

COTTAGE GROVE RAVINE Regional Park Master Plan



MARCH 2, 2017
REVISED DRAFT

Washington
 **County**

Cottage Grove Ravine Regional Park Master Plan

Washington County, MN

REVISED DRAFT March 2, 2017

Prepared for:



Prepared by:



In association with:

Heritage Shade Tree Consultants

Acknowledgments

The Cottage Grove Ravine Regional Park Master Plan has been a team effort led by a dedicated group consisting of Washington County staff, along with local city and agency staff.

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Executive Summary

Vision for Cottage Grove Ravine Regional Park

Cottage Grove Ravine Regional Park is regionally important because it contains a unique landscape of steep ravines, rolling hills, mature oak forests, and a scenic lake unlike other parks in the metropolitan area. There are exciting opportunities for active and passive recreation throughout the park, allowing visitors to immerse themselves in a scenic landscape that is minutes from the suburban communities east of Saint Paul. The park is adjacent to the Mississippi River Trail, a national bicycle route, and connects to the planned Central Greenway Regional Trail. This master plan update will provide Washington County with a strategy to enhance the developed areas of the park while protecting its natural features for the future enjoyment of Washington County residents and all Minnesotans.

Master Plan Update

The initial Cottage Grove Ravine Regional Park Master Plan was adopted by the Washington County Board of Commissioners in 1992 and updated again in May 2007. Since the development of the last master plan update, several planning and development projects in Washington County have come to light, with direct impacts to Cottage Grove Ravine Regional Park. This master plan update builds on the previous master plan by:

- » Incorporating the South Washington Watershed District (SWWD) Central Draw Storage Facility (CDSF) overflow system.
- » Preserving remaining natural areas for wildlife habitat including mature oak forests.
- » Introducing new development concepts for the trailhead area on the east side of Ravine Lake, a new group picnic facility and playground, and other new recreation opportunities for the park.
- » Establishing a new park entrance road.
- » Establishing a new park entrance with a contact station.
- » Updating the existing network of bike/pedestrian and cross-country ski trails.



Cottage Grove Ravine Regional Park location within the Washington County Park System

Central Draw Storage Facility Overflow Project

A primary reason for updating the Cottage Grove Ravine Regional Park Master Plan is to accommodate the South Washington Watershed District (SWWD) proposal to develop a stormwater conveyance system called the Central Draw Storage Facility (CDSF) Overflow Project. This project will provide a controlled emergency overflow outlet for runoff from 100-year flood precipitation events from upstream developed lands in the South Washington Watershed District's Northern Watershed to the Mississippi River. The project will also stabilize the ravine against existing and future erosion risk, stabilizing lake levels to protect park infrastructure, and reduce flooding downstream.

The CDSF within Cottage Grove Ravine Regional Park will consist of two main components: stabilizing the ravine running the length of the park and constructing an outlet structure for Ravine Lake. Construction is expected to occur in 2017.

The stabilization of the ravine running the length of Cottage Grove Ravine Regional Park will include a variety of structures and features to address impacts to side slopes and slow the velocity of the water in the system. The goal for this part of the project is to protect the ravine against erosion from local flash flood events and overflow events while maintaining park use. Extensive ecological mitigation is also planned as part of the project, which will require tree removal for construction. That mitigation includes vegetation management throughout the corridor to restore a forest community in line with County goals.

Ecological Stewardship

The long-range ecological stewardship vision of Cottage Grove Ravine Regional Park should be viewed on two scales: establishing an interconnected habitat within the

park boundary and providing a wildlife habitat corridor on a regional scale. Regional ecological restoration challenges within the park must be prioritized with respect to three factors: Significance of the plant community resource, probability of ecological degradation, and identifying funding sources to allow management of the natural resources within the park.

Development Master Plan

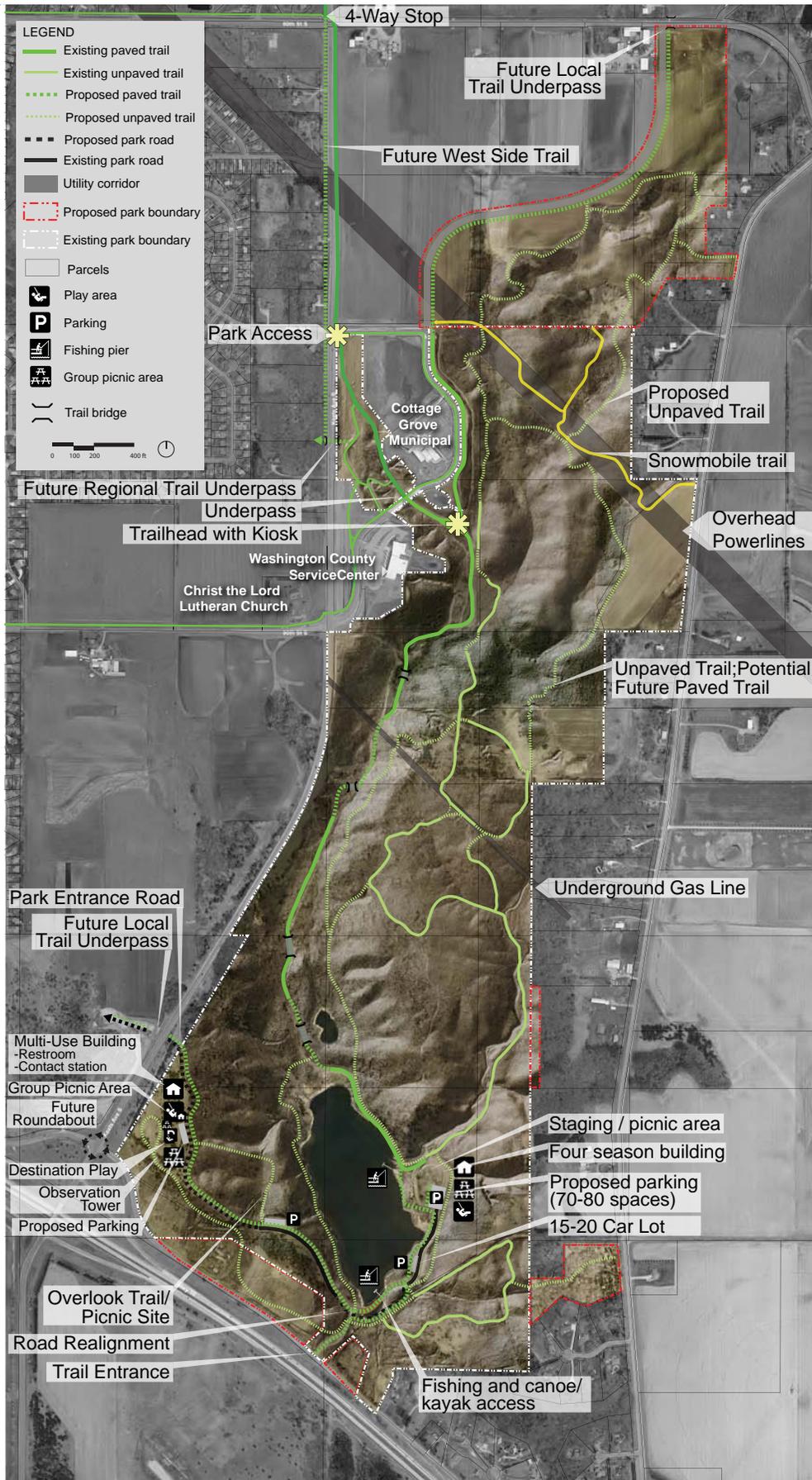
This updated development master plan builds upon previous planning efforts to preserve and protect the abundance and diversity of natural resource amenities while making the regional park more usable and accessible to park users in the face of new development challenges, including the CDSF Overflow Project and improvements to County Road 19. The public participation process allowed for recreational user groups, adjacent property owners, and elected officials to assist in guiding the park's future development and realize programming opportunities.

Park improvements are proposed at three main locations within the park, including:

- » The trailhead site on the east side of Ravine Lake
- » Improvements at the south end of Ravine Lake associated with the installation of a new outflow structure
- » A new park entrance and upper picnic area

Updates to the network of paved and soft-surface trails are also proposed in the master plan:

- » Cross-country ski trail intersections and trail segments that will be impacted by potential flooding will be relocated
- » Cross-country ski trails will be re-organized in sequential loops
- » Trail lighting will be installed for after-dark skiing



Cottage Grove Ravine Regional Park development plan



Lakeside Development Area



Overlook Development Area

Acquisitions

Washington County's current policy position on land acquisition is on a "willing seller" basis. The projected timing and sequencing of acquiring property adjacent to the park will ultimately be determined by the County's ability to acquire funds and the timing of parcel availability.

Cottage Grove Ravine Regional Park's original size was 515.3 acres. Several transactions have occurred that have modified the size of the park. Over the last twelve years 38.5 acres were removed from the park boundary to develop County and City municipal facilities. In that same time frame 30.45 acres have been added to the park. The current park size is 507 acres. The master plan identifies five additional locations and parcels for future land acquisition on the north, east and south sides of the Park that total 89.74 acres. The total Park acreage, with all proposed acquisitions will be approximately 597 acres.

Maintenance and Operations

Washington County manages and operates its park and trail system with internal staff. This includes Cottage Grove Ravine Regional Park as defined under this master plan. The Washington County Board of Commissioners established policies and goals for maintaining the parks and trails system through an annual budgeting process for capital and operating funds for parks. The development of more amenities at Cottage Grove Ravine Regional Park will require additional staffing and expenditures to meet maintenance and operational needs. The park currently does not have full-time employees. Maintenance and operations are conducted by park staff operating out of St. Croix Bluffs Regional Park.

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Chapter 1: Introduction and Planning Framework

Cottage Grove Ravine Regional Park is regionally important because it contains a unique landscape of steep ravines, rolling hills, mature oak forests, and a scenic lake unlike other parks in the metropolitan area. There are exciting opportunities for active and passive recreation throughout the park, allowing visitors to immerse themselves in a scenic landscape that is minutes from the suburban communities east of Saint Paul. The park is adjacent to the Mississippi River Trail, a national bicycle route, and connects to the planned Central Greenway Regional Trail. This master plan update will provide Washington County with a strategy to enhance the developed areas of the park while protecting its natural features for the future enjoyment of Washington County residents and all Minnesotans.

Relationship with Previous Master Plan

The initial Cottage Grove Ravine Regional Park Master Plan was adopted by the Washington County Board of Commissioners in 1992 and updated again in May 2007. Since the development of the last master plan update, several planning and development projects in Washington County have come to light, with direct effects to Cottage Grove Ravine Regional Park. While elements of the first two master planning efforts for the regional park remain valid, Washington County recognized this as an opportunity to update the development plan for Cottage Grove Ravine Regional Park to enhance the current developed areas of the park and vehicle and pedestrian circulation within the park.



Ravine Lake is a major attraction in Cottage Grove Ravine Regional Park. Proposed improvements to the park will increase access to the lake.



Upgrades to the trailhead and picnic and playground area on the east side of Ravine Lake will enhance the park.

This master plan update builds on the previous master plan by:

- » Incorporating the South Washington Watershed District (SWWD) Central Draw Storage Facility (CDSF) overflow system.
- » Preserving remaining natural areas for wildlife habitat including mature oak forests.
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Central Draw Storage Facility Overflow Project

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ravine against existing and future erosion risk, stabilizing lake levels to protect park infrastructure, and reduce flooding downstream. The proposed alignment for the overflow project will extend south through the center of the park, following the general path of the existing channel and paved trail as it heads south to Ravine Lake. The project will include a new outlet structure on the south shore of Ravine Lake that will be incorporated in the relocation of the park entrance road. The outlet structure will regulate the water levels of Ravine Lake and will reduce flooding risk to adjacent, downstream residences.

Changes to the park's natural resources from future development, including the proposed stormwater conveyance system are addressed in the Natural Resources Stewardship chapter. Changes to trails and other recreation elements from future development in the park are addressed in the Development Master Plan chapter.

Planning Framework

Planning Framework and Regional Park System Guidelines

The 2040 Regional Parks Policy Plan states that regional parks should contain significant regional natural resources such as lakeshore, wetlands, hardwood forests, native prairies, and groundwater recharging areas.

The 2040 Regional Parks Policy Plan also states that regional parks must meet the following criteria:

- » Contain a diversity of nature-based resources, either naturally occurring or human-built.
- » Regional parks are typically 200 to 500 acres in size.
- » Regional parks accommodate a variety of outdoor recreation activities.

Cottage Grove Ravine Regional Park conforms to the Metropolitan Council regional parks policy. The current park size is 507 acres. Once fully acquired, the regional park will be approximately 597 acres in size.

Planning Purpose and Assumptions

Master planning efforts for incorporating recreational amenities focused on:

- » Protecting the park from future stormwater runoff events while providing excellent recreation opportunities and natural resource restoration activities.
- » Locating active use areas in low-quality or already disturbed land areas.
- » Balancing multiple active and passive programming with the needs of the native landscape and existing habitat ecologies.

» Planning assumptions established by Washington County include:

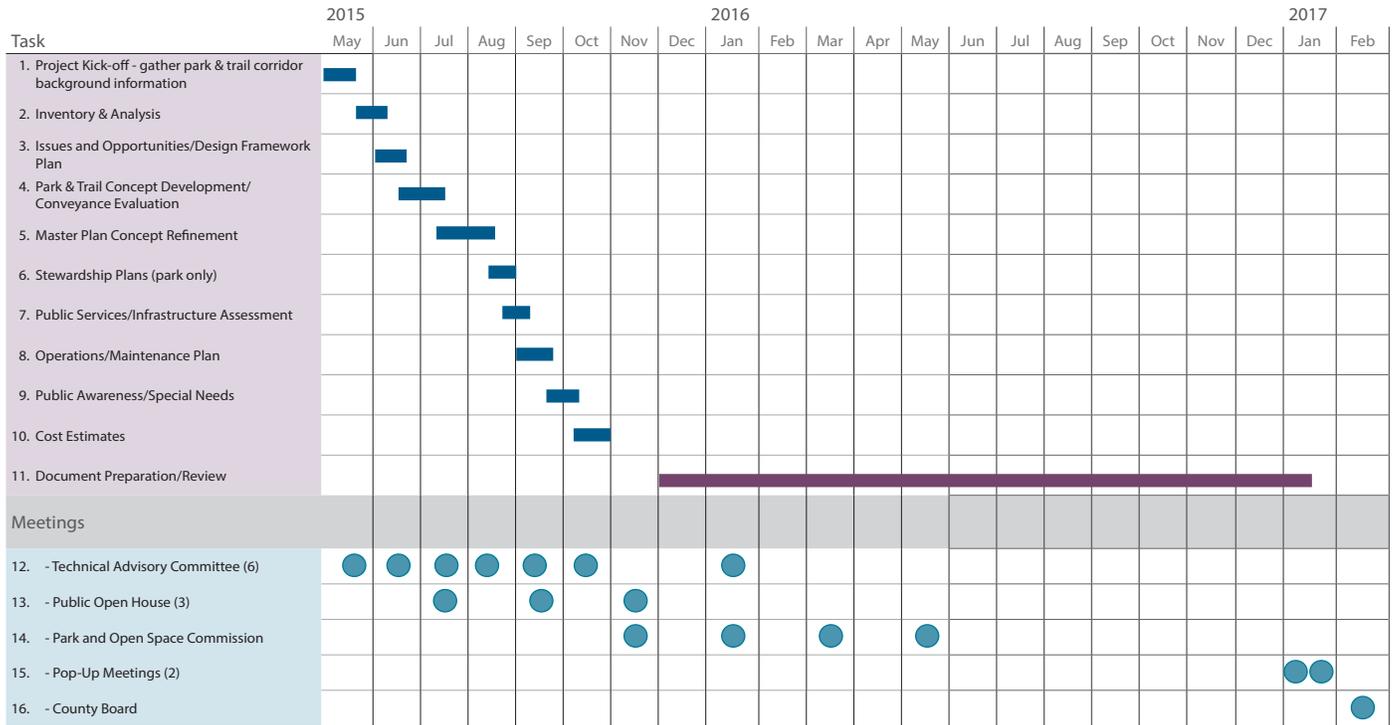
- Review proposed parcel acquisitions listed in the first master plan and identify additional acquisitions that will enhance park programming and natural resource protection.
- Land parcels will continue to be acquired compliant with the vision for the regional park.

The Planning Process

Soliciting feedback and input from all stakeholders was an important component of the master plan process. The key steps and time line associated for completing the planning process are outlined in Figure 1 and were as follows:

- » Complete site inventory for existing site resources, conditions, and facilities.
- » Identify needs, challenges, issues, and opportunities for updating developed areas of the regional park.
- » Develop master plan concept alternatives.
- » Refine concept alternatives in the preferred master plan.
- » Prepare the master plan document.
- » Seek plan approval from the Washington County Parks and Open Space Commission, Washington County Board of Commissioners, and Metropolitan Council.

Figure 1: Planning Process



Relationship within the Washington County Park system

The Washington County Park Vision Statement states: *“The Washington County Park and Open Space System adds value to all peoples’ lives and contributes to the well-being of local and regional communities by providing public enjoyment and education; and maintaining and restoring high quality natural areas. By virtue of its large size, high quality facilities and dispersed locations, the County Parks and Open Space System preserves and showcases the County’s heritage and provides a place for users to find quietude, green space, clean water and a place to recreate.” (Wash. Co. 2030 Plan p. 5-1).*

As the park vision statement indicates, Washington County is home to numerous significant natural resources and is comprised of regional, county, and state parks (see Figure 2). The Washington County Park System currently includes four regional parks, including Cottage Grove Ravine Regional Park, two park reserves, and two county parks. Washington County is also home to William O’Brien State Park, Afton State Park, and a portion of the Gateway and Brown’s Creek State Trail. Additional natural resources with national significance, include the St. Croix National Scenic Riverway and the Mississippi National River and Recreation Area. Cottage Grove Ravine Regional Park is located in southern Washington County on County Road 19 just north of Highway 10/61 in Cottage Grove.

