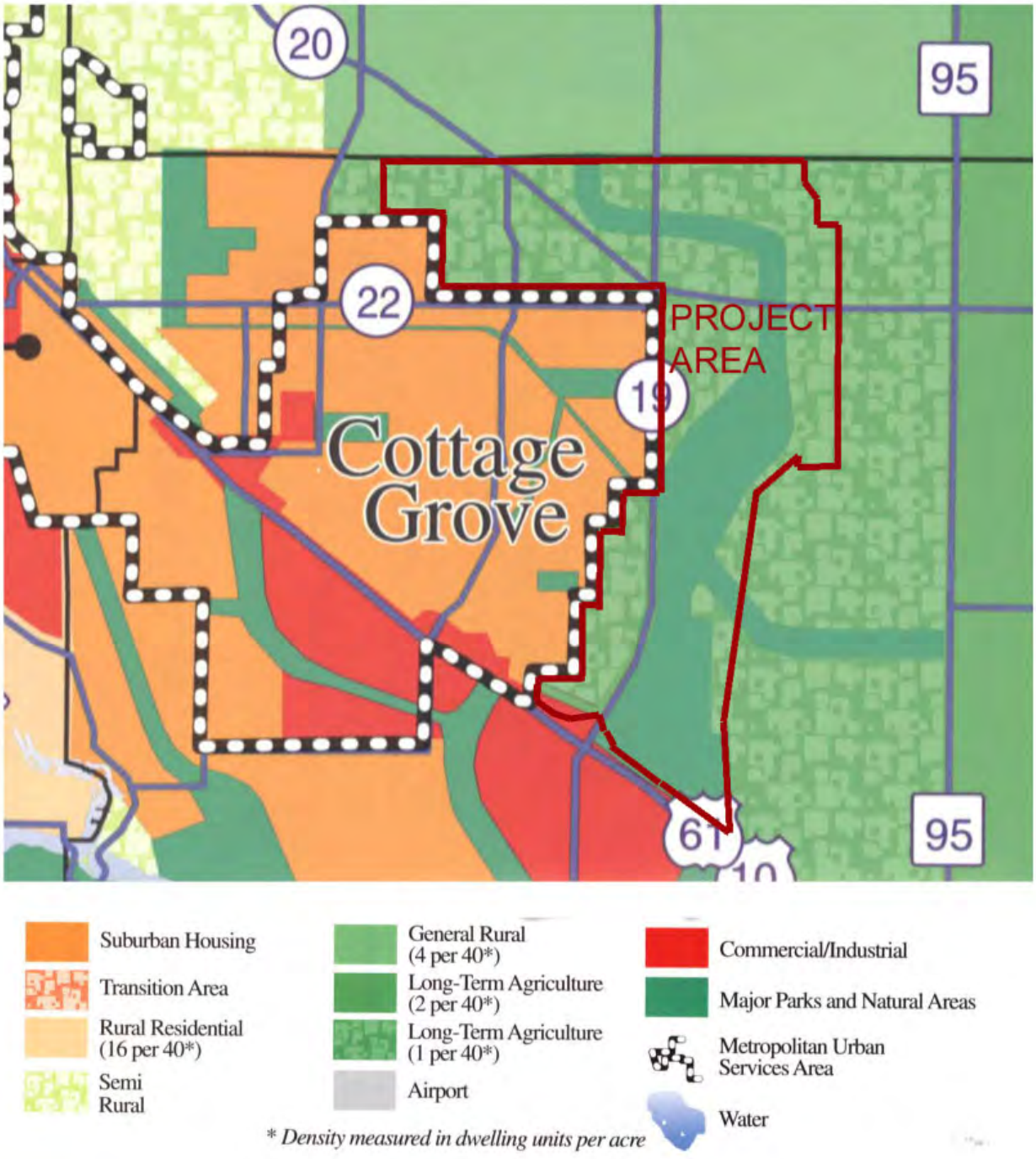


Figure 18
Washington County Comprehensive Plan

Hoisington Koegler Group Inc.
Earth Tech
Emmons & Olivier Resources
Howard R. Green Company
IBI Group
McComb Group, Ltd.

Quick Reference: Alternative Urban Areawide Review (AUAR)

The AUAR process is a hybrid of the Environmental Assessment Worksheet (EAW) and Environmental Impact Statement (EIS) review processes. Responsible Governmental Units (RGU) can use an AUAR as a planning tool to understand how different development scenarios will affect the environment of their community before the development occurs. The process is designed to look at the cumulative impacts of anticipated development scenarios within a given geographic area. The AUAR document uses a list of questions adapted from the EAW form, but provides a level of analysis of typical urban area impacts comparable to an EIS. Environmental analysis information from an AUAR can be used to inform local planning and zoning decisions. This quick reference guide is meant to provide a brief overview of the AUAR process and the steps required to successfully complete an AUAR. For more detailed guidance on properly preparing an AUAR, please see the Recommended Content and Format Guide on the Environmental Quality Board (EQB) website.