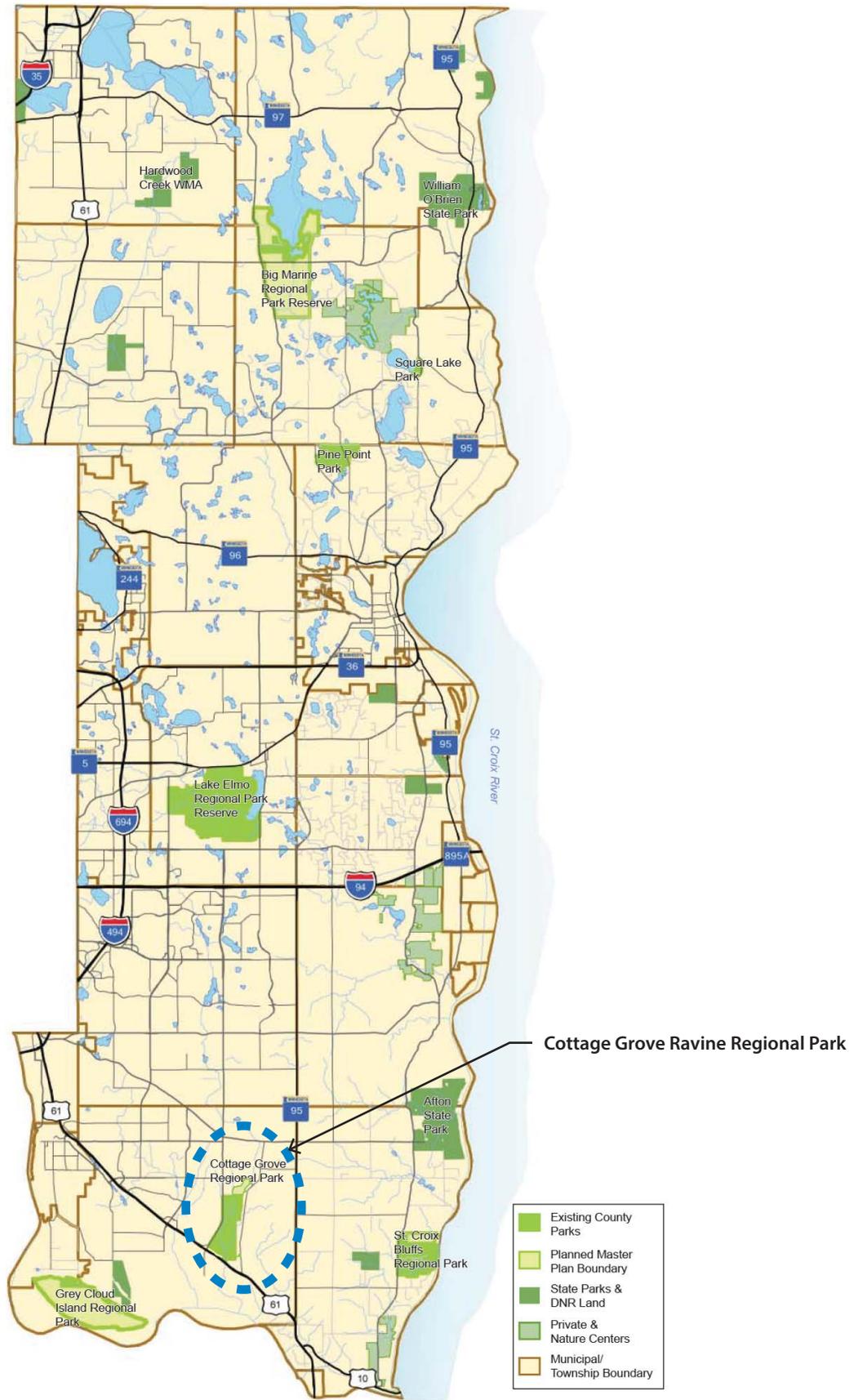


Figure 2: Washington County Park System

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Chapter 2: Recreation Trends and Demand Forecast

Population Trends

The metropolitan area continues to be the fastest growing region in Minnesota with an anticipated increase in population of 21.5 percent between 2015 and 2040. Furthermore, the Metropolitan Council forecasts the region to grow by an additional 647,000 people between 2015 and 2040.

	Population	Households	Employment
2015	3,005,000	1,177,000	1,677,000
2020	3,128,000	1,257,000	1,791,000
2030	3,389,000	1,378,000	1,913,000
2040	3,652,000	1,492,000	2,033,000

Sources: US Census Bureau and Metropolitan Council Estimates

Table 1: Metropolitan Area Population Projections

According to Minnesota’s State Comprehensive Outdoor Recreation Plan 2014 – 2018 (SCORP), Minnesota’s growth rate has increased since 2000, but at a slower rate than in the 1990s. Although population growth in the state has slowed, the geographic pattern of growth remained largely the same with the high growth areas centered on the Twin Cities metropolitan area. This new growth will fuel demands for near-home recreation opportunities in these areas. According to US Census data and Metropolitan Council estimates, the

Growth in Population and Households 1970 to 2040 Washington County				
	Population	Percent Increase	Households	Percent Increase
1970	83,003		21,314	
1980	113,571	27%	35,001	39%
1990	145,896	22%	42,246	17%
2000	201,130	27%	71,462	41%
2010	238,136	15%	87,859	19%
2015	251,015	5.1%	92,669	5.2%
2020	268,410	6.4%	102,280	9.3%
2030	299,130	10%	116,210	12%
2040	330,200	9%	130,090	11%

Sources: US Census Bureau and Metropolitan Council Estimates

Table 2: Growth in Population and Households 1970-2040

population of Washington County will increase by 79,000 between 2015 and 2040, which will not only contribute to increased recreation demand, it will also contribute to higher runoff levels in storm events which also impact the park. Within fully developed areas where population levels are expected to remain relatively stable, park visitation levels and type of use will also reflect shifting demographics in these areas. The Metropolitan Council estimated that for Cottage Grove Ravine Regional Park there were 66,600 visitors in 2015.

Aging Population

While the trend of young adults and their children shows a reduction in their involvement in nature-based recreation, SCORP notes that older adults have maintained a more stable involvement in outdoor recreation. Older adult recreation habits are well established and demand for their preferred activities will continue to be strong. However, as this group ages, physical limitations will require some park and trail

visitors to change their recreational activities from higher intensity activities such as running, in-line skating, and biking to lower-impact recreational activities such as walking, nature observation, and educational opportunities. Many of these activities are accommodated by the regional park system.

Minority Populations

Metropolitan Council demographers anticipate that 40 percent of the region's population will be people of color by 2040 compared with 24 percent in 2010. Within the region, there are three prevalent immigrant groups: Hmong/Southeast Asians, Hispanic/Latino, and Somali/West Africans.

Nature-based outdoor recreation involvement is much greater for the white/non-Hispanic population in Minnesota and the nation (Table 3). The involvement of non-whites and/or Hispanics is a fraction of whites/non-Hispanics. Whether the differences in the size of this fraction by activity and system are real is uncertain given the range of data sources. What seems certain is the general pattern: consistently low involvement of the non-white and/or Hispanic populations, averaging around one-quarter of white/non-Hispanic involvement.

The relative involvement of different populations in nature-

Activity or system	Place	Year	Measure of Involvement	Involvement of Population			Ratio of Involvement
				Total Population	White, Non-Hispanic Population	Non-White and/or Hispanic Population	Non-White and/or Hispanic to White, Non-Hispanic
Hunting	US	2006	Annual participation (age 16+)	5%	7%	1%	0.17
	MN	2006	Annual participation (age 16+)	13%	15%	4%	0.25
Fishing	US	2006	Annual participation (age 16+)	13%	16%	5%	0.33
	MN	2006	Annual participation (age 16+)	28%	31%	11%	0.36
Away from home wildlife watching	US	2006	Annual participation (age 16+)	10%	13%	4%	0.29
	MN	2006	Annual participation (age 16+)	14%	16%	5%	0.33

Sources: Minnesota's State Comprehensive Outdoor Recreation Plan 2014 - 2018

Table 3: Recreation Involvement by Population

Metropolitan Council research has indicated that these visitor groups share a common approach to park visitation, including group or family gatherings, and picnicking.

based recreation coupled with their respective population growth rates creates significant obstacles to expanding nature-based recreation both in Minnesota and around the

nation. They are likely important contributing factors to involvement declines in these types of recreation.

For example, Minnesota fishing and hunting participation declined 8 and 11 percent, respectively, between 2000 and 2010 (“participation” is the percent of the population age 16+ licensed for the activity). Fishing participation fell from 31.2 to 28.9 percent, while hunting fell from 14.2 to 12.6 percent. It is roughly estimated that about one-third of these declines can be attributed to the changing racial and ethnic composition of the population (MnDNR 2014). Young families are not participating in outdoor recreation.

Geographic Patterns and Recreation Impacts

The geographic pattern of population growth in Minnesota is another factor impacting recreation. The Minnesota SCORP 2014-2018 notes that the high growth areas will be the greater Twin Cities metropolitan area, which will place higher demands on near-home recreation opportunities, while the less densely settled regions and recreation amenities will see a reduction in growth. This will result in changes in the type of recreation with a reduction in hunting, snowmobiling, and off-highway vehicle use and an increase in passive recreation activities, including fishing and boating.

Top Outdoor Recreation Trends

The 2005 USDA Recreation Statistics update for Western and Mid-Western Metropolitan Residents ranked Minneapolis/Saint Paul in the top four most active cities for nature-based outdoor activities. The results were based on participation for users 16 years and older. The activities with the highest

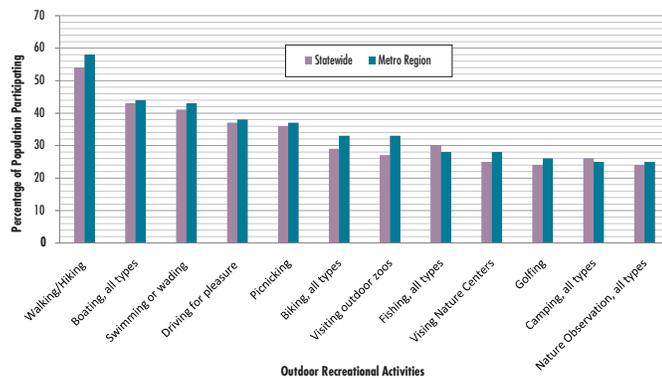
participation rates in the Metropolitan area in comparison to other cities were:

- » Warm water fishing
- » Canoeing
- » Big and small game hunting
- » Cross-country skiing

In 2004, the Minnesota Department of Natural Resources conducted a survey and study from data collected from Minnesotans ages 20 and older. Several trends were identified including top activities by annual participation rates and distance to recreational opportunities. Overall top activities in the seven-county metro region are listed in Table 4 and are led by:

- » Walking/hiking
- » Boating, all types
- » Swimming, all types

Statewide, fishing and camping ranked slightly higher than in the metro area alone.



Source: DNR SCORP 2008-2012, 2004 Minnesota Outdoor Recreation Participation Study

Figure 3: Top Activities in the Metropolitan Area

Near-home recreation (within ½ hour of home) is led by walking/hiking and away-home recreation (over ½ hour of home) is led by all types of fishing activities. In general, opportunities for near-home activities are provided by the private sector and more-local levels of government and opportunities for away-from-home activities are provided by the private sector, state or federal government (MnDNR 2014).

According to the 2008 Metropolitan Council Regional Parks and Trails Survey, primary activity in the regional parks system was walking and hiking (21 percent), followed by swimming (16 percent) and biking (10 percent).

Activity	% of park activity occasions ¹	# of park activity occasions	# of trail activity occasions	# of trail activity occasions	Total # of activity occasions	% of total visits
		1000's		1000's	1000's	
Walking/hiking	21%	7,489	30%	3,957	11,447	23%
Biking	10%	3,566	45%	5,936	9,502	19%
Swimming ³	16%	5,706	2%	264	5,970	12%
Picnicking	10%	3,566	0%	-	3,566	7%
Relaxing ²	9%	3,210	2%	264	3,474	7%
Jogging/running	5%	1,783	10%	1,319	3,102	6%
Playground use ³	7%	2,496	1%	132	2,628	5%
Dog-walking	5%	1,783	7%	923	2,707	6%
Sunbathing ³	5%	2,140	1%	132	2,272	5%
Fishing ³	6%	2,069	1%	132	2,200	5%
Boating	4%	1,427	0%	-	1,427	3%
Zoo visits (Como)	4%	1,427	0%	-	1,427	3%
In-line skating	2%	713	4%	528	1,241	3%
Camping	2%	713	0%	-	713	1%
		Regional Parks		Regional Trails		System-wide
2014 system-wide visits (in 1,000's of visits)		35,664.2		13,191.2		48,855.3
% of 2014 visits		73%		27%		100%

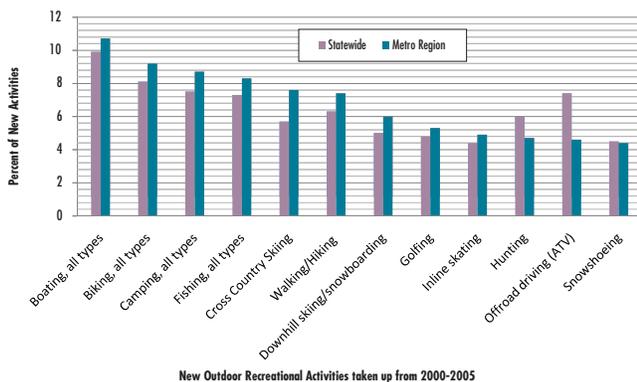
Notes:
 1 Activity pattern data of regional park and trail visitors was collected in 2008 and published in the Metropolitan Council Regional Parks and Trails Survey 2008. The activity patterns were applied to the 2008 visit estimate to generate this table. Visitors could do more than one activity during their visit to a regional park or trail. Each time they participated in an activity, it was considered an activity occasion. Therefore, the total number of activity occasions is greater than the actual number of visits.
 2 "Relaxing" was a general activity on a list of activities that park visitors used to indicate what they did during their park visit. This activity was not specifically defined.
 3 For trail visits, survey respondents indicated that the trails were providing access to these activities. For example, 2% of trail visits provided access to swimming and 1% of trail visits provided access to fishing
 Source: Metropolitan Council Annual Use Estimate of the Metropolitan Regional Parks System for 2014

Table 4: Top Activities in the Regional Parks System

Other Recreational Trends

New Activity Growth 2000-2005

Figure 4 compares new activities state-wide and in the metro region within the 2000 to 2005 time period. Boating (other than fishing) and biking (all types) have the highest percentage of participation. Of note, several snow-related activities (skiing, snowshoeing) show up in the top ten of this list for the metro region when they had very low percentages in existing trends. One possibility for this trend gap is that several winters preceding the survey had poor snow conditions leading to pent-up demand, which may have helped position these activities in their rank for new activity growth (MnDNR 2014).



Source: DNR SCORP 2008-2012, 2004 Minnesota Outdoor Recreation Participation Study

Figure 4: New Outdoor Recreational Activities

Water-based recreation is a big attraction for outdoor activities throughout Minnesota. Winter activities are also very important to Minnesotans as well although the data might not reinforce this assumption. User participation cannot be a substitute for public outreach and stakeholder input. Trend data along with public input were evaluated for refining recreational programming opportunities for Cottage Grove Ravine Regional Park.

Other Trends Affecting Recreation

A 2013 study by the Minnesota Department of Health found that statewide 26 percent of adults were obese and 36 percent were overweight. Obesity is a key predictor for many future health problems, including diabetes. Lack of adequate exercise – partially resulting from inadequate outdoor recreation facilities or opportunities – is often cited as a contributor to obesity. Many young people are not getting enough exercise and face future health risks as a result. The economic health of the state relies on continued use and enjoyment of our outdoor recreation resources. Availability of a wide range of outdoor recreation opportunities is one of the factors most often cited as contributing to the state’s perceived high quality of life. Participation in outdoor recreation may correspond to a greater interest in and support for measures to protect land, facilities, and resources necessary to ensure those same activities are available for future generations.

Living Healthy in Washington County

Active Living By Design – A Complementary Vision

The “active living by design” movement gaining momentum across the country complements the vision for this regional park. Active living by design “is a way of life that integrates physical activity into daily routines.” Key principles of this movement as it pertains to this plan include:

- » Physical activity is a behavior that can favorably improve health and quality of life.
- » Everyone, regardless of age, gender, language, ethnicity, economic status or ability, should have safe, convenient and affordable choices for physical activity.
- » Parks and trails, should be safe, accessible and part of a transportation network that connects destinations of interest, such as other parks, housing, schools, work sites, transit, community services and businesses.

»Municipalities and other governing bodies should plan for ongoing interdisciplinary planning and collaboration, promotion of facilities, behavioral supports and policies that implements the vision of active living.

»Routine maintenance and management that ensures continued safety, quality and attractiveness of the physical infrastructure and the natural environment.

The following provides an overview of pertinent findings from research that supports the active living movement and development of this regional park.

Physical Activity/Preventing Obesity

Physical inactivity causes numerous physical and mental health problems, is responsible for an estimated 200,000 deaths per year in the United States, and contributes to the obesity epidemic. The design of communities and the presence or absence of parks, trails, and other quality public recreational facilities affects people’s ability to reach the recommended 30 minutes each day of moderately intense physical activity. A growing number of studies show that people in activity-friendly environments are more likely to be physically active in their leisure time.

For example, research findings clearly indicate that better access to facilities, pleasant surroundings, safe places, walkable neighborhoods, and activity-friendly environments all encourage higher levels of active recreation. Proximity, connectivity, and design quality of parks and trails can be added to this list to encourage more active lifestyles.

Connectivity and Accessibility

Being able to reach or access a variety of destinations (e.g., parks, retail areas, tourist sites, workplaces, health services, grocery stores) is critical to many dimensions of a healthy

community and healthy personal lifestyles. Ensuring that the recreational facilities, restrooms, park shelters and trails that meet ADA standards is important to accommodate the broadest cross-section of user groups.

Mental Health

A number of studies have demonstrated how being outdoors and in direct contact with nature leads to improved mental health and psychological development. Recent data show that mental health disorders will account for some of the world’s largest health problems in upcoming decades. People do not have to actively use nature to benefit from it; rather, visual exposure is enough. The outdoor experiences and recreational opportunities offered in the Cottage Grove Regional Park framed by natural environment will, at some level, contribute positively to the collective well-being of the users of the park and the adjacent communities.

Statewide Health Improvement Program (SHIP)

Washington County, through the SHIP program, has developed the Living Healthy in Washington County initiative in order to implement policies and practices that create active communities by increasing opportunities for hiking, skiing, access to the parks natural resources and recreation facilities.