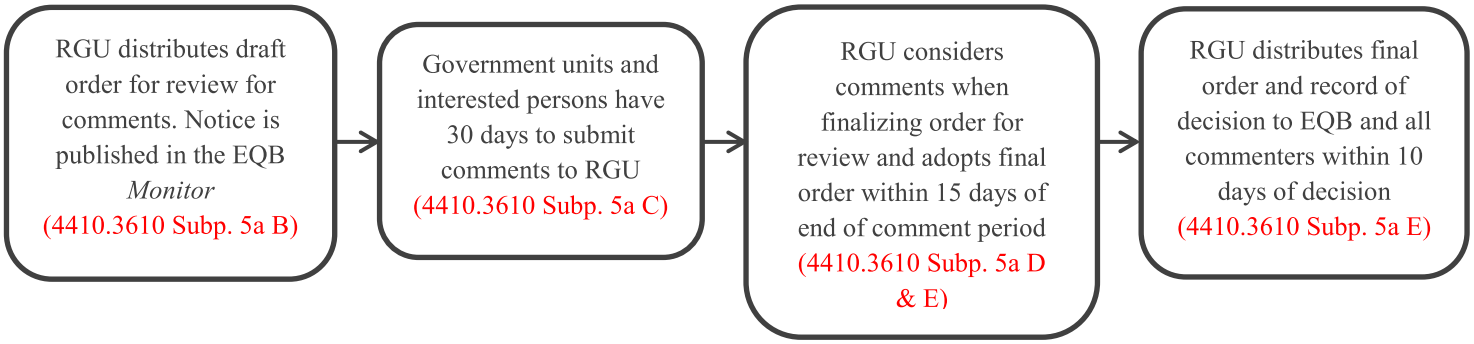
Please note that this quick reference guide is not intended to substitute for Minnesota Rules 4410. It is designed to help RGUs and others implement the environmental review process more effectively and efficiently. The guide does not alter the rules or change their meaning; if any inconsistencies arise between this guide and the rules, the rules take precedent. Please contact EQB Staff with any questions at Env.Review@state.mn.us or 651-757-2873.

Additional First Steps in AUAR Process for Certain Specific Large Projects

(Minnesota Rules 4410.3610, Subpart 5a)

Note: If you do not have a large project that meets the criteria described below, please see the AUAR Process Steps on page two.

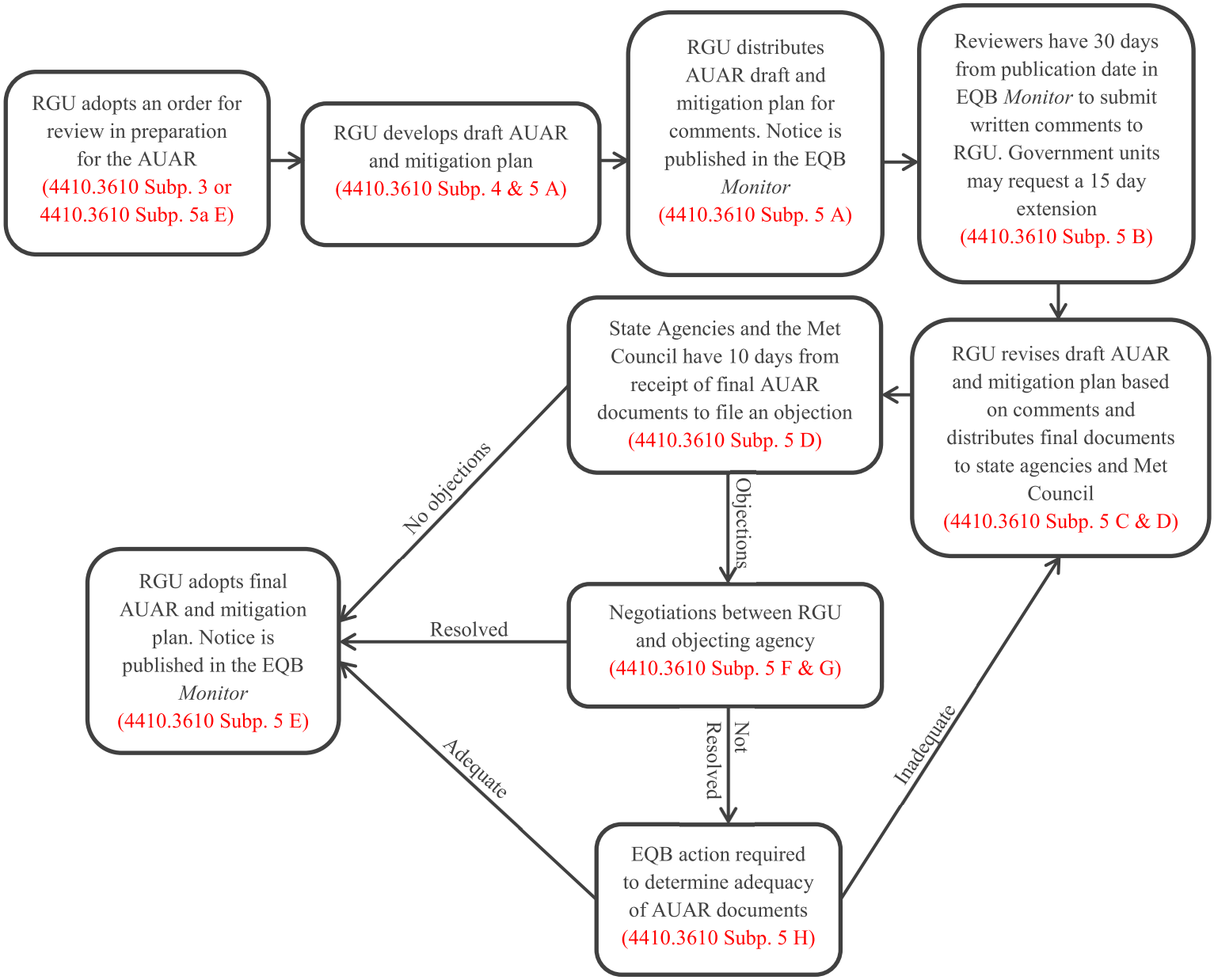
The 2009 Minnesota Rule amendments added additional required steps at the beginning of the AUAR process if the review will cover any specific projects that meet mandatory Environmental Impact Statement (EIS) requirements or comprise at least 50 percent of the geographic area to be reviewed. These steps include a public comment period on the scope of the AUAR review, specifically on the development scenarios and relevant issues to be covered. These steps must occur before a final order for review can be adopted.