Chapter 3: Existing Conditions Inventory

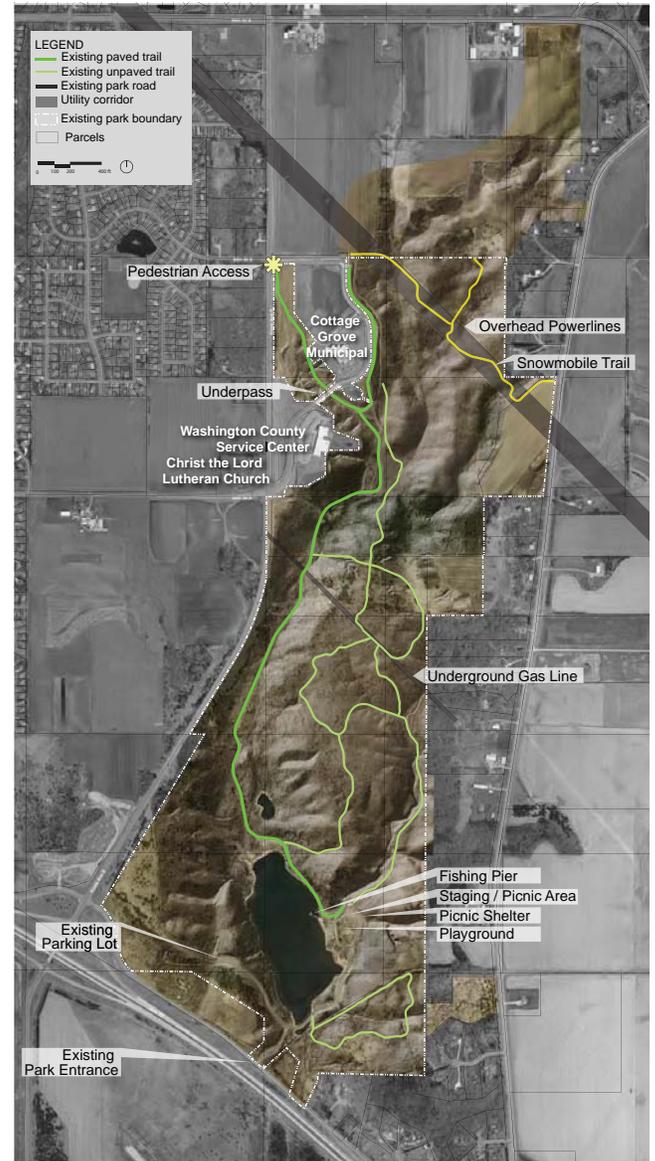
Overview

Significant changes both within and outside of Cottage Grove Ravine Regional Park will occur in the future that will effect the park's natural resources. The Cities of Woodbury and Cottage Grove will continue to develop around the park, which will affect the quantity and quality of water entering the park. The park will be susceptible to increasing flooding and associated erosion as development expands outside its boundary. In addition, the proposed construction of the Central Draw Storage Facility overflow through the park may also alter existing natural resources. The following section provides an overview of historical and existing conditions of natural resources and ecological systems within Cottage Grove Ravine Regional Park.

Existing Recreation Facilities

The majority of the Park's existing recreation facilities are located at the developed area on the east shore of Ravine Lake. These facilities include a picnic shelter with restrooms, playground, two parking lots, and a fishing pier. The Park's trail system emanates from the developed area and include soft-surface trails for hiking and cross-country skiing that circulate through the park northeast of Ravine Lake, and a small snowshoe loop is located south east of the lake. A paved trail extends from the picnic shelter north through the park to the County Service Center. Between 2012 and 2014, the paved trail system was expanded in the northwest corner of the park with a connection to 85th Street and Ravine Parkway.

Figure 5: Existing Conditions



Existing Trails	km
Ravine Trail Paved	2.12
Snow Shoe Trail	0.84
Soft-Surface Ski Trails	7.49

Table 5: Existing Trail Lengths



Existing Natural Resources and Ecological Systems

Cottage Grove Ravine Regional Park is composed of diverse natural systems. Ecological restoration and management, preservation of natural resources, land stewardship, and water resources management are important priorities for this park. This section provides an overview of the natural resources and ecological systems contained within the regional park. The following data has been analyzed to develop broad-based ecological stewardship priorities.

Geology

Cottage Grove Ravine Regional Park sits on the edge of the Rochester Plateau and Blufflands Subsections of the Paleozoic Plateau, which is defined as a rugged region of bluffs and valleys. Although originally a plateau, the area has been heavily eroded and dissected by streams and rivers that connect to the Mississippi River. The depth of drift over bedrock varies from 10 to 100 feet in the Paleozoic Plateau. In general, sediment thickness varies by landscape position. Large exposures of bedrock occur in the steep ravines. These exposures are primarily Ordovician dolomite, limestone, and sandstone, with Cambrian sandstone, shale, and dolomite exposed along the valley walls of the Mississippi River (MnDNR) (Morey 1981, Sims et al. 1966).

Soils

Soil profiles provide clues as to the characteristics of plant communities that once grew on them. The Natural Resource Conservation Service (NRCS) Soil Survey for Washington County reveals much about the pre-European settlement vegetation once present within the park reserve as well as guidance on managing target plant communities (Figure 6).

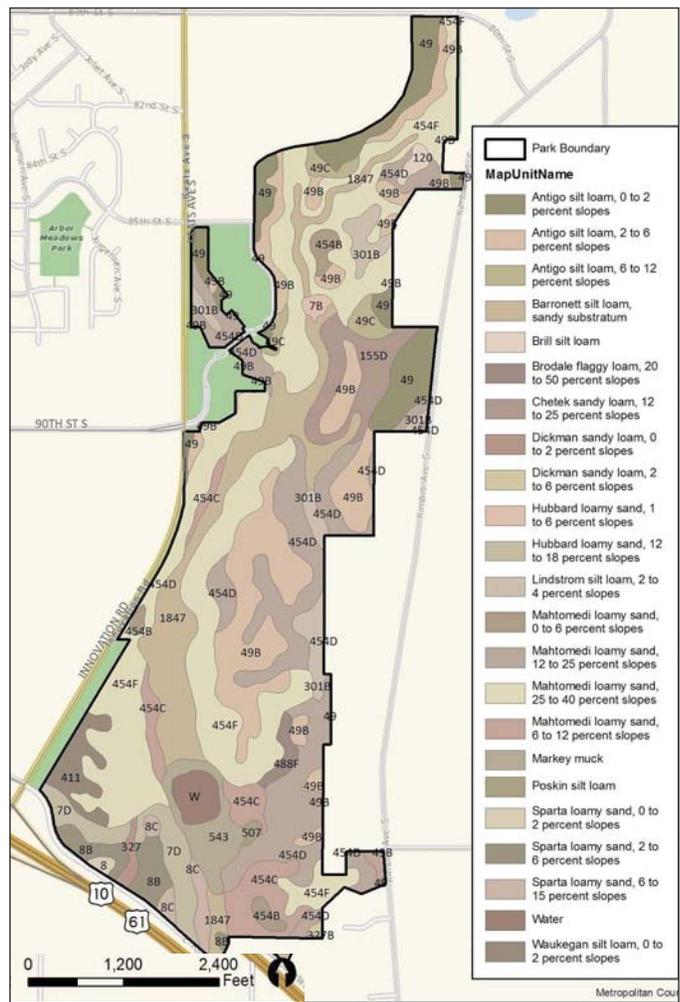


Figure 6: Soil Types

Surface Waters

The steep slopes and ravines of Cottage Grove Ravine Regional Park all drain to Ravine Lake at the far south of the park. Ravine Lake is a 25-acre lake with a maximum depth of 15 feet. There are two primary inlets to Ravine Lake: (1) north ravine drains a majority of the park and enters Ravine Lake from the north shore and (2) east ravine that enters the lake in the northeast corner and runs along the north side of the developed trailhead area on the east shore of the lake. There are several springs near the northeast shore. The lake is currently impaired but improving. The Minnesota Department of Natural Resources manages the fish population in Ravine Lake and has identified several species in the lake, including Bluegill, Black Crappie, Largemouth Bass, Walleye, and Bullhead.

Water Conveyance

The natural features that give the park desirable attributes for regional recreation also pose challenges related to flooding. The soils mentioned earlier are highly erodible and the projected growth in the area will send more stormwater into the park. The park's east ravine has been impacted by runoff and has considerable erosion as a consequence. Additional erosion can be anticipated in the park in both the east ravine and the central draw if no actions are taken to mitigate runoff entering the park. Upstream erosion and increasing local flows from surrounding development will continue to affect the park if no action is taken to mitigate these impacts. Future development in the drainage basin of the east ravine will increase flows in the ravine. Washington County, in partnership with South Washington Watershed District will conduct a study to review existing conditions of the east ravine to identify causes and solutions for erosion. Much of the runoff entering the east ravine comes from outside the park. Therefore, this study will be completed within six to eight years, prior to future development along the east side of the park. Stabilization and mitigation efforts in the east ravine will reduce degradation in the ravine and reduce sediment flow in to Ravine Lake. The Watershed District's Conceptual Overflow Design addresses issues of erosion (Appendix F).

Native Plant Communities

Minnesota County Biological Survey (MCBS) data indicates that Cottage Grove Ravine Regional Park contains three unique and significant plant communities (Figure 7). These include Oak (Red Maple) Woodland, Northern Bulrush-Spikerush Marsh, and Dry Sand-Gravel Prairie (Southern). There is also a considerable amount of invasive shrubs in the park. Recent restoration efforts have made removing these shrubs a top priority.

Plant community remnants inventoried by the MCBS represent windows into the landscape of our pre-European settlement past. Some indicators of modern human disturbance may be evident in these remnants; however,

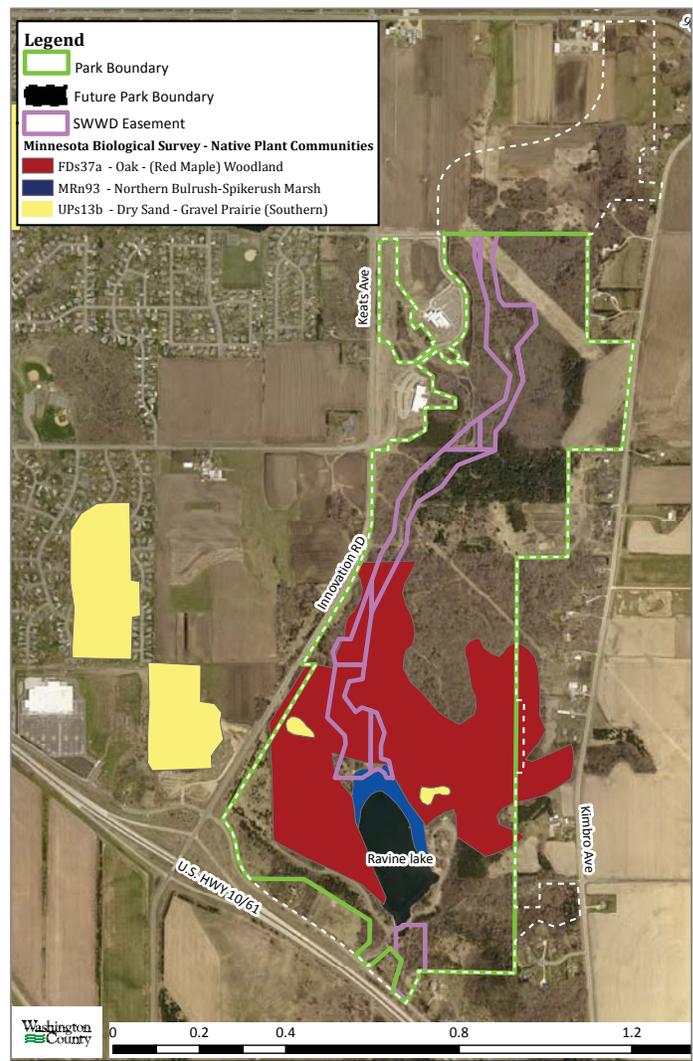


Figure 7: Minnesota County Biological Survey Rare and Unique Native Plant Communities map

they retain a characteristic structure and plant assemblage that clearly identifies them as important extant examples of our natural heritage. Modern disturbances may include grazing, erosion, logging, suppressed fire regime, and limited development. Often ecological disturbance is inferred from the presence of disturbance-tolerant or disturbance-adapted vegetation.

Historic Vegetation Associations

According to vegetation data at the time of European settlement circa 1850, the vegetation of the Cottage Grove Ravine Regional Park and surrounding landscape was covered by the Big Woods hardwood forest. More specifically, the area of the park is composed of oak opening and barrens, with some locations of dry gravel prairie in the area.

Oak Openings and Barrens

Oak Openings and Barrens are grassland, savanna, and woodland systems dominated by dry, mesic, and wet prairie grasses and forbs, with open grown oaks co-dominant. These systems tend to occur on drier, well drained soils types and have frequent disturbance from fire in a natural landscape.

Dry Gravel Prairie

The Dry Gravel Prairie type was restricted primarily to broader ridge tops, where fires could spread, but also occurred on steep slopes with south or southwest aspect.

Important Plants and Wildlife

There are two protected species of plants and wildlife found within the boundaries of Cottage Grove Ravine Regional Park. Protection of such species requires protection of their

habitat. Table 6 summarizes the listed status of these species and their habitat requirements.

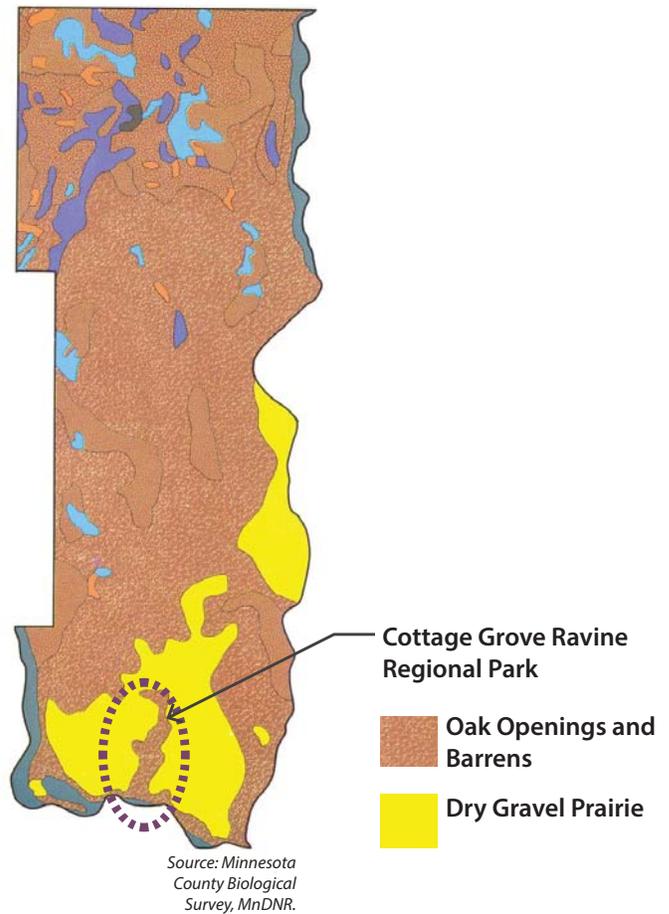


Figure 8: Original Vegetation of Washington County

Table 6: Important Plant and Animal Species

Plant Species	Listed Status	Habitat Requirements
Kitten-tails	Threatened	Primary species of oak savanna communities but also occurs in dry prairies and dry-mesic oak/maple woodlands.
Wildlife Species	Listed Status	Habitat Requirements
Blanding's Turtle	Threatened	An abundance of wetland or riparian habitat in close proximity to sandy upland nesting habitat.

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Chapter 4: Natural Resources Stewardship

Overview

Cottage Grove Ravine Regional Park contains a variety of ecological communities and landscapes that include steep ravines, Ravine Lake, and expansive oak forest, which make the park a special place that more visitors will appreciate as comprehensive resource management practices improve the character of the park landscape over time.

The park also lies within a greenway corridor that creates a habitat link between Lake Elmo Park Reserve to the north and the Mississippi River to the south.

Ecological Stewardship Vision

The long-range ecological stewardship vision of Cottage Grove Ravine Regional Park should be viewed on two scales: establishing an interconnected habitat within the park boundary and providing a wildlife habitat corridor on a regional scale. Regional ecological restoration challenges within the park must be prioritized with respect to three factors:

» **Significance of the plant community resource.** Plant communities may be considered significant for several reasons - perhaps for their constituent high floristic diversity or perhaps for the necessary habitat they provide for a wildlife species. An assemblage of plant communities may also be considered significant if it provides for varied habitat needs of species such as Blanding's turtle (*Emydoidea blandingii*). Plant communities within the park that have been inventoried by the MCBS should be considered as high priorities for management activities. These communities are windows into our rich past. Other areas, perhaps recently row-cropped, may now represent only very early successional

forbland and non-native grassland. As such – major management activities on these severely disturbed plant communities might appropriately be delayed. It should be noted that such ecologically disturbed or early successional plant communities may have a high probability of invasive plant infestations. If uncontrolled, such infestations will spread rapidly – eventually into the plant communities with high natural quality. Due to the threat of invasive species, the County will continue to prioritize invasive species mitigation in vegetation management plans.

» **Probability of ecological degradation.** Immediate ecological degradation may occur as a result of erosional processes, nearby infestations of invasive plant species, impacts from recreational or natural resource development within the park, or inappropriate human use. Slower more long-term degradation may occur as a result of an inappropriate burn regime, either too frequent or with excessive inter-burn periods. Careful mapping of infestations of invasive plants can help to prioritize weed control efforts by demonstrating how imminent their spread is in relation to high quality plant communities.

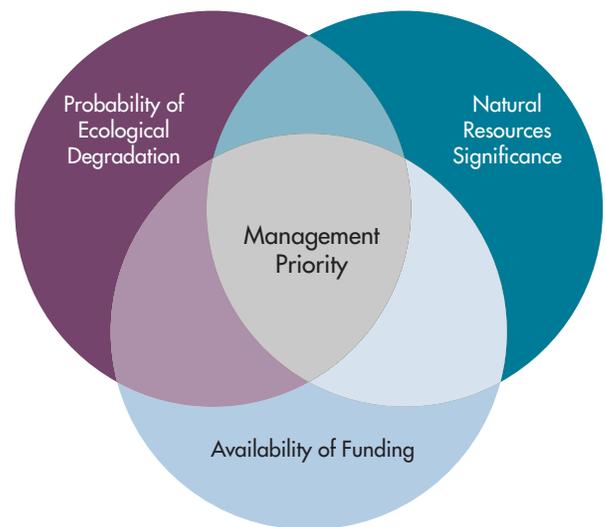


Figure 10: Ecological Stewardship Vision

» **Funding.** Identifying funding sources for managing natural resource areas should be a priority for the park. A comprehensive strategy should also be developed for restoring any degraded natural resource areas within the park.

Steep Slopes and Erosion

Part of the attraction of Cottage Grove Ravine Regional Park is the varying topography. The park is unique because it contains steep ravines that have evolved over time from natural forces including erosion. However, increasing erosion in the Park, caused in-part by outside land use, is a concern. In 2004, the Washington Conservation District (WCA) prepared a drainage features report that documents several erosion locations in the Park and provides recommendations for erosion mitigation. A copy of this report is included in the appendix. The east ravine is one of the areas identified in the WCA report and it is recommended that additional analysis of this area be completed to assess erosion and identify stabilization and mitigation efforts that will enhance water quality downstream and in Ravine Lake. Much of the storm water flow into the Park originates outside its borders and is caused by activities on adjacent properties. The work to stabilize this ravine will require work outside the park boundary on private property. WCA will work with these private landowners on ways to improve water retention to reduce runoff entering the park. The County is aware of the need to stabilize this ravine and will work with our public and private partners to prepare a plan for this work.