AUAR Process Steps

(Minnesota Rules 4410.3610, Subparts 3-5)

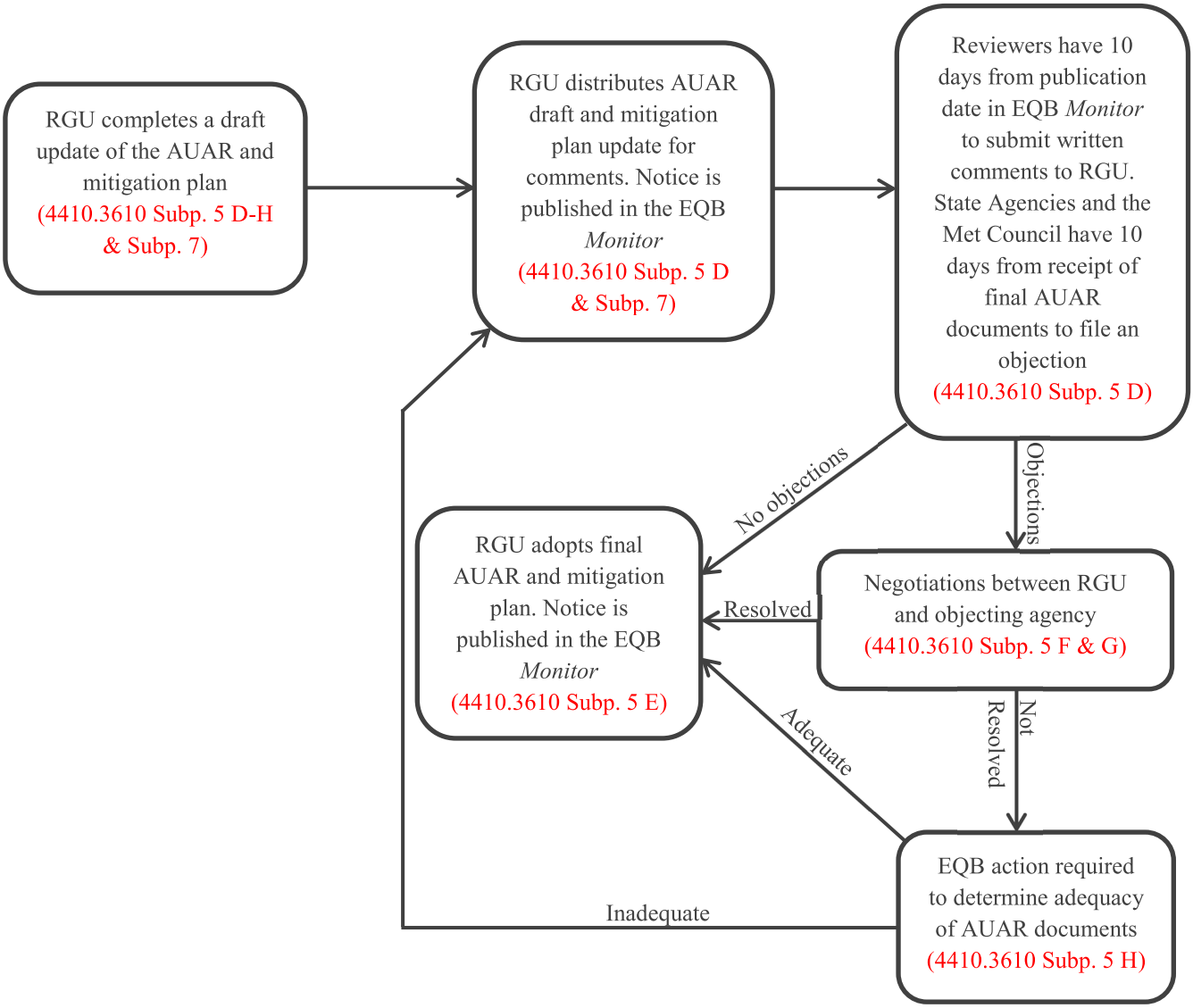
Unless the AUAR includes additional first steps due to a large specific project as detailed on page one, the first step of the AUAR process is the adoption of an order for review by the RGU. The draft and final AUAR, along with the mitigation plan, are prepared and distributed for comments to ensure adequate review. A process for appeal to the EQB can be invoked by state agencies and the Metropolitan Council.



AUAR Update Process Steps

(Minnesota Rules 4410.3610 Subpart 7)

Minnesota Rules provide guidance on the circumstances that require an AUAR update. Regardless of any significant changes, the AUAR must be updated every five years until all of the development in the area has been approved. An AUAR update is generally a faster process than starting a new AUAR since the update process does not require a complete revision of the AUAR document. Instead, the update process requires that the AUAR document, along with the mitigation plan, be updated to the extent necessary to reflect the changes that have occurred in the area included in the review. The updated documents are distributed in a manner similar to a final AUAR except that the documents must be sent to all parties listed on the EAW distribution list and a notice must be published in the EQB *Monitor*. The process for appeal to the EQB can still be invoked by state agencies and the Metropolitan Council as in the normal AUAR process.



COTTAGE GROVE PLANNING COMMISSION **September 22, 2025**
12800 Ravine Parkway South
Cottage Grove, MN 55016

COUNCIL CHAMBER – 7:00 P.M.

The Regular Meeting of the Planning Commission was held in the Council Chamber and telecast on Local Government Cable Channel 16.

1. CALL TO ORDER

Frazier called the Planning Commission meeting to order at 7:00 p.m.

2. ROLL CALL

Pradeep Bhat-Here; Ken Brittain-Here; Jessica Fisher-Here; Evan Frazier-Here; Eric Knable-Here; John Stechmann-Here; Terrence Woodman-Here.

Members Absent: None

Staff Present: Emily Schmitz, Community Development Director; Samantha Pierret, Senior Planner; Max Erickson, Planner; Kelly Becker, Associate Planner; Justin Olsen, City Council Liaison.

3. APPROVAL OF AGENDA

Fisher made a motion to approve the agenda. Stechmann seconded. The motion was approved unanimously (7-to-0 vote).

4. OPEN FORUM

Frazier opened the Open Forum and asked if anyone wished to address the Planning Commission on any non-agenda item.

Hello, Good Evening. Bonnie Matter, 6649 Inskip Avenue South, Cottage Grove, so are these Public Hearings, and I will be able to speak if I want to? Frazier replied yes, all four of the agenda items we have tonight are Public Hearings. Bonnie said thank you, that's all I had.

As no one else wished to address the Planning Commission, Frazier closed the Open Forum.

5. CHAIR'S EXPLANATION OF THE PUBLIC HEARING PROCESS

Frazier explained the purpose of the Planning Commission, which serves in an advisory capacity to the City Council, and that the City Council makes all final decisions. In addition, he explained the process of conducting a public hearing and requested that any person wishing to speak should go to the podium and state their full name and address for the public record.

6. PUBLIC HEARINGS AND APPLICATIONS

A. 6219 Lamar Lot Split Variance - Case V2025-025

The Estate of Frances Ratzlaff: Benjamin Ratzlaff, Personal Representative, applied for a Variance to subdivide a 47.63-acre parcel located at 6219 Lamar Avenue South into two separate parcels resulting in one parcel under 5 acres,

which will be under the 5-acre minimum lot size allowed in the AG-1, Agricultural Preservation District, for an existing dwelling. The remainder of the parcel will continue to be used for agricultural purposes.

Pierret summarized the staff report and recommended approval based on the findings of fact and subject to the conditions stipulated in the staff report.

Frazier asked if there were any questions for staff; none were asked, then Frazier said I do have a question for you. So, it was in the packet as well as you said today that there are a number of other parcels in the area that are less than 5 acres, and so that's part of the reason why it wouldn't change the community. Do we know if those were created prior to the requirement that parcels be 5 acres, or were they also Variance Requests? Pierret replied said that's a good question, Mr. Chair. So, several of those parcels are in the R-1 District where there is a 3-acre minimum; however, there are a couple of parcels in the AG District that were created prior to our current Zoning Ordinances that are under that 5 acres, that are around 3 acres in size. Frazier said thank you.

Fisher said I'm glad you added that fourth stipulation with the Deed Restriction because we don't want to ever make it like a landlocked parcel, right? But how, that little strip that's along Lamar, how did that ever get divided into its own little entity there, or does it go with another parcel, or how does that figure? Pierret replied Commissioner Fisher, Mr. Chair, that is a very good question. As I mentioned, that parcel is actually part of a plat and that plat that it is a part of is actually on the west side of Lamar Avenue; so, conceivably at some point this was all one big plat, this sliver, as I call it, was platted and kind of remained as a remnant parcel. The Applicant was able to actually purchase this from the previous owner so they could have road frontage here. Fisher said it sounds like you're trying to avoid re-platting this particular parcel. Is there a specific reason why a plat wouldn't make more sense? Pierret replied so plats do take up a considerable amount of time and cost for an Applicant, and in this case, adding that fourth condition that these two pieces be sold together really will save the Applicant, in some time and monetary costs when we do see that this sliver again really does contribute to that road frontage requirement, as specified in the ordinance. Fisher said okay, thank you.