The South Washington Watershed District (SWWD) has prepared a plan to address water runoff in south Washington County that includes a conveyance system through the Park. The plan addresses erosion in the central draw that extends north/south through the park. The project will help protect the park and vegetation communities from the existing

erosion risk by designing the channel to control the flow of water during flood events. The full report is included as Appendix C.

Central Draw Storage Facility System

The South Washington Watershed District boundary includes portions of 10 cities and townships across the southern part of the County, including Afton, Cottage Grove, Denmark Township, Grey Cloud Island Township, Hastings, Lake Elmo, Newport, Oakdale, St. Paul Park, and Woodbury. Stormwater from the northern watersheds is collected in Bailey Lake, which had no controlled outlet. The increasing frequency of high intensity rainfall events and the amount of development in the SWWD has amplified the amount of runoff in the northern watersheds. Communities in the SWWD recognized that Bailey Lake would not be adequate to contain all of the runoff from the watershed when it was fully developed.

To address the issue of stormwater runoff, the SWWD and its partners have been working to construct the Central Draw Storage Facility (CDSF), which includes 1,800 acre feet of storage on 250 acres near the outlet of Bailey Lake to provide an outlet for stormwater from the northern watersheds. A City of Woodbury lift station now pumps water from Bailey Lake to the CDSF. With the size of the CDSF and rate/volume restrictions on development draining to Bailey Lake, the system should be adequate to retain the runoff for a 6.3", 24-hour rainfall event. However, because of uncertainty in design, recent trend of extreme precipitation events and degree of safety necessary for flooding situations, SWWD is in the process of constructing a controlled overflow out of the CDSF to the Mississippi River. The controlled overflow will consist of a series of underground pipes and use of existing drainage ways between Bailey Lake and the Mississippi River. The project is being implemented in five phases. Two phases are complete, including one north of Cottage Grove Ravine

Regional Park and one south of the park. Phases III and IV are within Cottage Grove Ravine Regional Park.

CDSF Overflow Project in Cottage Grove Ravine Regional Park

The CDSF within Cottage Grove Ravine Regional Park will consist of two main components: stabilizing the ravine running the length of the park and constructing an outlet structure for Ravine Lake. The new outlet will be constructed as part of the relocated park entrance road on the south end of Ravine Lake. The new outlet, along with the new roadway, will provide adequate capacity to limit bounce on the lake during local flood and overflow events. It will provide improved access to the park because existing roadway flooding will be mitigated and it will help reduce flooding risk for adjacent residences. Construction is expected to occur in 2017.

The stabilization of the ravine running the length of Cottage Grove Ravine Regional Park will include a variety of structures and features to address impacts to side slopes and slow the velocity of the water in the system. The goal for this part of the project is to protect the ravine against erosion from local flash flood events and overflow events while maintaining park use and avoiding disruption to an existing 3M pipeline. Extensive ecological mitigation is also planned as part of the project, which will require tree removal for construction. That mitigation includes vegetation management throughout the corridor to restore a forest community in line with County goals. The conveyance system will be designed to minimize forest canopy impact. Tree protection strategies will be employed during construction to protect large diameter oak trees.

The Preliminary design for the CDSF Overflow Project in Cottage Grove Ravine Regional Park was developed with input from the Technical Advisory Committee (TAC) working on the park master plan. The TAC reviewed several options

for the CDSF Overflow Project within the park and helped determine the layout of the preferred alternative through the park boundary. The design includes check dams with a maximum height of three feet and 3:1 side slopes on both the upstream and downstream sides, 4,300 linear feet of excavated channel (generally eight feet wide at the bottom with 3:1 side slopes and an approximately 2.8 foot depth), four boulder riffle drops, and raised trails and channel crossings. In order to minimize disruption to recreation in the park, the project will relocate paved and soft-surface trails to create separation from the channel.

Trail Design Considerations from CDSF Overflow Project

Post construction, tree planting along the trail will tie into adjacent native plant communities. County and SWWD staff will use the Field Guide to the Native Plant Communities of Minnesota, Eastern Broadleaf Forest Province as a reference for trees to be planted. In select segments, where the trail needs to be relocated, trail relocation will prioritize protecting large diameter oak trees. Substantial effort was made in the design and location of the trail adjacent to the conveyance project. Trail alignment has been strategically located to weave throughout existing plant communities, minimizing impacts to oak trees more than 20 inches in diameter to maintain canopy cover

Flooding Impacts from the CDSF Overflow Project

While the South Washington Watershed District Central Draw Storage Facility Overflow Project will result in physical changes to the park, it will also reduce the impact both local and regional flooding events would have if the project were not completed. Since the park is located in a ravine at the bottom of a watershed, increased development upstream will have significant impacts to park resources (built and natural). This project seeks a balance between the effects of construction and the impact of flooding, if nothing were done.

The South Washington Watershed District will identify and stabilize pathways of stormwater runoff. This allows Washington County to better identify areas where trees and other natural resources will be impacted, and will help determine the location of recreation facilities so they won't be affected by flooding events.

It is important to note that water flows helped shape the park's landscape over long periods of time and that runoff will continue to alter the landscape. Increasing development outside the park boundary will create larger flows into the park and the development of the CDSF Overflow Project will address many of the existing local risks to the park while providing a stable path for future regional water flow through the park.

High precipitation occurrences carrying a volume of water (145 cubic feet per second) will overflow from the CDSF to the park property and impact existing vegetation. Estimates are that approximately 20 acres of park property could be flooded for up to four weeks at a time during a 100-year flood event, including existing wetlands and lakes. The entire channel will be designed to handle inundation and will therefore minimize subsequent impact to trees. During such an event, park staff will be monitoring flood impacts both during the high-water period and afterwards. While it is difficult to predict flooding impacts to individual trees, basic flood tolerance characteristics are recognized within the tree care and forestry communities:

- » The longer trees are exposed to flood conditions, the higher the potential for substantial root injury that will result in tree decline and death.
- » Flood events during the growing season are more harmful to deciduous trees than events that occur during the dormant season.

- » Flooding for extended periods will create anaerobic soil conditions where soils are devoid of oxygen resulting in root death and inhibition of tree growth.
- » Toxic compounds will be produced in water-logged soils (e.g., hydrogen sulfide and alcohols) due to the anaerobic decomposition of organic matter.
- » Water-logged soils reduce the ability of tree roots to remain anchored making them more vulnerable to wind throw.
- » Trees stressed by the flooding are more susceptible to insects and pathogens. This vulnerability remains at least five years after a flood event. Opportunistic soil borne pathogens Phytophthora, Pythium, and Armillaria are abundant in post-flooding, water-saturated soils. Wood borers, emerald ash borer (EAB), two-lined chestnut borer and others are attracted to and survive better in trees stressed from flooding.

Potential Effects and Opportunities from the CDSF Overflow Project

- Reduction of impacts from development-related runoff and erosion within the park
- New structure at Ravine Lake will regulate water levels and minimize potential for park roadway flooding
- Removal of 784 trees for construction of CDSF Overflow Project
- In a 100-year flood event, approximately 20 acres may be flooded within the inundation area for up to four weeks during CDSF release occurrences
- Flood-stressed trees become more susceptible to insect and pathogen outbreaks
- Mature trees that define the wooded-ravine character of the park will be identified and preserved where possible. Trees will remain along the new trail and channel corridors.

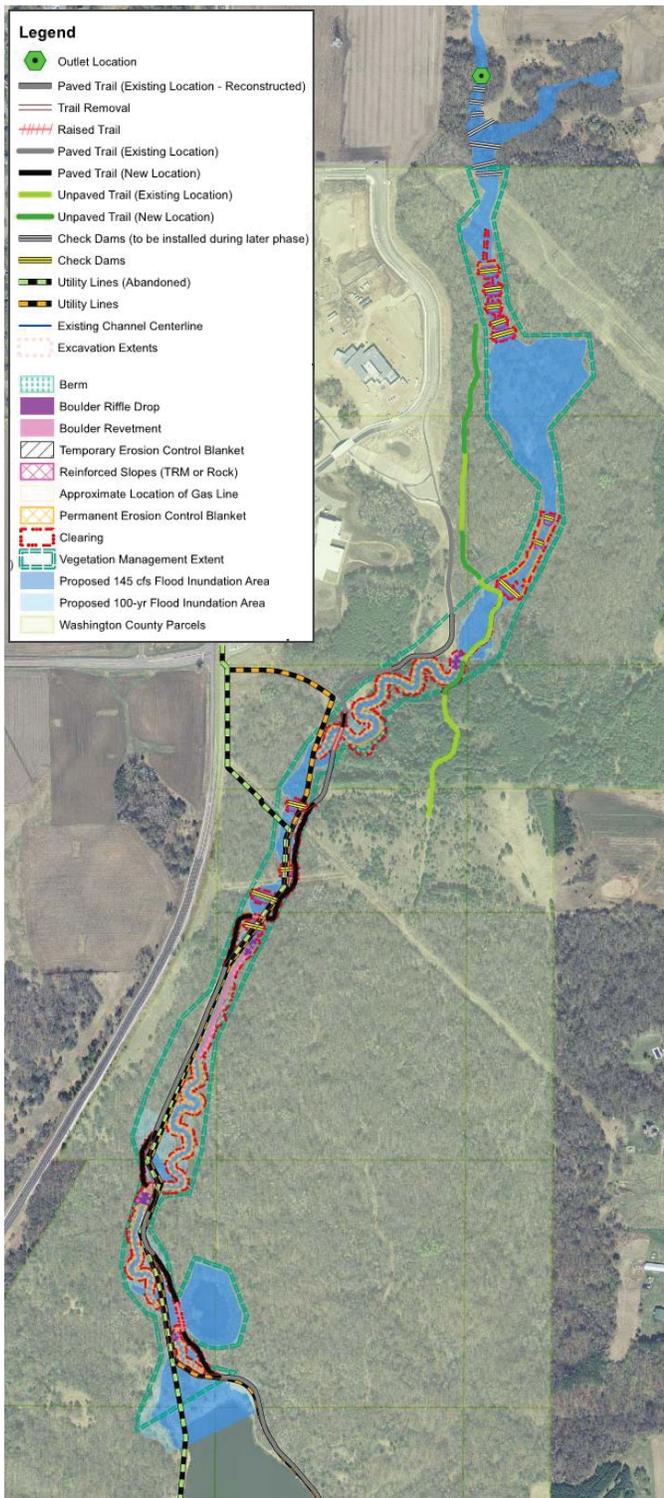


Figure 11: Proposed CDSF Overflow Project in Cottage Grove Ravine Regional Park.

Park Flooding Impacts on Tree Distribution

Houston Engineering, Inc. conducted an inventory of trees in the high-impact water volume overflow area during a preliminary design of the CDSF Overflow Project in the park. Significant aspects of the tree analysis in relation to flood tolerance are summarized. Seventy percent of the trees are from two different genera: ash and elm. While both of these trees are relatively tolerant of flooding events, they are also both susceptible to significant landscape pathogens (Dutch Elm Disease [DED] and Emerald Ash Border [EAB], respectively).

There are 30 oak trees with 20-inch DBH or larger that are within the clearing area of the Ravine Park Stabilization Project. This size classification is important as it denotes a tree reaching full maturity. Protection of these large canopy-defining trees during the conveyance and structural installation is crucial to minimize effects from the project.

Based on the tree inventory, one percent of the trees inventoried are known to be of a genus that is tolerant to flooding. However, close to 90 percent have intermediate tolerance to flooding.

Note that these figures may provide a vision of flooding tolerance that is inexact. Inventoried trees were described to genera, and it is well established that individual species within a genus can have disparate tolerances to flooding. In this instance, one example that could be of concern is the differences between flooding tolerances within the Quercus/Oak genus. Red oaks are known to be much less tolerant of

flooding than white oaks while bur oaks and pin oaks have an intermediate tolerance of flooding events.

Construction of Lined Channel Impacts

Based on the tree inventory, protection of oak trees along the proposed conveyance system is crucial. The oaks, which provide the largest number of mature trees and are part of the climax plant community, are a vegetation anchor for the entire project. Protection for the oak trees and other large significant trees adjacent to or within the construction limits of the conveyance system should include the following preventative measures:

- » Design a system to minimize the footprint of excavations and topographical changes. This will minimize root damage to trees needed for structural support.
- » Clearly define access points to enter and exit the required construction areas. This should minimize tree removals and damage to understory and ground-level plant communities.
- » Time construction activities, such as major excavation and hauling of material, to occur during the dormant season when the ground is frozen. This will minimize damage to tree roots.
- » Create a reasonable workspace for equipment and supplies that is designed to minimize impact to trees both in the area (horizontally) and in height (vertically) to minimize potential for damage to trees. This is particularly important for the oaks. Mitigating the potential for spreading oak wilt should be of paramount importance during the construction phase of the project.

» Prune nearby trees to create a vertical workspace for the conveyance installation. Pruning should be done by a certified arborist with experience in natural target pruning using the most up to date ANSI A300 Standards.

145 CFS Flooding Impact on Tree Distribution

The tree species identified by the tree inventory that are within the 145 CFS zone but outside the lined channel area are primarily comprised of two genera, elm and oak, with the largest number of mature specimens overwhelmingly comprised of oak trees. As mentioned before, both of these tree species are susceptible to important landscape pathogens such as Dutch elm disease and oak wilt that thrive on trees in stressed conditions. Additional information on the tree species located in the 145 CFS zone is included in Appendix A.

Construction of Lined Channel Impacts on Conifer Plantation

Construction of the lined channel will impact the evergreen stands that are a relic of previous efforts to plant and manage the trees as a wood product resource. The evergreen plantations are composed of coniferous tree species that are intolerant of flooding.

The tree inventory from Houston Engineering identified 199 trees within the evergreen stand that need to be removed. While construction will impact a portion of the evergreen stand, significant numbers of spruce and pine trees will not be impacted, preserving the unique experience for trail users that is found nowhere else in the park.

Due to the dense linear plantation arrangement of the evergreens, losses of trees on the edges of the plantings will have effects on other trees within the plantings. As these changes occur, affected trees on the “new” edges will be more susceptible to wind throw and pest problems, such as bark beetles. While impacts may not be observable immediately after construction, the remaining trees will certainly be damaged through a chain of responses due to the loss and or damage to their surroundings. No management has occurred in this area to date. Future management is needed to improve stand health in these areas.

The chart in Figure 12 illustrates that 54 percent of the larger than 20-inch diameter oak trees are within the cleared construction and adjacent buffer areas. Once again, this size classification is important as it denotes a tree reaching full maturity. The protection of these large canopy-defining trees during the conveyance and structural installation is crucial to minimize long-term damage. Figure 13 summarizes the total number of oak trees and elm trees that may be impacted by the construction of the CDSF Overflow project in Cottage Grove Ravine Regional Park. Additional information about tree impacts can be found in Appendix A. These figures represent the maximum number of trees impacted. The actual quantity of trees removed will be identified during final design. A final design will strive to minimize tree impact.

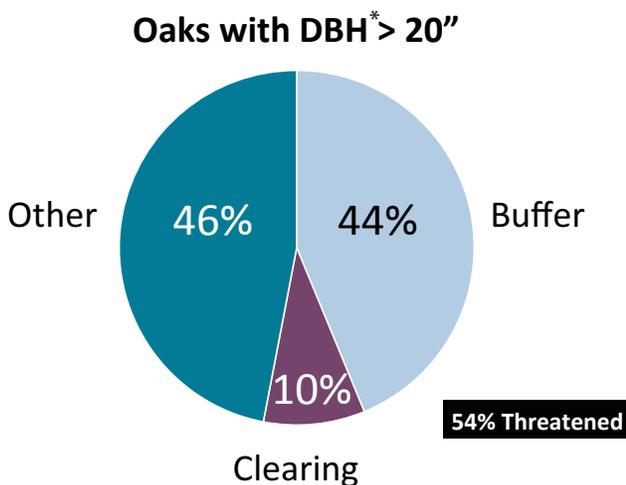


Figure 12: Oak Trees with Diameter Breast Height (DBH) >20" in Conveyance
 *Diameter Breast Height

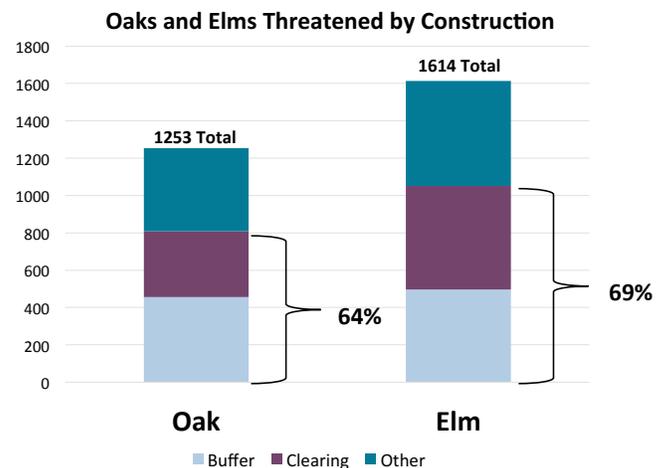


Figure 13: Oaks and Elms Threatened by Conveyance Construction

Vegetation Management in the Flood Area

Management of the defined flood areas due to the CDSF Overflow Project construction and impacts to park vegetation caused by other park development and recreation will require more management than existing non-impacted areas. There will be changes caused by the development of the CDSF Overflow Project and the potential impacts from a 100-year flood event. The County and SWWD will be in a better position to respond to the effects of the conveyance project, following the construction. Washington County will help advance and coordinate with SWWD on management efforts, including invasive shrub control, tree disease mitigation, and forest management. During this process, SWWD will work to replant trees if it is determined they have been impacted by the conveyance project. Impacts may include loss of tree cover and damaged or diseased trees. It is a priority of the County and SWWD to implement the conveyance project with minimal impact on the park's natural resources. When trees and associated vegetation is replaced by Washington County or the SWWD, new flood tolerant early colonizer species will be planted, which will eventually reach the successional climax state of a riparian woodland. South Washington Watershed District will be responsible for the management of the easement area and other affected areas. Washington County will help advance and coordinate management efforts, including replanting efforts, tree disease mitigation, and forest management. A vegetation management plan and timeline are outlined in more detail in Table 7. Management of areas impacted by flooding and park development should include the following measures:

» Plantings for the purpose of conveyance-related construction restoration should be selected with the mesic oak forest or Savanna ecosystems in mind. Figure 14 illustrates the plant communities that will inform our restoration and management decisions. These plants will become the seed sources for the long-term ecosystem transition as the intermediate tolerant trees are slowly phased out. New plantings within the flood area should also be selected with the new transition in mind, matching plant needs for successful establishment with existing site-specific conditions. After the SWWD project is constructed, replanting along the trail will be done strategically, in consideration of the park vegetation goals.

» Species selection of flood tolerant trees should initially have a balanced mix of early and late successional species to aid in biodiversity and kick-start the successional change. This targeted restoration approach will minimize the overall ecosystem transition to the untrained eye, minimizing the aesthetic impact on the park users. Plant species to consider include: aspen, basswood, birch, bur oak, cottonwood, elm, hackberry, maple and swamp white oak. The tree plantings will include a variety of trees from the recommended types both near the trail and further back in the management area.

» Invasive species are adept at colonizing disturbed areas with gaps in tree canopy. Increases in management resources will be required for managing invasive species introduced through conveyance construction. The County and SWWD are expanding invasive species removal efforts completed during the CDSF Overflow Project, which will further enhance the forest health.

» Routine inspections of the conveyance construction areas should be conducted to assure success in the restoration plantings. These inspections should also include management efforts for invasive plants colonizing the disturbed areas.

» Herbivore control is essential for establishment of restoration plantings in the conveyance construction areas as well as in the flood areas. It is essential to aid in establishing a reliable seed source for flood tolerant plants in the flood areas to assist in the ecological transition of the flood area.

Pathogen Management of the Flood Area and Adjacent Areas of the Park

Periodic surveys of the flood areas should be conducted to check for tree mortality of current dominant tree species due to pathogens: oak wilt for oaks, emerald ash borer (EAB) for ash, Dutch elm disease (DED) for elm trees. Management of these pathogens should focus on minimization of pathogen spread as indicated by tree care and forestry best management practices. Failure to manage pathogen spread in the flood and conveyance areas will result in exponential pathogen pressure well beyond normally occurring levels with the current management practices.

The same increased efforts to manage pathogens as described above should be considered for the evergreen plantation areas impacted by the conveyance construction. Even if the overall goal of the management of the evergreen stands is

Table 7: Vegetation Management Plan & Timeline for Conveyance Project Area

Year	Task	Task Description	Deliverable
2016 - 2017	Forest Management, invasive shrub removal	40 acres of invasive shrubs were removed by the SWWD within the Vegetation Management area between 2016 and 2017, to prevent re-seeding and increase native groundcover.	Initial removal of invasive shrubs.
2017	Forest Management, follow-up invasive shrub control	Implement management practices to reduce invasive shrub presence, and promote native groundcover to stabilize slopes. Practices may include: selective foliar applications of invasive shrubs, basal bark herbicide stem treatments, controlled burn and targeted grazing.	Reduce invasive shrub presence to promote herbaceous native groundcover establishment.
2017	Construction of CDSF Overflow Project	Implement techniques to minimize vegetation impact. These techniques include trail design around large diameter oak trees, use of tree protection fence to minimize footprint of construction equipment and conducting removals in the dormant season.	Tree removal only in necessary locations
2017	Forest Management, Post Construction Tree Needs Assessment within 30' of trails	Post construction; in the fall of 2017 identify locations adjacent to trails (within 30') where tree planting and protection can occur in the spring of 2018.	Map of locations where trees can be planted.
2018	Forest Management, Flood tolerant tree planting and protection	In the spring of 2018, plant flood tolerant 18"-6' tall trees within the ravine corridor, within 30' on either side of the adjacent trails. Tree plantings will include a variety of trees from the recommended types the Master Plan, based on the Field Guide to the Native Plant Communities of Minnesota, Eastern Broadleaf Forest Province as a reference. Planting will be assessed both near the trail and further back in the management area. Planting densities will be determined based on Forest canopy goals which range from interrupted to continuous (50% to 100% in FDS37 & MHs37). Larger trees will be considered within 30' of the trail where forest canopy needs exist. As needed, Washington County and the South Washington Watershed District will work together to purchase and install trees. Following tree planting, protection and watering measures will be implemented.	Planting of flood tolerant trees and installation of tree protection tubes.
2019	Forest Management, Tree planting assessment	Assess condition of planted seedlings in 2019, determine if further planting is needed. A 3 - 5 year maintenance period on the planted trees will be required to ensure the health of the trees at the end of the maintenance contract period.	Assessment of planted trees living.
2019 - 2020	Forest Restoration Plan - Development	In the fall of 2019, develop a Forest Restoration Plan for the park area. This activity is scheduled for 2019 to ensure the land manager has a better idea of how the forest will respond post construction. The goal of the plan would be to develop site specific forest composition and identify management practices which can be implemented to prepare for future inundation once development accelerates within the region. Examples include selective timber harvests, tree seedling planting strategies, invasive shrub control, oak wilt monitoring and control, pine plantation management. The Metropolitan Council will be included in the development of this document.	Forest Restoration Plan for the area affected by SWWD project.
2020 to 2040	Forest Restoration Plan - Implementation	Implement strategies to increase the resiliency of the forest within the vegetation management area.	By 2040, forest is prepared for potential flood inundation.

to have them phased out, diligence to minimize hazards to trail users from dead and dying trees must be a priority for all areas including the evergreen stands.

Ecological Stewardship Plan

Mobilizing Stewardship Groups

Stewardship groups can be mobilized cost-effectively to assist with management activities at Cottage Grove Ravine Regional Park. Some management activities such as herbicide treatments, controlled burning, and aquatic weed harvesting will require trained staff. Some invasive species removal, hand planting, placement of herbivory exclusion fences, native seed collection, or litter pick-up can be accomplished by stewardships groups. Entities such as Minnesota Conservation Corps (MCC), local school groups, Great River Greening, the State and County funded “Sentenced-to-Serve” program, Scouting groups, 4H groups, company-organized “green” groups, and Park-based volunteer lists can all play an important role in managing the built and natural environment within the Park. Volunteer groups will require supervision and planning to focus their efforts. Since 2014, Washington County has worked with the non-profit group Friends of the Mississippi River (FMR) to remove invasive shrubs in the Park. A total of 134.8 acres of invasive shrub removal has been completed since in the last two years. Efforts with FMR and other organizations will continue in accordance with the ecological stewardship plan. The SWWD is committed to long-term maintenance on the 40-acre conveyance corridor.

Overview of Stewardship Techniques

A variety of proven techniques can be used to improve the floristic quality of plant communities. Among these tools are controlled fire, weed control (chemical and hand picking), planting, and grazing.

Controlled Burns. Controlled burns often have a beneficial effect on the floristic quality of fire dependent plant communities such as upland prairies and mesic oak forest. A burn regime that emulates a natural burn frequency of these plant communities can be effective in reducing unwanted woody shrubs. Prescribed burning on upland prairies can also

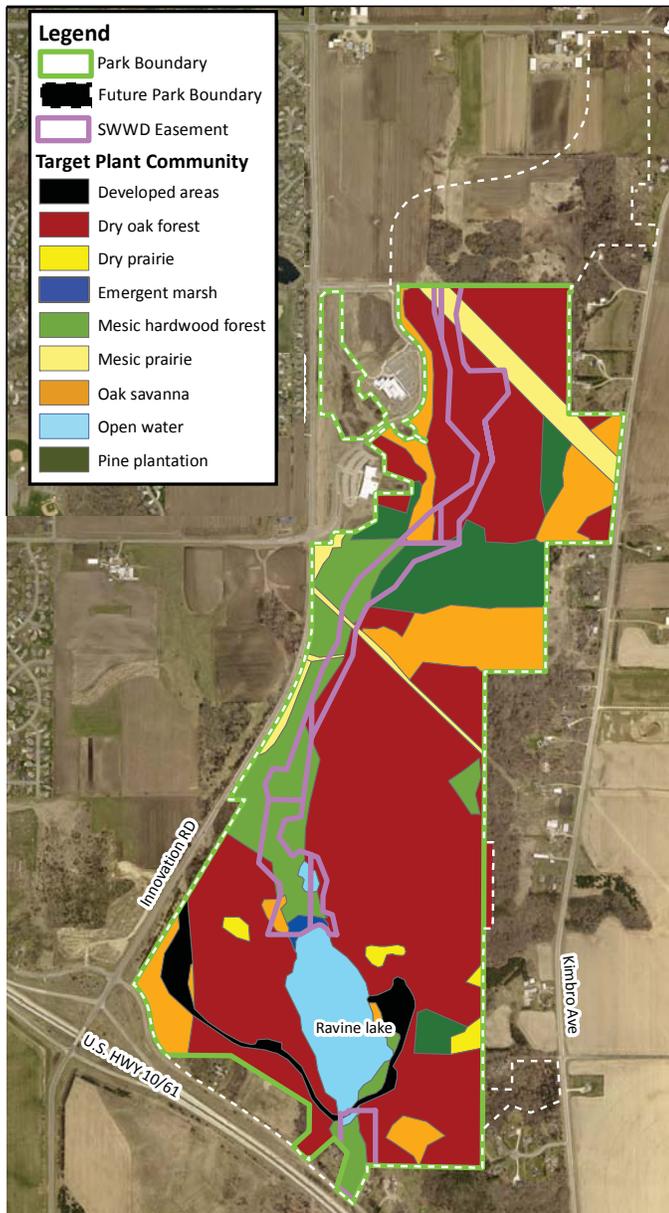


Figure 14: Restoration Zone Map

help to encourage warm season grasses such as little bluestem (*Schizachyrium scoparium*) and big bluestem (*Andropogon gerardii*), allowing them a competitive advantage over non-native cool season grasses such as smooth brome (*Bromus inermis*).

While fire can be beneficial to some fire-adapted plant communities, it can be disastrous to some wildlife if not thoughtfully planned. Nesting times of various wildlife species should be taken into account prior to undertaking a controlled fire. Only a small portion of a given plant community should be burned at one time. This provides wildlife with small scattered standing unburned habitat in which to seek refuge. With controlled burns, it is important to leave refuge in for pollinators.

Weed Control. Weed control can be accomplished with hand picking, herbicide application, or bio controls. When planning for the use of herbicide application, natural resource managers should take into account known locations of rare plant species; inappropriate herbicide use could destroy them.

Herbicide Application. Herbicide application must be tailored for each invasive species and plant community that is to be treated.

Planting. Washington County lies mostly in the Eastern Broad-leafed Forest Ecological Province, Minnesota and Northeast Iowa Morainal Ecological Section, and the St. Paul - Baldwin Plains Ecological Sub-section. Seed mixes used for restoration in the park should be formulated to thrive within this ecological region. All seed mixes should be certified weed-free. Techniques and appropriate seed mixes are summarized below. Appropriate planting techniques varies depending on the plant community to be restored. Hand planting seedlings or seeds is typically used for forested communities. Tractor

or ATV-pulled seed drills can be used for large-scale prairie restorations.

Adaptive Ecological Management Plan

An ecological management plan is an important tool for monitoring and managing natural resources in large regional parks with significant ecological resources such as Cottage Grove Ravine Regional Park. Ecological management plans need to be flexible because of the changing nature of ecological systems and because management objectives may change over time. The basis for a sound management plan is monitoring, which will provide data on a regular basis about how the plan is working and what changes may be needed. The management plan should be adaptive and should evolve as the ecological systems change within the park boundary. The ecological management plan is an important tool for guiding future management, maintenance and restoration of ecological resources within the park.

Prairie Restoration. After invasive exotic plant species have been thoroughly controlled, prairie planting can begin. Seed mixes used by the Minnesota Board of Soil and Water Resources (BWSR) have proven to be effective if applied to appropriate site conditions and locations. Selection of appropriate native prairie seed mixes should take into consideration the following:

- » Pollinator-friendly species. Seed mixes should contain perennial plants that are favorable to pollinators and should include a variety of plants that bloom throughout the growing season.
- » Available Soil Moisture. Dry gravelly hilltops slated for prairie restoration would be ideal conditions for BWSR Seed Mix 35-221 Dry Prairie General (i.e., short to mid-height prairie vegetation). Areas slightly lower on the landscape but upslope from wetlands might be ideal for BWSR seed mix 25-241 Mesic Prairie General (i.e., tallgrass prairie vegetation).

Both of these seed mixes derive from an ecological region in the state suitable for Washington County.

Aesthetics. In key restoration areas such as park entrances or other areas highly visible to visitors, seed mixes can be augmented with additional brightly colored native prairie forbs. While such an explosion of colors may not normally be found in native plant communities, these plantings can enthuse visitors about native plants. Native prairie seed mixes will have a component of native grasses and native forbs (that is, more brightly colored flowers). The russet fall colors of native bunchgrasses such as big bluestem (*Andropogon gerardi*) and little bluestem (*Schizachyrium scoparium*) complement the brightly colored forbs – some blooming early in summer and some in early fall.

»**Motorist/Recreational Trail Sight Lines.** Native tallgrass prairie vegetation can attain a height of seven feet and, if planted close to park roadsides and recreational trails, can create a visual barrier and limit sight distance. If unsafe sight lines are an issue concerning road and trail configurations within the park, planting short to mid-height native prairie will increase sight distance.

Forest Enhancement. The first phase of forest restoration is identification and marking of native trees that should remain intact and those disturbance-tolerant or non-native trees that should be removed. Professional loggers should be employed for tree removal. Typical tree species to be removed include box elder (*Acer negundo*), aspen (*Populus spp.*), and European buckthorn (*Rhamnus cathartica*). The stumps of cut trees should be sprayed or painted with an appropriate herbicide to prevent sapling re-growth. Removed woody biomass can be transported to several local biomass-fueled power plants. Trees that should remain, if in healthy condition, are bur oak (*Quercus macrocarpa*), white oak (*Q. alba*), red oak (*Q. rubra*), and scattered birch (*Betula papyrifera*). Trees to remain intact should have a diverse age class including young, sub-mature, and mature. Non-native, invasive shrubs such as glossy

buckthorn and tartarian honeysuckle should be cut with pruners near the soil surface and stump-sprayed or painted with an appropriate herbicide.

Forest Restoration. Acorns should be collected from existing oak forest within the park. Typically, only one percent of acorns produced each year escape herbivory to naturally germinate into seedlings. Thus, acorn collection can greatly increase the rate of successful seedling recruitment. This is a great activity for volunteer groups. Acorns should be collected from living healthy trees and placed in breathable fabric or paper bags. Acorns should be separated based on species and placed in a large bucket of water to determine seed viability; those that float are not likely to germinate and should be disposed of and those that sink should be kept. Viable acorns should be planted in a nursery setting, perhaps established at the park and then installed within appropriate management units in the park after they have germinated. Planting density recommendations for oak seedlings vary from roughly five feet apart to 30 feet apart. After oak seedlings are planted they must be protected from herbivory; several methods have been effective such as tubex tubing or ¼" metal grid hardware cloth. Seedling plantings should focus on areas in the forest that have good light penetration through the canopy.

Savanna Restoration. Savanna restoration should begin by referencing the 1847 Public Land Survey. If some of these areas are already occupied by high-quality plant communities, then these plant communities should be preserved. Large oaks in good health should be identified and preserved – with appropriate management, they might once again attain the open grown crowns that characterize the savanna aesthetic. Undesirable tree, shrub, and herbaceous species should be removed as described in "Forest Restoration." Native prairie should be planted first and allowed to stabilize for several years before scattered oak seedlings are planted within the

prairie. Seedlings should be protected from herbivory as described above.

Wetland Restoration. Hydric soils situated upslope of wetland areas may provide good opportunities for wetland restoration. Typically wetland restoration would involve invasive species management and re-establishment of wetland hydrology to drained areas.

Water Resources Management

Maintaining Water Quality. Native vegetation buffers should continue to be established on all open water shorelines to minimize the potential for erosion and prevent contaminated runoff from draining directly in to surface water areas.

Wetland Protection

There are several wetlands located within Cottage Grove Ravine Regional Park. A few of these wetlands will be impacted by future development within the park. The wetlands along the south and east side of the lake will be impacted by construction of the new park circulation road and Ravine Lake outlet. There may also be wetland impacts associated with the CDSF Overflow Project.

Impacts to wetlands are regulated by the Minnesota Wetland Conservation Act (WCA) and the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act. Mitigation for unavoidable wetland impacts associated with the future proposed development within the park will be followed in compliance with all rules, regulations, and replacement requirements in place at the time final design and construction occur.

Stormwater Management Regulatory Environment

Regulatory and permitting authority for stormwater management falls to the Minnesota Pollution Control Agency (MPCA), the City of Cottage Grove, and the South Washington Watershed District (SWWD). Regulations can change, and the project will be subject to regulations in effect when

the design is submitted for approval by the permitting authorities. Each permitting authority requires volume control and water quality and water quantity treatment prior to stormwater runoff leaving the site. The volume control requirement is to provide abstraction of the first one inch of rainfall from the site's new impervious surface. The water quality requirement is to provide best management practices that achieve minimum post-development reductions in total phosphorus (TP) and total suspended solids (TSS) by 50 percent and 80 percent respectively. The project must also meet the total maximum daily load (TMDL) requirements for Ravine Lake. It is very likely that by meeting the volume control requirement that the water quality requirements will also be met. The water quantity requirement is such that runoff rates from the proposed activity shall not exceed the existing (predevelopment) rates for the one-year, two-year, 10-year, and 100-year critical storm events.

Ravine Lake is impaired for Nutrient/Eutrophication Biological Indicators, which are considered to be construction-related parameters and require additional construction-related best management practices if the project has a discharge point within one mile of and flows to the impaired water. Portions of the future development within Cottage Grove Ravine Regional Park will discharge to Ravine Lake; therefore, the additional construction-related stabilization best management practices will be required.

Stormwater best management practices will be designed within the future development of Cottage Grove Ravine Regional Park to meet the regulatory requirements. The best management practices will likely consist of native plantings in raingardens or bioretention basins located within the parking lot islands to treat the new impervious associated with the building and parking lot development. There will also be treatment ditches incorporated into the new park circulation road that will provide water quality and water quantity treatment for the new impervious surface areas associated with the roadway.

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Chapter 5: Development Master Plan

Overview

This updated development master plan builds upon previous planning efforts to preserve and protect the abundance and diversity of natural resource amenities while making the regional park more usable and accessible to park users in the face of new development challenges, including the CDSF Overflow Project and improvements to County Road 19. The public participation process allowed for recreational user groups, adjacent property owners, and elected officials to assist in guiding the park's future development and realize programming opportunities.

It is important to recognize that this updated master plan will continue to evolve as a planning document and be further refined as property acquisition is realized and site improvements are implemented within the park. Additional input from stakeholders should continue to be solicited as more detailed plans evolve during the planning and implementation process.

Development Impacts

New Park Development

Updating recreation features at the trailhead area on the east side of Ravine Lake and developing a new park entrance with a picnic area and playground in the southwest corner of the park will impact the existing conditions and natural resources in the park.

Trailhead Site. The proposed improvements at the trailhead site will require the removal of the existing picnic shelter building, parking lot, park road, and playgrounds. The new facilities, which include a larger parking lot, new four-season trailhead building, two small picnic shelters, and a playground,

will be developed within the area currently occupied by the existing facilities. Several ash trees may need to be removed to make room for the new facilities, but it is anticipated that there will be minimal impacts to the surrounding vegetation. All development activities will be situated away from the edge of Ravine Lake. The proposed improvements for the trail along the northeast side of Ravine Lake will require tree removal and re-shaping of the slope to accommodate widening the trail and constructing a small wall between the existing paved trail and the new soft-surface trail.