Woodman said just to make sure I'm understanding it fully as well, the reason for that 3-acre split is more of just a logical reason that that is the homestead area and we're not just expanding it to 5 to make up more room; so, that's the reason for the 3, not some other random requirement, correct? Pierret replied yes, Commissioner Woodman, that is correct. It is the most logical space to split this property, as you can see. Woodman said perfect, thank you.

Frazier asked if there were any further questions, there were none, so Frazier thanked Pierret.

Frazier asked if the Applicant has anything additional they would like to add, and he asked him if he could just state his name and address for us, please.

I'm Benjamin Ratzlaff, I reside at 6225 Lamar Avenue South. Now, I'm obviously going to mention that this is basically to settle my mother's estate, and it's going to be split to her descendants. We're going to continue farming it, and there is going to be absolutely no change in the residence use or anything. I mean, it's going to essentially stay the same. That's about the only comment I have, just to settle the estate of Frances Ratzlaff, my mother. He asked if there were any questions. Frazier asked if there were any questions for the Applicant, but there were none. Frazier said thank you very much.

Frazier opened the Public Hearing. No one spoke. Frazier closed the Public Hearing.

Frazier asked if there was any further comment or discussion from the commission.

Stechmann said this seems like a logical result here, so we can avoid destroying some of the tiles property and also maintain the other trees and other things like that. That seems like this is the logical thing to do, so I can't imagine not voting for it. Thanks.

Fisher made a motion to approve the Variance based on the findings of fact and subject to the conditions stipulated in the staff report, as well as the condition that was added at the meeting on the Deed Restriction. Woodman seconded. The motion was approved unanimously (7-to-0 vote).

B. NorthPoint Preliminary Plat - Case PP2025-023

NorthPoint Development (NP BGO Cottage Grove Logistics Park, LLC) has applied for a Preliminary Plat to modify the south and east lot lines of the Cottage Grove Logistics Park plat. This request is being made to fully encompass the improvements on Lot 2 of the existing plat, including private stormwater management, drive access, and utility lines.

Becker summarized the staff report and recommended approval subject to the conditions stipulated in the staff report. She said we do have representatives from NorthPoint here tonight as well for any questions. Thank you.

Frazier asked if there were any questions for staff.

Woodman said I think just one clarifier. This is only approval of the plat and not any of the future buildings or anything like that that'll be on there, correct? Becker replied correct, Mr. Chair and Members of the Commission, this is just the Preliminary Plat, adjusting those lot lines. Woodman said awesome, thank you.

Fisher asked at this time if the Applicant would like to add anything additional.

Planning Commission, my name is Charlie Cannon, I reside in Chicago, and work for NorthPoint Development. I just want to take a moment to thank Kelly and Emily and the City staff's hard work, they make it very easy for us to do business here. So, I appreciate your guys' time and explanation, and I'm here to answer any questions for you guys.

Frazier asked if there were any questions for the Applicant; Frazier said I don't see any, thank you very much for being here. Charlie replied thank you.

Frazier opened the Public Hearing.

Thank you very much for allowing me to ask some questions. Bonnie Matter, 6649 Inskip Avenue South, Cottage Grove, said I just have a few questions, I'll just put the questions out there: I'd like to know when the Alternative Urban Areawide, AUAR, will be updated to include the Data Center information, including the environmental information, and when it will be available for review and public comment. I'd like to know if we know who will occupy the Data Center at this time. I'd like to know how much water will the Data Center use per day, per year. I'd like to know where the water's going to come from. I'd like to know what is Cottage Grove's current water appropriation amount. Has the developer requested information on groundwater availability and local capacity? How many megawatts will the Data Center require? What type of backup power generation will be used during outages and how many? And if you're interested in learning more about any of this, there are many Data Center requests in Minnesota EQB Monitor right now. The City of Cannon Falls Industrial AUAR, in the September 16th Monitor, is worth reading. So, those are my questions. Thank you very much. Frazier thanked Ms. Matter and said she provided me with a copy of her questions, and so we'll include that in the record for the meeting.

No one else spoke. Frazier closed the Public Hearing.

Frazier asked Becker if she wanted to come back up, as a lot of Ms. Matter's questions were about a Data Center, and I know in response to Commissioner Woodman's question, you indicated that this is just essentially a realignment of lot lines at this point, correct? Becker replied yes, correct, Mr. Chair, Members of the Commission, we don't have an application for a Data Center now. Frazier said okay, so maybe that comes in the future, but today the application that we're looking at is should the Preliminary Plat be approved by City Council. Becker said correct. Frazier said all right, and any future Data Center that was going to come in or any new building that was going to be built would have to come through again for approval for that building and the Site Plan. Becker said correct.

Frazier said okay, and asked if there were any further questions by commission.

Bhat said so the existing two buildings, are they Data Centers? Becker replied no, they are not. Bhat said okay, and what happened to the original Lot 1, it's not showing on the map, so it's still a lot associated with this, or is it a separate lot now? Becker replied yes, Commissioner Bhat, that lot will still remain separate, and that won't be included into this new plat. Bhat said okay, thank you.

Frazier asked if there was any discussion or comments by commission; seeing none, I'll look for a motion then.

Woodman made a motion to approve the Preliminary Plat subject to the conditions stipulated in the staff report. Brittain seconded. The motion was approved unanimously (7-to-0 vote).