Improvements at the South End of Ravine Lake. The existing park entrance that enters the park south of Ravine Lake will be removed. All disturbed areas will be stabilized and re-planted with native vegetation. The park road, as it heads east along the lakeshore to the picnic shelter, will be removed from its current location and reconstructed south of the lake. The new road will be raised above the existing roadway elevation to protect it from future flood events. A new water control structure will be installed under the roadway, as part of the CDSF Overflow Project. The new control structure will stabilize the bounce in Ravine Lake and ensure the roadway does not flood. A new canoe access, fishing pier, and pedestrian bridge are proposed at the south end of the lake. These elements will be developed close to or at the water's edge. Careful planning and design will be necessary to minimize impacts to the riparian area when these elements are installed.

New Park Entrance and Upper Picnic Area. The new park entrance and upper picnic area will be developed in the open meadow southwest of Ravine Lake. The park entrance road will connect with the existing roadway that terminates after rising up the slope southwest of the lake. The existing road will

be removed and a new, narrower road will be reconstructed. The new park entrance will be located at the edge of the meadow and require the removal of approximately 300 linear feet of existing trees to a width of approximately 50 feet to accommodate the road, turnarounds, and access on the contact station. East of the proposed contact station the park road will pass along the edge of the woodland until connecting to the existing roadway alignment. Minimal vegetation impacts are anticipated for the development of the picnic and playground facilities adjacent to the new park entrance. There will be an opportunity to restore disturbed areas around the edge of the new development with native plantings and prairie grasses.

Development and Use Areas

Within Cottage Grove Ravine Regional Park, current park development is focused on approximately 15 acres south and east of Ravine Lake. The existing park road enters the park from the south, along Point Douglas Road. It extends north and forks on the south end of Ravine Lake. The park road west of the fork leads uphill to a parking lot that currently serves as an unofficial trailhead for undeveloped trails that lead along the west side of Ravine Lake. The east fork of the park road leads to the primary developed area.

Lakeside Area

Most park visitors follow the park road to the trailhead area that is located on the east shore of Ravine Lake. The park road winds along the southeast shoreline to a circular parking lot that is adjacent to a picnic area, playground, and a group picnic shelter. The picnic shelter has four-season restrooms

that do not have running water and use a composting toilet system to treat solid waste. This area serves as the trailhead for winter cross-country skiing and summer hiking. A paved trail extends south from the Washington County South Service Center and terminates at the trailhead area.

The new concept for the trailhead area includes a new parking lot that will accommodate 70 to 80 vehicles. The parking lot is situated on the east side of the existing clearing and provides direct access to the new, four-season trailhead building. The new building will house restrooms with running water and a large, open room that will accommodate large groups and will also serve as the warming area for cross-country skiers during winter months. A new playground will be located west of the parking lot and will incorporate structures for both K-5 and 6-12 children. Adjacent to the new playground will be two small picnic shelters that will be available for stand-alone rental use or for small groups on a daily basis. It will be possible for a large group to reserve both shelters or the trailhead building and one or both picnic shelters, if necessary. The existing fishing pier will remain, as it is a popular location for families and individuals to fish in Ravine Lake, which has previously been stocked by the Department of Natural Resources with sport fish.

South Shore of Ravine Lake

The new park circulation road will be reconstructed south of the lake and will be raised so that it will be less susceptible to flooding. A new water control structure, which is a component of the SWWD stormwater conveyance system will be installed under the new park road. Together, the new outlet and roadway will provide a lake outlet with adequate

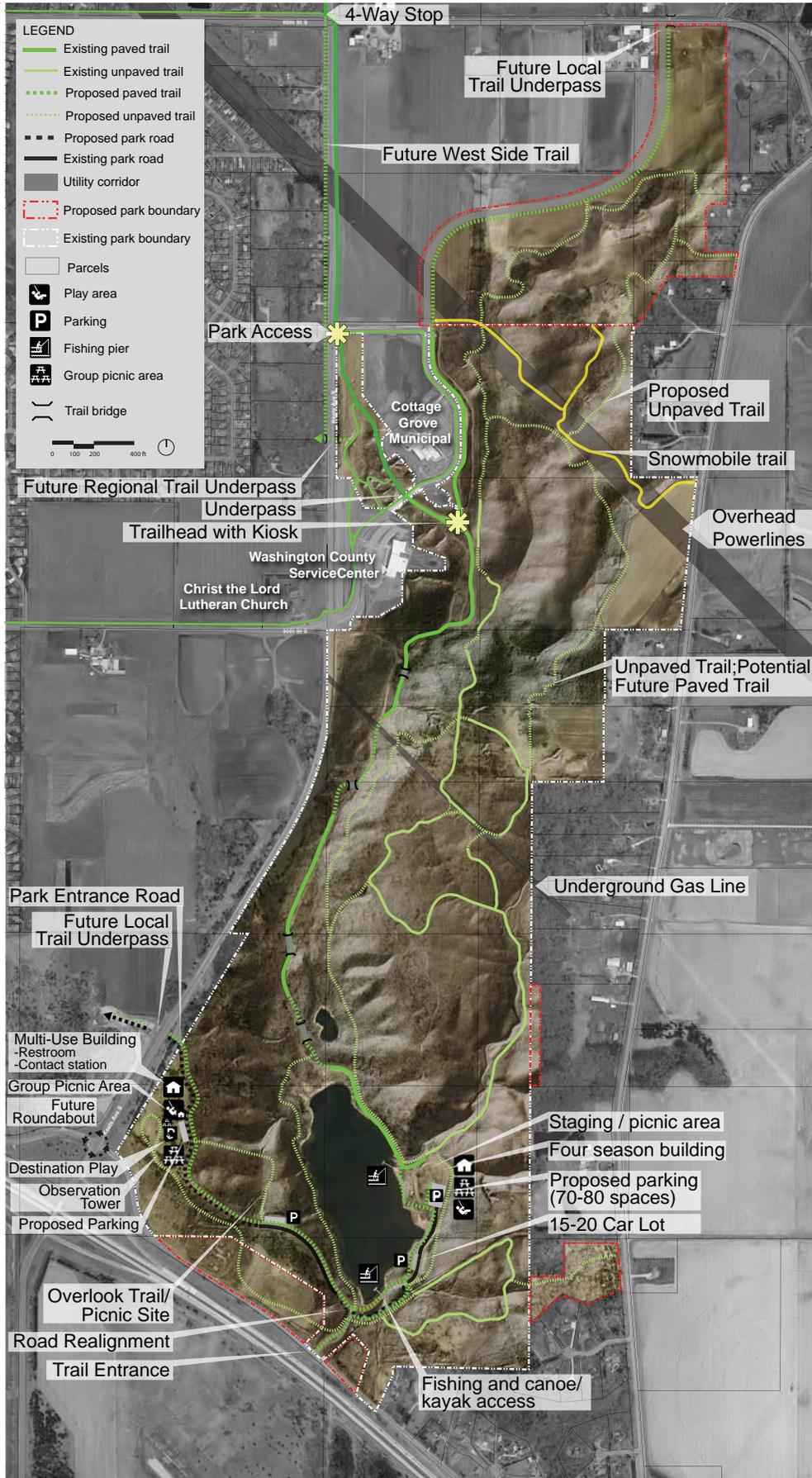


Figure 15: Cottage Grove Ravine Regional Park development plan.



Figure 16: Lakeside Development Area

capacity to limit bounce on the lake during local flood and overflow events and provide improved access to the park. The old alignment of the park road on the south side of Ravine Lake will be removed and replaced by a pedestrian bridge that will connect a new paved trail along the lake shore to the new park entrance along County Road 19. Adjacent to the new pedestrian bridge will be a second fishing pier and a non-motorized boat landing will be installed further up the eastern shore to provide access for canoes and kayaks onto Ravine Lake. A small parking lot for up to 20 vehicles will be developed near the non-motorized boat access to provide parking for boaters and users of the south fishing pier.

Overlook Development Area

Washington County is currently working with the City of Cottage Grove on a roadway enhancement project on County Road 19 that will provide new access to Highway 10 and the retail development west of the county road. This provides a unique opportunity to develop a new entrance to Cottage Grove Ravine Regional Park that will create a more visible entrance into the park. The new entrance road will extend from County Road 19 into the upper meadow in the southwest corner of the park that is currently undeveloped. The existing park entrance road off of East Point Douglas Road will be removed and similar to other regional parks in the Washington County park system, the new entrance will include a contact station where park staff can collect user fees and respond to park visitor questions and needs. This facility may also house public restrooms that will be available for the nearby playground and picnic area.

The upper meadow provides sweeping views south toward the Mississippi River and will be a great location for a new K-5 and 6-12 playground with a climbing wall and some traditional elements like a tall slide, picnic area and overlook structure. A parking lot for 40 to 50 vehicles will be constructed off the entrance road to provide access to the new picnic and playground area. Paved and soft-surface trails will connect this part of the park with the trailhead building on the east side of Ravine Lake.

As Cottage Grove expands and development occurs on the west side of County Road 19, there will be an opportunity to install a new grade-separated pedestrian crossing of County Road 19 and connections to future local trails.

Camper Cabins

There has been increasing public interest in renting camper cabins in state and regional parks around Minnesota. Cottage Grove Ravine Regional Park could be well-suited to provide limited opportunities for camper cabins. However, since this would be an overnight facility in a park that currently does not accommodate overnight use, more analysis will be needed to determine the additional operations and maintenance and staffing requirements to add these facilities to the park. There are suitable locations within the park for camper cabins. One such location is the hilltop on the west side of Ravine Lake. The existing parking lot on the southwest side of the lake could serve as the trailhead for campers who would walk a short distance to the camper cabins, which could be placed along the hilltop with views through the woods overlooking the lake. The access trail would extend through the woods toward the new upper meadow picnic area.



Figure 17: Overlook Development Area

Cross-Country Ski and Soft-Surface Trails

Cottage Grove Ravine Regional Park has over seven miles of cross-country ski trails that also provide hiking opportunities during the summer months. The new trailhead building on the east side of Ravine Lake will provide direct access to the trails that will be reconfigured to provide one-way loops of varying lengths and challenge. Trail user safety is a major concern, so the updated trail system will be modified to separate skiers and hikers from the paved trail system. The trails will be re-aligned to create better access in areas of steep slopes and difficult trail intersections will be reconfigured to provide better sight lines. Based on input provided during the public process, Washington County will consider options for improving the ski trails, such as snowmaking or trail maintenance improvements.

To increase the ability to access the ski trails, several kilometers will be lighted with low, bollard-style light fixtures to extend the skiing hours until park closing time in the evening. The lighted ski trails include the South Ski Loop, the Middle Ski Loops 1 and 2, the North Ski Loop and the West Trail (Figure 18). During the fall months, the trails could be lighted for walking and hiking.

Paved, Multi-Use Trails

Cottage Grove Ravine Regional Park has a popular paved trail that extends the length of the park from the South Service Center in the northern part of the park down to the bottom of the central ravine to its terminus at the developed area on the east side of Ravine Lake. The proposed CDSF Overflow Project is being planned for the same location within the park. It is important that when the CDSF Overflow Project is fully operational, the multi-use trail is not impacted by flood events. It is possible that during extreme 100-year or larger flood events, the trail will flood for short periods of time. However, it is likely that roadways and other infrastructure will be closed to keep the public safe in such extreme situations.

North of the Lakeside Development Area, along the northeast shore of Ravine Lake, the proposed trail plan includes side-by-side paved and soft-surface trails to accommodate cross-country skiing in the winter. In order to make this possible, a retaining wall will be needed between the trails because the existing area is too narrow for a dual treadway. It is important that the retaining wall and trails do not impact the wetland surrounding the outlet of the eastern drainage channel where it enters Ravine Lake.

Traffic Signage and Devices

Modifications to the existing trail have been made in the master plan to relocate segments of the existing trail to keep it separated from the stormwater conveyance system. There are several locations where the trail will need to cross over the stormwater channel. To provide safe and consistent trail use, structural boardwalks designed to a H10 rating to accommodate emergency vehicles or a raised trail with a culvert crossing will be constructed to allow the trail to extend over the channel. When the stormwater conveyance system is in use, the trail will be operational during all but short, extreme flooding.

New paved trails are planned to extend south of the trailhead area to provide off-road access for bicyclists, walkers, runners, and in-line skaters to travel between the new park entrance and the north end of the park.

Regional Trail Connections

Cottage Grove Ravine Regional Park will become a destination for trail users. The proposed Central Greenway Regional Trail will extend south along County Road 19 from Lake Elmo Park Reserve. A new pedestrian underpass will connect the trail to the park just west of the South Service Center. On the south side of the park, bikers following the Mississippi River Trail (MRT) will be able to access the park through a new trail connection that will follow the old park entrance road. Local trails proposed in Cottage Grove will connect to the regional park at the new park entrance.

Other Recreational Activities

During the master plan process, the public had several opportunities to provide input about what they would like to see incorporated in the park. The new south fishing pier was proposed and has been incorporated in the park master plan to provide additional access to the lake in an area that has historically provided good fishing opportunities.

The undulating terrain in Cottage Grove Regional Park provides an opportunity to develop a new and increasingly popular recreation attraction: adventure courses with zip lines are becoming popular amenities at parks and recreation centers around the country. An adventure course might include a ropes course or a forest canopy trail that would provide opportunities for visitors to experience the park from new perspectives. These elements could provide an exciting and unique recreation attraction unlike any other in the metropolitan area. Washington County is currently not suited to operate an adventure course and may need to partner

with a vendor to develop and such a facility in Cottage Grove Ravine Regional Park. Ropes courses and zip line courses typically have between six and 12 stations set high in the treetops where ropes and cables are strung between platforms. Users wear special harnesses and protective gloves and helmets to move between platforms.

Table 8: Trail Lengths

Paved Trails		km
Ravine Trail		2.67
Park Entrance Trail		1.71

Hiking/Snowshoe Trails		km
West Lake Trail		0.79
Kimbro Ave Trail		0.3
South Loop Trail		0.84
Lake Overlook Trail		.038

Ski Trails		km
South Ski Loop	■ ■	2.14
Middle Ski Loop 1	■ ■	0.66
Middle Ski Loop 2	■ ■	3.06
North Loop	■ ■	2.32
Future North Loop	■ ■	2.37
West Trail	■ ■	.08

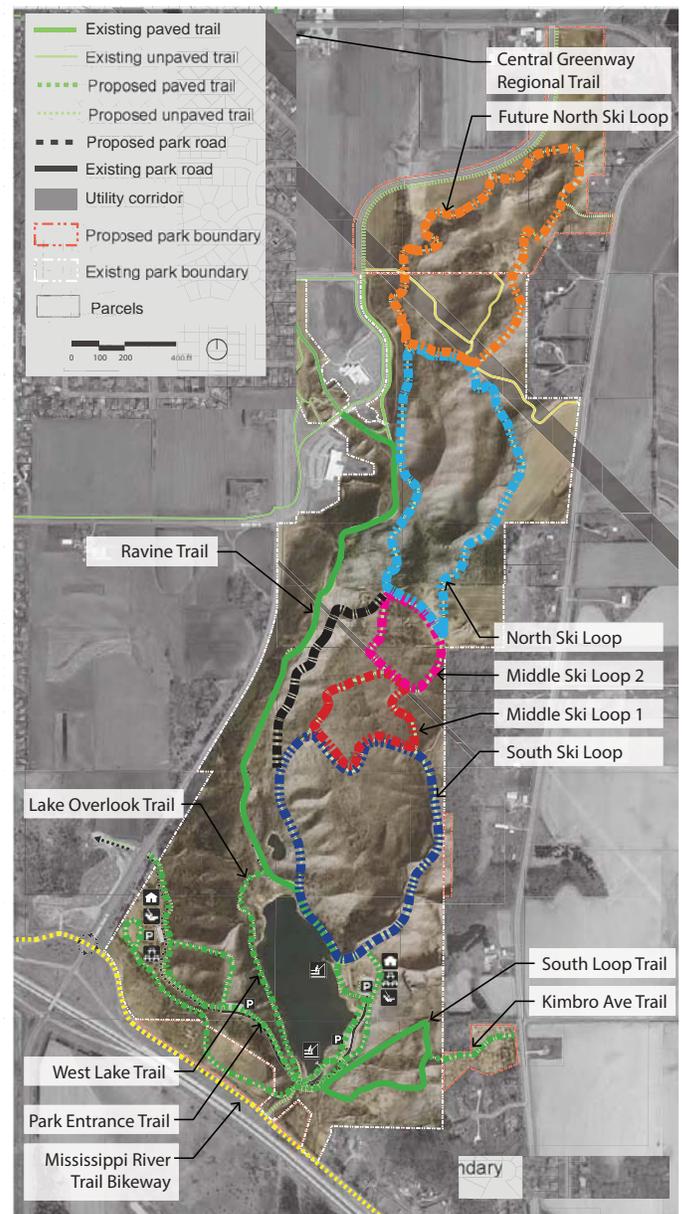


Figure 18: Trail System



Figure 19: Paved Trail Adjacent to Conveyance Channel

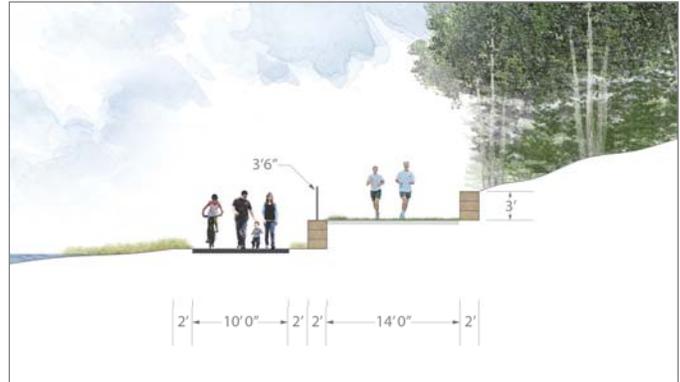


Figure 20: Side-by-Side Trails Adjacent to Ravine Lake



Figure 21: Preliminary Boardwalk Design

Interpretation and Wayfinding Signage

The wide variety of soft-surface, cross-country ski, and multi-use trails and the unique natural environments offer many opportunities for interpretation and education throughout Cottage Grove Ravine Regional Park. A uniform signage theme should be developed throughout the park for orienting visitors to facility locations and trail circulation and understanding the rules and regulations for park use. The design and implementation of signage should be integrated with wayfinding signage to create an attractive and unobtrusive appearance throughout the park. Wayfinding and interpretation should include the following elements:

- » Kiosks to hold maps and information signs.
- » Wayfinding signs to identify destinations and distances.
- » Interpretation panels to point out natural features or systems.
- » Regulatory signage along trails and roadways to direct traffic and provide traffic control.