C. Highnorth Dispensary – Case CUP2025-022

Astraeus Investment Group, LLC (DBA Highnorth) applied for a Conditional Use Permit to engage in cannabis retail sales and continue lower-potency hemp edible retail sales at their existing business at 8711 East Point Douglas Road South, Unit #108.

Pierret summarized the staff report and recommended approval based on the findings of fact and subject to the conditions stipulated in the staff report.

Frazier thanked Pierret and asked if there were any questions for staff.

Fisher said so, Highnorth is in that strip mall by Target, I was looking, but my pad is frozen so I'm having a hard time getting to the page, but with all the different circles and the radius to the daycare center, it looks like its just right there. So, how do you, do you calculate from like the front door? Because I mean I can imagine if it was down by where Chuck & Don's is, maybe the radius wouldn't qualify. Like how do you come up with that? Because it does look like it's pretty close. Pierret replied Commissioner Fisher, Mr. Chair, so on this map, the distance from a daycare is required to be 500 feet, and the yellow circle in the middle of the image is showing that distance to the daycare, and it is labeled as over 1,000 feet away. On this map, we labeled the exact distances, so that the commission and the public would know exactly how far away these businesses were. Fisher said so, where do you measure, do you measure from like the door? I mean, that is a large parcel, and there are multiple. Pierret replied good question. Yes, so, we measure from the storefront of the cannabis business to the property line of the use in question. For parks, we measure from the storefront to the park feature, so whether that be a disk golf hole or a picnic shelter, we're measuring to that specific item in the park. Fisher said okay, thanks for clarifying. I see now that it's double the distance that it needs to be, but it does look really close on that. Thank you.

Bhat asked what were the two compliance violations? Pierret replied those were age verification compliance violations. There's more information available from our Public Safety Department; however, the age verification was either not done or done improperly and during the Public Safety's inspections of the property, items were sold to minors. Bhat said okay, thank you. Where did you say this information was available? Pierret replied through our Public Safety Department, and the most recent violation in May was available, our City Council did take action at that time, in May of 2025. Bhat said okay, thank you.

Frazier asked Pierret if she knew if it was City Ordinance that clarifies the 500 feet from a daycare? Pierret replied in the State Statute, 500 feet is the absolute maximum that we could go, and in City Code, they went with the absolute maximum from daycares. All of these distances are actually the absolute maximum allowed by Statute. Frazier said okay, and I couldn't remember if that's what we did when we adopted the City Ordinances on it. And is it just daycare centers or does that include licensed in-home daycares as well? Pierret replied it is only daycare centers in Business Districts. Frazier said got it. All right, thank you.

Fisher said okay, my question follows up with Commissioner Bhat's; so, the violations that happened, at what point do we become worried about those violations, those repetitive violations? I think you said that the Public Safety Department doesn't have any issues with this at the moment, but at what point does it become an issue? Pierret replied so, our Public Safety Director has informed us that they, as I mentioned, continue to work with Highnorth on compliance and everything. If there were a third violation within a year span, it would go back to City Council; the fine and the suspension would be greater. If there were a fourth violation, that's when the Public Safety Director has indicated that things such as revoking licensure would be implemented. Fisher said so, there is a specific framework in place with time constraints and number of violations? Pierret replied yes. Fisher said okay, perfect, thank you.

Frazier asked if there were any further questions for staff, none were asked. Frazier thanked Pierret.

Frazier asked if at this time the Applicant would like to add anything additional.

Ladies and gentlemen of the commission, thanks for having me today, appreciate it. It's been a pleasure to work with the City on this. It's been a long road, we've gone through a lot with the changing from hemp to cannabis and things like that. We've moved locations to stay compliant. It's been a treat to work with you all, so I appreciate everyone that worked on our project. I just

wanted to open it up; my name is Tyler Thompson, by the way, I'm the co-owner, I grew up here in Cottage Grove, went to Park, but I wanted to open myself up for questions if there are any.

Frazier thanked Thompson. Are there any questions for the Applicant?

Bhat said so, following up on those violations, what steps are you going to take to avoid further compliance violations? Thompson replied that's a great question. So, at the time, we did not have any actual scannable ID software built into our system, and that's something that after this violation we did add, in two different forms: 1) Our new cannabis specific platform that we use for our point of sale actually requires an ID to be scanned in, in order for a transaction to begin. So, what we will do in our plan is to have a vestibule system where the customer comes in, we have a secretary that will check the ID before the customer then gets buzzed into the rest of the building, which will require verification before entering. 2) We also have an audit trail system built into that, so we can go back and provide any ID ever scanned into our system and the timestamp. Bhat said thank you.

Frazier asked if there were any other questions, and none were asked. Frazier thanked Thompson.

Frazier opened the Public Hearing. No one spoke. Frazier closed the Public Hearing.

Frazier asked if there was any further discussion or comment by commission

Stechmann said it seems to me that the Applicant, Mr. Thompson, has adequately addressed the concerns that were raised, and so that's to his credit, that sounds like a very good and safe mechanism. I do know that there are criminal penalties for people who sell improperly alcohol or what have you, and so, there's also those types of considerations that also will deter like unauthorized sales. So, otherwise, I think that everything else is in order, I'm prepared to vote in favor of this. Frazier thanked Stechmann, asked if there were any further comments; seeing none, Frazier said he would look for a motion.