The map in Figure 22 provides an overview of the wayfinding signage locations throughout the park. These signs will provide park and trail users information on navigating around and through the park.

Utilities

New facilities at Cottage Grove Ravine Regional Park will be incorporated in two locations at the south end of the park, with upgraded buildings and facilities at the trailhead, picnic shelter, and playground area as well as a park contact station with restrooms at the new park entrance along County Road 19.

Water and Sanitary Sewer Service

As a part of the roadway enhancement project on County Road 19, the feasibility to extend sewer and water into the south portion of Cottage Grove Ravine Regional Park will be explored.

The new, four-season trailhead building will include public restrooms and storage areas for park maintenance staff. To accommodate the effluent produced by this building a septic tank and drain field will be needed because the distance to pump sewer waste to the regional sanitary system along County Road 19 is likely too far to be economically feasible. Water for the new trailhead building will be provided by existing well that currently services the existing picnic shelter building.

The new park entrance from County Road 19 will provide better access to Cottage Grove Ravine Regional Park. A four-season contact station with restrooms will serve park staff and the nearby picnic shelter and playground area. It is anticipated that sanitary sewer service will be accessible from County Road 19. Either a new well or water service extended from County Road 19 will be needed to provide water for the restrooms and contact station.

Conflicts

One of the main purposes of the master plan update for Cottage Grove Ravine Regional Park is to identify the impacts to recreation facilities and natural resources as a result of two proposed projects that will impact the park. The first and larger project that will impact the park is the proposed CDSF Overflow Project. The second project that will impact the park is improvements to County Road 19 at the Highway 10 interchange southwest of the park boundary.

CDSF Overflow Project

The SWWD proposal to develop the CDSF Overflow Project will impact the park's natural resources and recreation activities. Impacts to vegetation from construction and mid to long-term water inundation are outlined in the Natural Resource Stewardship Chapter. Adjustments to the paved trail that will extend adjacent to segments of the conveyance channel have been proposed, including relocating sections within the flood zone and constructing culverts under the trail boardwalks to carry the trail over potential flood areas.

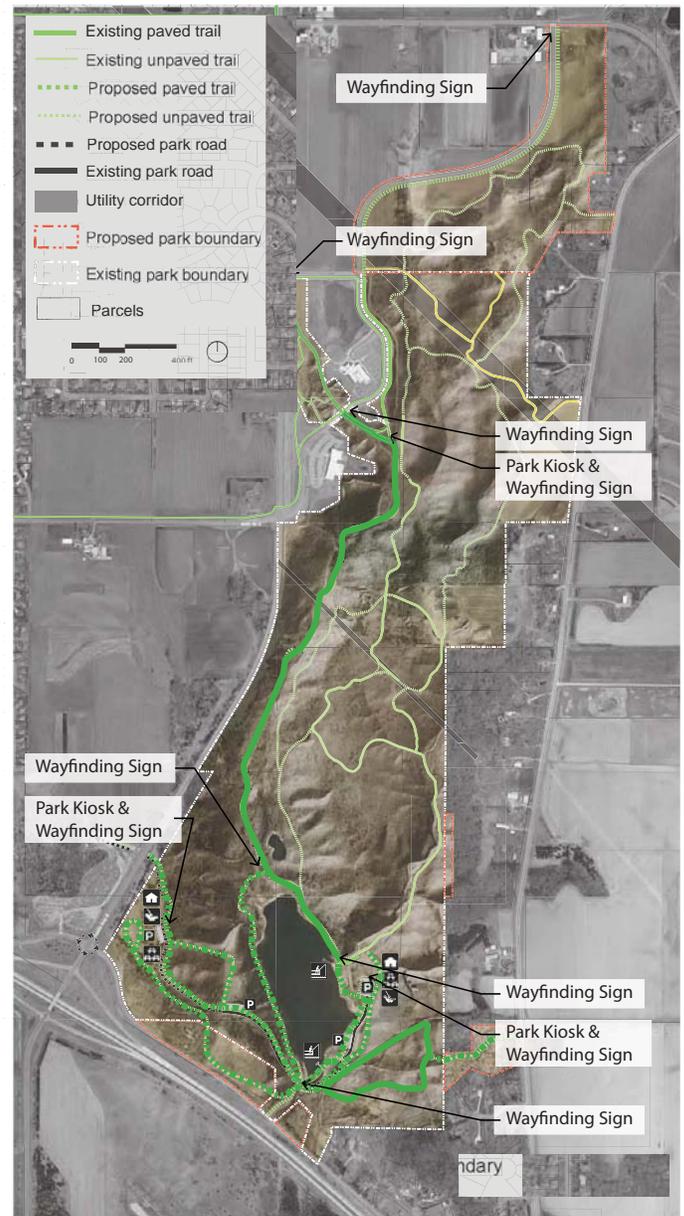


Figure 22: Wayfinding Sign Locations

In an effort to minimize conflicts with the conveyance system and the paved trail system, ski trails and soft-surface trails are proposed to be relocated to keep away from these activities. Revisions to the paved and soft-surface trails are shown in Figure 17.

County Road 19 & Park Road Improvements

Washington County and the City of Cottage Grove are preparing to upgrade the Highway 10 and County Road 19 interchange to provide needed safety improvements that are necessary because of recent development on the west side of County Road 19. While it is unlikely that the roadway improvements will impact the park itself, the project provides an opportunity to incorporate the proposed park entrance from County Road 19 in the roadway improvement project. Washington County staff are working closely with the design team to ensure the concept developed during this master planning process for a new park entrance road, utility improvements, and a new contact station are designed to minimize impacts to the park’s natural resources. The new park circulation road will extend 9/10th of a mile into the park to connect with the new parking lot at the trailhead building.

Future park improvements and the design of the new park access road need to reflect the potential for water level bounce in Ravine Lake that may increase due to higher levels of water in the park as a result of increasing development pressure and the SWWD conveyance project. Future improvements should be developed above the anticipated high water level as identified by the SWWD during a 100-year storm event with full development in the drainage basin. Preliminary park road concepts developed by Washington County have the road elevation set at approximately 779.5 feet.

OPPORTUNITIES TO IMPROVE RECREATION FACILITIES IN THE PARK

- Relocation of 1,820 linear feet of paved trails
- Relocation of 2,600 linear feet of soft-surface trails
- Installation of 4 structural boardwalks or culvert crossings to keep trails out of flood-prone areas
- New park entrance and road
- New visitor amenities such as playgrounds and a fishing pier
- New 4-season trail building

Table 9: Ravine Lake Water Levels

Water Levels	Feet
MnDNR Ordinary High Water Level	770.70
MnDNR Highest Recorded Water Level (since 1994)	772.65
Fully Developed Cottage Grove Watershed 100-Year Storm Event Lake Level	777.80

Chapter 6: Stewardship, Operations and Management

Park Boundary Plan

Expansion of the park boundary is proposed as part of the master plan for Cottage Grove Ravine Regional Park. Some land will be added to the park to meet the requirements of agreements put in place to provide for the development of the Washington County South Service Center and the City of Cottage Grove Municipal Center, while other proposed

acquisitions will expand the park boundary to provide additional conservation and recreation land.

In 2004 Washington County negotiated an agreement with the Metropolitan Council to remove the restrictive covenant associated with the park boundary to remove 38.5 acres for the development of a County Service Center and a municipal building for the City of Cottage Grove. The

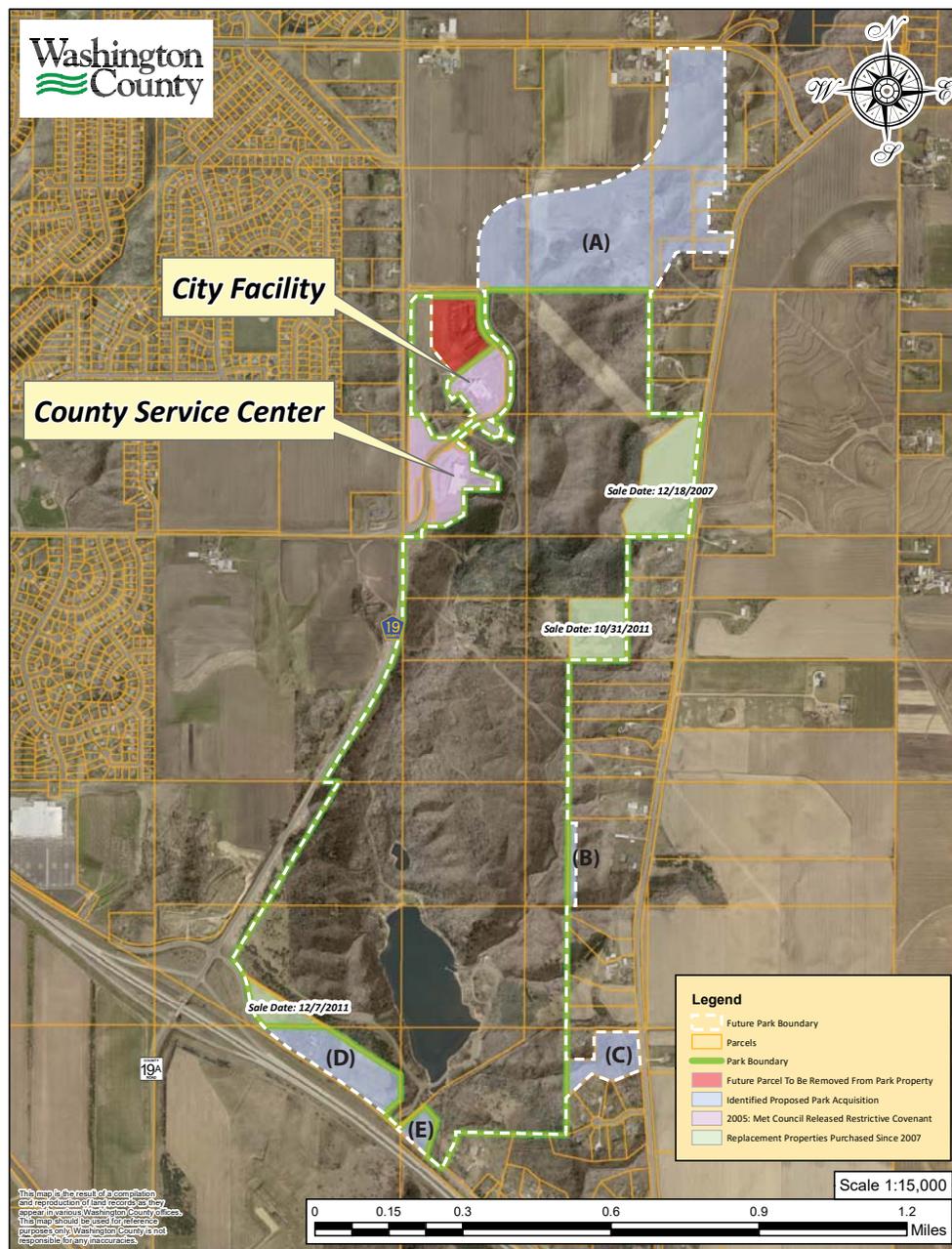


Figure 23: Recent and Proposed Property Acquisitions

agreement required the County to replace the property with land northeast of the park on an acre-per-acre basis and with similar natural characteristics. In 2005, the Council released the restrictive covenant on 17.7 acres of land for the County Service Center. In 2008 the Metropolitan Council approved a request by Washington County to amend the terms of the 2005 agreement so that the “replacement” properties may also include inholdings to the south and east of the park boundary. In 2011 the Council released the restrictive covenant on 20.8 acres of park land for the development of the City facility.

In the ensuing years, the County purchased 17.7 acres of land to replace the land removed from the Park for the County Service Center and the County has replaced 7.44 acres of land for the City facility. The County still needs to replace 13.36 acres of land to fulfill its agreement. In 2016, the Council approved an amendment to the 2008 agreement to extend the time frame for acquiring the remaining property to the end of 2022.

Ultimate Park Boundary

Cottage Grove Ravine Regional Park is an important component of the region’s open space and recreation plan and it is a major part of the Washington County park system. The current park size meets requirements for regional park status but four additional proposed acquisitions will enhance park’s value as a natural and recreational resource. These parcels are identified in Figure 22.

Acquisition Property at North End of Park (Property A)

The largest proposed land acquisition includes a block of land to the north of the park totaling approximately 64 acres. This property will enhance the recreation opportunities in the park and will create a meaningful addition to the natural

resource buffer from future development. The Minnesota Pollution Control Agency has identified the property located at 10473 80th Street S. as a farm with a feedlot, small amounts of hazardous waste and a tank site with above or below ground storage tanks.

Acquisition Property on East Side of Park (Property B)

Proposed east property B is located east of the East Ravine natural feature in the park. The parcel is a two-acre, wooded outlot that will serve as a valuable buffer area to the adjacent existing trail. The City of Cottage Grove intends to acquire the property through the subdivision process for a proposed future development, and would dedicate it to Washington County for a municipal building, known as the HERO project.

Acquisition Property on East Side of Park (Property C)

Proposed east property C is located at the southeastern corner of the existing park boundary and is currently owned by the City of Cottage Grove. The parcel is 7.22 acres. This acquisition would provide protection of steep ravines with native oak forest. This parcel will also extend the park boundary to Kimbro Avenue South and would allow for trail connections and pedestrian access to the park from the east side.

Acquisition Properties on South Side of Park (Properties D & E)

Two private parcels are located the southern boundary of the park. The parcel sizes are 13.95 acres and 2.57 acres. These parcels will enhance the park because it will expand the boundary to E. Point Douglas Road S. creating a natural buffer between adjoining properties. These parcels will also provide options for new trail connections within the park and enhance the connection to the Mississippi River Trail.

Table 10: Parkland Acquisitions and Acreage Summary

Future Acquisition Summary	Acres	Cost*
North End of Park (A)	64 (approx.)	\$651,300
East Property (B)	2.00	\$20,353
East Property (C)	7.22	\$175,300
Southwest Property (D)	13.95	\$338,800
Southeast Property (E)	2.57	\$217,900
Total	89.74 (approx.)	\$1,403,660

Park Acreage Summary	Acres
Original Park Acreage	515.3
Land Removed for Other Purposes	38.5
Land Added and Proposed Additions	120 (approx.)
Current Park Acreage	507
Ultimate Master Plan Acreage	597 (approx.)

* Based on 2016 tax assessed value of property

Willing Seller Policy

Washington County’s current policy position on land acquisition is on a “willing seller” basis. The projected timing and sequencing of acquiring property adjacent to the park will ultimately be determined by the County’s ability to acquire funds and the timing of parcel availability. “Highest priority acquisition and development is planned for areas that would provide opportunities to restore or better manage the natural resource base and reduce fragmentation of county ownership.” (Wash. Co. 2030 Plan)

The priorities for acquiring park lands identified in Metropolitan Council approved master plans which would be lost if timely action is not taken are:

» Essential to protect the natural resources that define a park or park reserve and make it usable to the public as planned.

» Essential for the park or park reserve to reach its full service potential for regional natural resource-based outdoor recreation as defined in the Council’s Regional Parks System plan and the park unit’s master plan (2040 Regional Parks Policy Plan).

Enforcement and Public Safety

The Washington County Sheriff’s Office and City of Cottage Grove Police provides patrolling and security for the park as well as responds to emergencies and criminal complaints. The Washington County South Service Center and Cottage Grove City Hall/Police Department is located adjacent to Cottage Grove Ravine Regional Park.

Maintenance and Operations

Washington County manages and operates its park and trail system with internal staff including 19 permanent employees. In addition, approximately 100 seasonal employees are hired each year as life guards, maintenance workers and gate attendants. The Parks Division has an annual operations and maintenance budget of approximately \$3,025,700 to operate and maintain the County’s park and trail system.

The Park currently does not have full-time employees. Maintenance and operations are conducted by park staff operating out of St. Croix Bluffs Regional Park. In 2015 annual expenditure for Cottage Grove Ravine Regional Park was \$11,102. The Metropolitan Council estimates that there were 66,600 visitors to Cottage Grove Ravine Regional Park in 2015. The number of visitors is expected to increase its use proportionally. Operations and maintenance costs

will increase as park development is phased in over time. Additional staff will be needed to manage the park gate, maintain trails, buildings and other park facilities. It is anticipated that the cost to operate and maintain the park upon full build out will be \$30,000, including additional staff and time and resources.

The Washington County Board of Commissioners established policies and goals for maintaining the parks and trails system through an annual budgeting process for capital and operating funds for parks. The Parks and Open Space Commission, appointed by the County Board of Commissioners, serves as an advisory committee advocate for enhancing the park and trail systems within the County. The specific responsibilities include:

- » Review proposals and make recommendations concerning park and trail acquisition and development.



- » Review and make recommendations concerning recreation programming, fees for facility use and park use policies.

- » Recommend enhancing natural resources in County Parks and regional trail corridors.

- » Provide input into the County Park Policy Plan and Park Master Plans for park development site planning.

- » Perform fact finding tasks as directed by the County Board.

Central Draw Storage Facility in the Park

CDSF Maintenance and Operations

The SWWD will design and develop the CDSF Overflow Project through Cottage Grove Ravine Regional Park and serve as the operating agency for the system. Maintenance and operations of the CDSF system will be managed by the SWWD in perpetuity. Maintenance activities above and beyond those needed to operate the system include vegetation management along the channel corridor, long-term monitoring of vegetation within the project area as defined by the vegetation survey prepared in 2015. Access routes to the CDSF system within the park will be coordinated with Washington County and will take into consideration changes to park amenities such as trails and park user safety. Construction access and operation and maintenance responsibilities will be through an agreement to be developed. The agreement will also lay out event-response procedures to monitor and assess park and vegetation changes following any regional flow event and specify the restoration response to such an event as part of ongoing vegetation management.

Sources of Revenue

Washington County budgets annually for operating the park system. The budget includes maintenance of recreation facilities and management of natural resources within the parks. Revenue for these expenditures originates from three primary sources:

- Vehicle passes and campground reservations
- County levy
- Operations and maintenance grants consisting of State general funds and lottery in-lieu sales tax funds that are disbursed through the Metropolitan Council

The future introduction of group picnic shelters, potential camper cabin facilities, and a regionally significant playground facility will all contribute towards increasing attendance and providing additional revenues for the park. Visitation to the park will also increase when the trail system is updated to serve the needs of various trail user groups. Before developing any of these new facilities, it will be important to secure additional staffing and funding to ensure they can be planned and accommodated within the County's yearly operations and maintenance budget.