Stechmann made a motion to approve the Variance subject to the conditions stipulated in the staff report. Knable seconded. The motion was approved unanimously (7-to-0 vote).

D. Grey Cloud Elementary – Case SP2025-024

KOMA Architects and Engineers, on behalf of South Washington School District ISD 833, has applied for a Site Plan Review for building additions at Grey Cloud Elementary, located at 9525 Indian Boulevard South. The site improvements include approximately 6,505 square feet for a gymnasium/storm shelter and a 3,467 new classroom addition. The Site Plan Review request also includes minor reworking of the drive lanes within the northeastern and northwestern parking areas and the relocation of a playground.

Erickson summarized the staff report and recommended approval based on the findings of fact and subject to the conditions stipulated in the staff report.

Frazier thanked Erickson and asked commission if there were any questions for staff. Bhat said so there's a proposal for moving a playground from an existing location to a new location, right? My question is does it need to be done? I mean, can't they have two playgrounds, is there a requirement to move the playground? Erickson replied no, it is not a requirement. This is something that they have proposed, and I might invite the Applicant up to explain, but the playground is going to be closer to the new classroom addition, which would be utilized by the Special Education students. Bhat said okay, so there is no requirement to tear down the existing playground? Okay, thank you.

Frazier asked if there were any further questions for staff, and none were asked. Frazier thanked Erickson and asked at this time if the Applicant would like to add anything additional; he said I'm seeing shaking heads back there, okay, so seeing none, unless there are questions from commission or the Applicant, and there were none.

Frazier opened the Public Hearing. No one spoke. Frazier closed the Public Hearing.

Frazier asked if there was any further comment or discussion by commission.

Fisher said I'll just say that the application seems pretty straightforward, so I don't have any questions.

Fisher made a motion to approve, subject to the conditions stipulated in the staff report. Bhat seconded. The motion was approved unanimously (7-to-0 vote).

7. APPROVAL OF MINUTES

A. Approval of the August 25, 2025 Planning Commission Meeting Minutes

Knable made a motion to approve the August 25, 2025 Planning Commission Meeting Minutes. Fisher seconded. Motion passed unanimously (7-to-0 vote).

8. REPORTS

A. RECAP OF SEPTEMBER 2025 CITY COUNCIL MEETINGS

Schmitz summarized the actions taken at the September 3 and September 17, 2025 City Council Meetings.

Council Member Olsen said thank you very much. As I typically do, I open myself up for questions from you on anything that may be going on in the community, and I'm happy to answer if I can. Before I do that, though, just a couple of items that I would like to note: First of all, if you're interested, this coming Thursday, September 25, we have our Public Works and our Parks Open House, that will be held at the Public Works garage, which is located at 8635 West Point Douglas Road, here in Cottage Grove. For those of you who have not been there before, it starts at 3:00 p.m. and it goes until 7:00 p.m. We have a sensory friendly hour from 3:00 to 4:00 p.m., so if you have members of your family who may struggle with a little bit of sensory overload, that first hour there won't be all the flashing lights and the noises and those sorts of things. So, people can still come and enjoy the Open House, look at the trucks, talk to our staff members, etc. without the distraction of all of the other goings on that could overload somebody's senses if they are sensitive to that. There will be games that take place down there, you'll have the opportunity to spend a little time looking at all of the various Public Works vehicles, including our brand new double-axle trucks that we received after purchasing three years ago. So, we're really excited that we actually got those in time for this year's snowplow season so we could an extra snowplow route. But tons of really cool things to do, the Parks Department will be down there, they always have some fun games for the kids; well, I'm a kid, too, I guess, because I like them, too, but there's certainly plenty to do, so I would encourage you all to attend.

I also wanted to note that September 15 through October 15 is National Hispanic Heritage Month, and as a City Council we passed a proclamation declaring Hispanic Heritage Month here in the City of Cottage Grove. So, we wanted to make sure that we acknowledged the fact that we do have a very vibrant Hispanic population here in the City, it continues to grow, and we're grateful for all of the contributions, not just here in Cottage Grove but across the State of Minnesota and our nation, on behalf of our friends with Hispanic heritage. I am not one of those people, therefore I do sunburn when the moon is out, but I have a great deal of respect for a lot of my friends who have Hispanic background, and I'm grateful that we passed that proclamation. Also, today happens to be Rosh Hashana, so for those of you of the Jewish faith, we want to wish you a happy new year because tonight is when that celebration begins.

A couple of other items of note, just with regard to policy issues. As Emily mentioned, we had a 5-0 approval of the 2026 budget with a 2027 preliminary budget. So, what that means is we set the ceiling, we can't go any higher, but we can certainly come in lower if we choose to with regard to our 2026 Levy. We took a lot of different things into consideration, and I know I mentioned this at the last Planning Commission meeting as well, we took the Polco survey, the community survey that was done, and really put a lot of stock into what our residents said that they value most about our community. For example, Public Safety received a 91% rating for something that the public here in the City of Cottage Grove values; so, when we looked at making investments, making investments in Public Safety was right at the top of the list. Additionally, we had a great deal of approval for our Parks system, so naturally, we followed suit and we made significant investments in our Parks and our trail system here in the City. Of course, Public Works and making sure that on those snowy days, which we haven't had many of in the last couple years, but it sounds like we might this year if you believe the old Farmers Almanac, I should have asked Ben when he was here, he knows; Ben is a good friend, and he used to work down at the golf course, and that man has an intuition for weather like nobody you've ever met. I don't know if it's the farmer in him or if he's just gifted that way, but he's like Radar from MASH, for those of you old enough to remember when that was, he knows when snow's coming. But we are very glad to know that we've been able to

invest in the equipment that we need in order to keep our City safe and keep our roads clear and make sure that everybody can get to work, etc. So, with that, I will open myself up for any questions you might have for me.

Frazier said thank you and asked if there were any questions for Council Member Olsen.

Fisher said we had a resident talk about Data Centers earlier. That's a little bit out of left field for me, so I'm wondering has the City been approached by anybody who is looking to put in a Data Center? Are there certain, I know they're kind of a hot button topic, are there discussions in place? I mean, what do we do as a City? Council Member Olsen replied in my time as a member of the City Council, we've been approached several times by individuals who are interested in having a conversation about Data Centers. Data Centers are a little bit interesting when it comes to development because they don't generally produce many jobs, and they take a significant amount of resources to operate effectively in most cases. I don't want to paint with too broad of a brush because I'm sure as you know as Planning Commissioners, every application is unique and has its own different details, but up to this point, no, we really haven't had any major dialogue with anybody about a Data Center. So, that was a little bit out of left field for me, too, I guess, but could it happen? Sure. Somebody could put in an application, absolutely; at this point, though, I'm not aware of anything.

Fisher said I feel like for cannabis, for example, when that was coming up, nobody really had any regulations or nobody really knew like what was going to happen next. Do we feel like that's kind of where the Data Center thing is at, like if there's something that does come before us, are we going to have a framework to be able to? Council Member Olsen replied yeah, we have a very strong framework for span of control and influence around how a development that might include a Data Center would come to pass. It goes through the same regulatory processes, everything else that comes before us, and that would include involving the Planning Commission. It could certainly include other local and State agencies, it include the County, it all depends on the specifications of the application, of course. So, again, without painting with a broad brush, I feel pretty confident that if somebody did bring an application forward, we would certainly have the wherewithal to analyze it very closely and determine whether or not it was a good fit for our community. Data Centers are interesting as well because the people who operate Data Centers have to have certain parameters in place before they can even consider that as an end use, and some communities just don't have that, they don't have the infrastructure, they don't have the ability to host a Data Center. So, could we have a conversation? We certainly could, but I can't even speak to whether or not we would be able to meet their needs until such time as something would become concrete, which at this point, I'm not aware of anything. Fisher said okay, thank you.

Frazier asked if there were any further questions for Council Member Olsen, but none were asked. Frazier thanked Council Member Olsen for being here. Council Member Olsen replied thank you guys very much, appreciate your hard work.

B. RESPONSE TO PLANNING COMMISSION INQUIRIES - None.

C. PLANNING COMMISSION REQUESTS

Bhat said so, when Bonnie was speaking, she mentioned about AUAR, with the expansions. What is it and can we access it? Schmitz replied Mr. Chair, Commissioner Bhat, an AUAR is a planning tool that we use to do a review of an area with potential development scenarios. In this particular Business Park, an AUAR was completed 15, plus or minus years ago, it's required by State Statute to update those studies every five years; I believe the last update to the Business Park AUAR was in 2022, so the next update to that AUAR is in 2027. What that work does, Commissioner Bhat, is it allows us to evaluate from an environmental and any other impact of potential development scenarios, which then really helps us to complete that work ahead of a development coming in, knowing the potential impact; and then we have a mitigation plan that's tied to that study that any development is required to follow as a part of their development. Bhat asked can we access the 2022 AUAR? Schmitz replied I am happy to send a link; Bhat said thank you.

9. ADJOURNMENT

Stechmann made a motion to adjourn the meeting. Brittain seconded. Motion passed unanimously (7-to-0 vote). The meeting was adjourned at 7:54 p.m.

Cottage Grove
Where Pride and Prosperity Meet

October 14, 2025

Bonnie Matter
6649 Inskip Ave S
Cottage Grove, MN 55016

Ms. Matter,

During the September 22, 2025, Planning Commission Meeting, the City of Cottage Grove held a public hearing on a planning application for a Preliminary Plat submitted by NP BGO Cottage Grove Logistics Park, LLC. Your comments were received during the public hearing at the September 22, 2025, Planning Commission public hearing.

Planning Case 2025-023 that was reviewed by the Planning Commission as a Preliminary Plat application. The Preliminary Plat application proposed adjustment of property lines and establishing required easements. The application did not propose a use or construction of infrastructure for review. Future proposed development would require a planning application; therefore, no data exists to respond to your questions received during the public hearing at this time.

The Business Park Alternative Urban Areawide Review (AUAR) was originally completed in 2017 and last updated per State Statue in 2022. AUAR's are required to be updated every five years therefore, the Business Park AUAR will be updated in 2027.

Sincerely,

Emily Schmitz
Community Development Director