Energy Conservation and Recycling

The master plan for Cottage Grove Ravine Regional Park proposes new facilities including a four-season trailhead building, three-season picnic shelters, and camper cabins that will be used year-round. These buildings will be designed and constructed using the latest conservation technologies and may include solar panels, in-floor radiant heating, and energy-conserving materials that will greatly reduce operating expenses. Outdoor light fixtures for walkways,

trails, parking lots, and park roads will use LED light fixtures that greatly reduce operating costs and can be directed to minimize unwanted light pollution.

Washington County provides recycling bins adjacent to trash receptacles throughout Cottage Grove Ravine Regional Park that are collected regularly.

Ordinances

Washington County has adopted Ordinance No. 174 which establishes rules and regulations for park use and management under its jurisdiction. The ordinance incorporates Minnesota statutes that address regulations for:

- » Public Use
- » General Conduct
- » General Parkland Operation
- » Protection of Property, Structures and Natural Resources
- » Recreational Activities
- » Motorized Vehicles, Traffic and Parking

A copy of the ordinance is available for review through Washington County.

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Chapter 7: Public Engagement and Participation

Overview

Washington County strives to provide an inclusive public engagement process for its park planning efforts. To reach a diverse cross-section of the community and to engage people of diverse races, ethnicities, classes, ages, abilities and national origin, Washington County staff developed a plan to provide information to the public in multiple ways with an emphasis on trying to make it easy and accessible for all interested citizens to participate in the planning process. The public engagement process included several meetings with a technical advisory committee, updates to the Washington County Parks Commission on the plan development progress, conducting public open houses and pop-up meetings to provide public updates and presenting information at local city council meetings to keep the communities updated about the master plan process. The general public, including park users and Washington County residents are important stakeholders in the master planning process and their input is highly valued. Comments received have been addressed in revisions to the master plan.

Cottage Grove Ravine Regional Park Technical Advisory Committee

A Cottage Grove Ravine Regional Park Master Plan Technical Advisory Committee was established to guide the park master plan update and coordinate planning efforts within the local communities and greater region. Committee members included representatives from the following stakeholders: City of Woodbury, City of Cottage Grove, Washington County, and the South Washington Watershed District. The responsibilities of the Technical Advisory Committee included:

» Coordinating with respective governing bodies, such as City Councils, Planning Commissions, Park Commissions and other staff/departments within the respective city/agency.

» Assisting in implementing public participation opportunities.

» Providing information and support necessary to identify important natural features and recreation features that meet all applicable agency goals.

» Assisting Washington County in local municipality/agency approval processes.

The full Technical Advisory Committee met six times:

» May 12, 2015

» June 30, 2015

» July 15, 2015

» September 1, 2015

» September 30, 2015

» January 19, 2016

Throughout the master planning process, Washington County staff met with committee members to identify opportunities and address and resolve issues and concerns. These meetings often involved other individuals, groups, and organizations as detailed route information was exchanged.

Washington County Park Commission

The Washington County Park Commission reviewed planning updates and the final draft master plan four times throughout the planning process, including:

» September 17, 2015

» November 19, 2015

» December 17, 2015

» January 21, 2016

» March 17, 2016

Municipal Presentations & Input

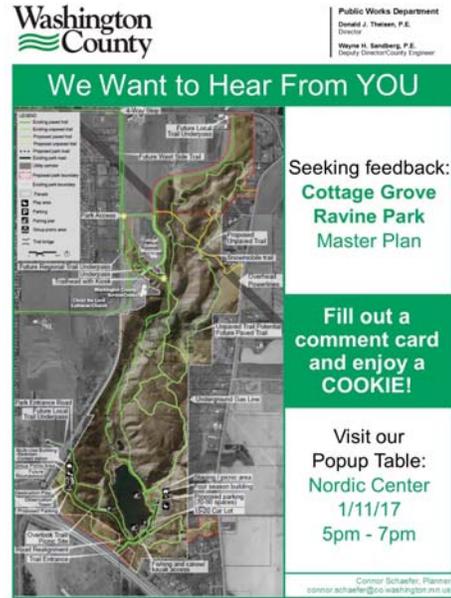
Washington County staff presented updates on the master plan process to local city councils, city government committees and watershed district meetings several times throughout the master plan process to keep local authorities updated and to solicit additional input about the master plan. Meetings were held on the following dates:

- » September 14, 2015 City of Cottage Grove Parks and Recreation Commission
- » September 29, 2015 City of Woodbury Park, Planning and Economic Development staff presentation
- » February 17, 2016 Cottage Grove City Council presentation
- » February 24, 2016 Woodbury City Council presentation

Public Communications/ Social Media

Online and social media tools were identified as alternative ways to get information and updates to the public. The Washington County website was the primary on-line portal for meeting information and for posting draft plans for public review. All open houses and pop-up meetings were listed on the County's website. The County utilized its Facebook and Twitter accounts to promote the pop-up events. In addition, fliers were printed and posted at County facilities to promote the pop-up events.

A MySidewalk social media site was developed for the master plan, but the site was not made public because this phase of the master plan process coincided with a county-wide update of on-line and social media materials, which impacted opportunities to utilize this on-line tool in a timely fashion for appropriate public engagement.



Fliers were posted at County facilities announcing the Pop-up events.

Public Open Houses & Pop-Up Meetings

Washington County, with the support and assistance of Technical Advisory Committee members, held six public open houses and engagement events where the public had an opportunity to review the status of planning efforts and provide comments.

In an effort to reach out to a variety of residents, Washington County held meetings at public buildings accessible to the public. A community engagement event was held at a public housing facility near the park to provide easy access to the information. Public presentations were held on the following dates:

- » July 28, 2015 Open House at the Washington County South Service Center
- » September 22, 2015 Open House at the Washington County South Service Center

- » November 18, 2015 Open House at the Washington County South Service Center
- » December 12, 2015 Community Engagement Event at The Woodlands Apartment Complex

Washington County initiated two additional public pop-up events to seek more public input about the master plan update. The 2040 Regional Parks Policy Plan requires that the public engagement process seek to mitigate existing racial, ethnic, cultural, or linguistic barriers and include people of diverse races, ethnicities, classes, ages, abilities and national origin. In order to reach out to populations that may not feel comfortable attending open houses or public meetings, the County set up two pop-up events designed to “meet people where they are already located.” Staff set up tables at strategic locations and times that are frequented by Washington County residents of all backgrounds. Pop-up style tabling allowed for more in-depth, one-on-one conversations. The County received positive feedback on conducting this type of engagement, as several members of the public mentioned they would not typically attend an open house, but were happy they were given the opportunity to provide feedback in this setting. The pop-up meetings were held on the following dates:

- » January 10, 2017 Park Grove Library
- » January 12, 2017 Lake Elmo Park Reserve Nordic Center

Open House #1 Approach & Findings

The first public open house was held on July 28, 2015 at the Washington County South Service Center. The Service Center is located adjacent to the Park in an easily accessible public



The open house meetings included presentations and numerous information boards and maps describing the current park layout and proposed improvements for the park. Attendees were given the opportunity to write comments on comment cards to add their ideas.

building with ample parking. Attendance at the open house included 21 members of the public and representatives from Washington County, the City of Cottage Grove, the City of Woodbury and the South Washington Watershed District. Existing Park site inventory and analysis information was presented as well as updated park programming activities being considered. Several preliminary layout concepts for park activity areas were also prepared and displayed for comment and feedback. Feedback from the first open house was positive with many individuals commenting on the need for updated recreation facilities and new trails throughout the park. Specific comments from the open house are listed in Table 10.

Open House #2 Approach & Findings

A second open house was held on September 22, 2015 at the Washington County South Service Center. Attendance at the open house included ten members of the public

and representatives from Washington County, the City of Cottage Grove, the City of Woodbury and the South Washington Watershed District. In addition to the analysis graphics presented at the first open house, an early concept of the SWWD's CDSF Overflow Project was overlaid on the park concept map. Revisions to the paved and soft-surface trails were presented, along with concept alternatives for the trailhead area and new park entrance area in the south portion of the park. While attendance was light at this open house, those in attendance provided input on the proposed revisions to the trail network and new park entrance. Positive feedback was given about the new park entrance, especially about the opportunities for more group gathering spaces and increased visibility from County Road 19. A complete list of comments from the public meetings is included in Table 10.

Open House #3 Approach & Findings

The third open house, held on November 18, 2015 at the Washington County South Service Center was meant to provide the public with updated revisions to the park development areas and revisions to the park trail system. Attendance at the open house included three members of the public and representatives from Washington County, the City of Cottage Grove, the City of Woodbury and the South Washington Watershed District. A complete list of comments from the public meetings is included in Table 10.

Open House #4 Approach & Findings

The public engagement opportunity that was added to the public process was an open house at the Woodlands

Apartments in Cottage Grove, located just a couple miles from the park. County staff felt it was important to reach out to nearby residents who may not have easy access to the South Service Center or other public meeting venues. The draft park layout was presented at the open house on December 12, 2015. Attendance was light at this open house with three members of the public providing input. Staff was surprised at the low attendance and discussed additional ways to solicit input from existing and future park users. A complete list of comments from the public meetings is included in Table 10.

All open house materials were also posted on the Washington County website for public review and comment.

Pop-up Event #1 Approach & Findings

In an effort to obtain more input from the public about the Cottage Grove Ravine Regional Park Master Plan, Washington County held two pop-up meetings focused on families and winter park users. The first pop-up event was held at the Park Grove Library in the morning of January 10, 2017, providing an alternative to evening meeting times. The library is located approximately three miles west of the park in an area with several apartment complexes and nearby two schools. Twelve visitors asked questions about the master plan and provided input. The library's story time program was scheduled for the same time frame and this created the opportunity for families with youth park users to provide input. The focus of the comments was on recreation, especially activities for children and families. There were recommendations to maintain the geocaching activities in the park and to increase access to the



Washington County held two pop-up meetings to seek additional public input about the master plan update. One meeting was held at the Park Grove Library and one was held at the Lake Elmo Park Reserve Nordic Center.

lake for fishing. Comments were also made about restoration efforts and ensuring that native plant material is utilized in future plantings.

Pop-up Event #2 Approach & Findings

The second pop-up event was held at the Lake Elmo Park Reserve Nordic Center on January 12, 2017. Lake Elmo Park Reserve is the most visited regional park in Washington County and is heavily used by winter recreation enthusiasts, providing the County to reach out to this population about Cottage Grove Ravine Regional Park improvements for winter recreation. The meeting was purposefully scheduled in the evening when high school ski teams were practicing and happened to occur after a fresh snowfall. Twenty four people provided input on the master plan for Cottage Grove Ravine

Regional Park. Many of the comments focused on trails and winter recreation. Feedback was received by ski coaches and teenagers, as well as and members from the general public who were excited to ski in the fresh snow pack. One suggestion that was made several times was to add snow making and enhance grooming to improve the cross-country skiing experience. Staff was also able to discuss park use with members of the Hmong community who mentioned the interest in fishing at Ravine Lake.

Community Engagement Results

The various meetings and public outreach events that were conducted as part of the Cottage Grove Ravine Regional Park Master Plan process provided the project team with beneficial input about what the public would like to see improved at the park. The comments received in the community engagement process brought to light a variety of activity themes and overarching desires for the regional park. These included:

- » Maintain the high-quality natural environment of the park.
- » Seek to minimize impacts to natural resources and recreation resources through the development of the SWWD stormwater conveyance project.
- » Improving access to the Ravine Lake is important in both summer and winter seasons.
- » Developing and maintaining high-quality paved and unpaved trails is important. The park is known for its challenging terrain and unique trail system.

» General facility upgrades will make the park more appealing to visitors and will help increase overall park attendance rates.

Development Themes

Guided by the input received from the public, project committees, city and county staff, the following development themes are present in the updated master plan:

» **Protect and restore natural habitats-** Throughout the public process, a key theme was the importance of the natural environment in the park. Visitors are drawn to the hilly, wooded environment and enjoy hiking through the variety of landscapes that are represented in the park. It is important to protect and restore the park's natural environment during future improvements to recreation facilities and during construction of the SWWD stormwater conveyance system. Continuing the natural resource maintenance and restoration programs, including invasive plant removal are beneficial initiatives.

» **Improve existing recreation facilities-** Existing park facilities are outdated and in poor condition. The public is excited about a new park entrance road, new trails, new four-season park building and upgraded picnic and playground facilities. Cottage Grove Ravine Regional Park is a unique park environment and improving the existing recreational facilities will enhance the user experience.

» **Develop new recreation elements to broaden interest in the park-** Throughout the public process, ideas were generated to create new and exciting ways for people to use the park. Increasing access to Ravine Lake for fishing and providing a non-motorized boat launch were two ideas to improve access to the lake, an underutilized park feature. Introducing camper cabins and developing a second playground are popular ideas that will draw more visitors to the park.

Summary of Public Engagement Comments

The following table summarizes the comments that were received at the open houses and pop-up meetings throughout the master planning process. Several of the comments were repeated at multiple events but are listed only once for clarity.

Public Comment/Question	Response
Open House #1	
Fix the road into the park	A new park road alignment from CR 19 is proposed
The restrooms in the park are in poor condition	Proposed park buildings will have new restrooms
Light paved trails in park as well as soft trails	Paved trails will be lighted where they are adjacent to ski trails
Additional picnic shelters are a good idea	Three new picnic shelters are proposed in the master plan
Disc golf would be a good addition to the park	The County will review this idea for this and other parks
Ski rentals would be good in the park	The proposed trailhead building could house ski rentals as a programming item
Can a Nice Ride bike rental facility be added?	Nice Ride Minnesota is an independent non-profit not affiliated with Washington County Parks
Open House #2	
Pave more park trails for year-round use	The park plan proposes extending paved trails further south and west in the park
Please add a destination playground like the Hyland Play Area in this park	A destination playground is proposed at the Overlook Development Area
Make driving into the park free	Washington County is reviewing park access fees for people who receive financial assistance from the County
Please include a kayak/canoe landing in the park	A canoe/kayak landing is proposed
Pop-Up Meeting #1	
A zip line would be a nice addition to the park	The master plan includes an option for a zip line in the future
Will tree species planted as part of the conveyance system restoration in the park be native?	The master plan includes a list of native tree species for future planting
Include a climbing wall and taller slides in the playgrounds	These elements have been included in the narrative about the playgrounds
Separate ski trails and hiking trails	Ski trails and winter hiking trails have been separated in the plan
Rain gardens for the parking lots could be good educational elements for the public	Rain gardens are good Best Management Practices (BMPs) and will be considered when the parking lots are designed
Retain and add geocaching in the park	Geocaching has not been modified by the master plan
Provide increased fishing opportunities in the park	A second fishing pier is proposed as well as a boat launch for non-motorized boats
The new access road will provide good visibility for the park	Increasing the park's visibility is a benefit of relocating the park road
Pop-Up Meeting #2	
More skiers would use the park if the ski trails were improved and widened	The plan calls for ski trail improvements for safety and accessibility, and to accommodate larger groups
Lighting of ski trails would make them more useable	Lights are proposed for winter trail use in the park
The park needs better facilities to attract more users in summer months	New facilities are planned for both summer and winter activities
It would be nice to accomodate fat tire bicycles in the park	The sandy soils are not good for maintaining bicycle trails because they are prone to erosion
Snowmaking capabilities would be good to expand the ski season	The master plan indicates that the County may review options for installing snowmaking in the future
A lot of trail runners and hikers use the park because of the undulating terrain	New soft-surface trails have been added and existing trails have been re-routed in the park to expand the trail system
More reserved picnic facilities would be nice in the park	Four new facilities are proposed that could be rented for picnics
Skiing is more challenging at CGRRP but the terrain is hard for beginners	Ski trails in the plan have been re-routed for safety
Local high school ski teams would like another place to train	The proposed four-season shelter will accommodate larger groups for skiing and the proposed trail improvements will benefit large ski groups

Table 11: Summary of public comments and responses

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Chapter 8: Public Awareness

Washington County uses public relations, marketing, and media relations tools, such as a website, event planning, press releases, and promotional materials to promote their parks and trails. Washington County also collaborates with a wide array of community, business, and government organizations to promote their facilities, programs, and services and to educate the public about the available resources.

Washington County engages the public through several on-line and social media tools. The County website has a page dedicated to parks and trails that provides information on the parks and trails across the county, lists information about programs and events, explains how individuals can support the park system by donating or volunteering, and provides information and a link for reservations and permits. Washington County actively posts information on Twitter and Facebook to share news and information about the park system.

Opportunities for expanding social media and on-line resources for public awareness will likely expand in the future as new media tools and new platforms become available. Younger park users frequently access public service information on-line and will continue to seek additional ways to engage with the County about the park system through social media.



Soft-surface trails in the park will be updated and relocated in some locations to increase safety for trail users.



The new trailhead area will include an upgraded playground and small group picnic shelters.

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Chapter 9: Accessibility

Washington County is committed to providing access and recreational opportunities to all people, including persons with disabilities, minorities, and other special-population groups. Washington County meets this commitment through appropriate facility design and programming considerations and by actively addressing potential barriers to participation.

All regional park facilities described in the master plan will be developed in accordance with Americans with Disabilities Act (ADA) standards and guidelines. More specifically, the Cottage Grove Ravine Regional Park will adhere to the *Minnesota Bikeway Facility Design Manual (MnDOT 2007)*; *Trail Planning, Design and Development Guidelines (MnDNR 2007)*; *ADA Accessibility Guidelines for Outdoor Developed Areas (United States Access Board)*; and *ADA and ABA Accessibility Guidelines for Buildings and Facilities (U.S. Access Board)* unless more current guidelines and standards exist at the time of development.

All new and reconstructed elements within the park including parking, restrooms, water access, trails, boardwalks, fishing piers, camper cabins, an adventure course, and playgrounds will be designed to accommodate individuals with disabilities. In addition, paved trails will safely accommodate two-way directional non-motor vehicle traffic.

Compliance with ADA standards is an important goal of park design. Development of the new park entrance road and user amenities will adhere to ADA standards. Playgrounds and all park buildings will be accessible, and paved trails will be designed to meet current trail standards with maximum slopes of eight percent, whenever possible. In situations where grades are steeper than ADA standards allow, signage will be added warning of steep grades.

Affordability

Washington County has several options to make park access more affordable. Park access fees are not charged for patrons who walk or bicycle into parks. Additionally, park access fees are waived on the first Tuesday of each month. Washington County provides free programming for park users including campfire talks, fitness hikes, bird walks and other programs coordinated with free Tuesdays. The South Service Center has public parking is available with direct trail access into Cottage Grove Ravine Regional Park.

The Washington County Parks Department and Community Services is reviewing the option of providing free park permits to individuals who receive financial assistance from the County.

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Chapter 10: Phasing and Cost Estimates

The elements proposed in the master plan encompass a substantial amount of work that will be implemented over time and in phases. There are two projects proposed within the Park and adjacent to the park that impact development and project phasing. These include the South Washington Watershed District (SWWD) Central Draw Storage Facility Overflow Project and improvements to County Road 19 at the new park entrance. The CDSF Overflow Project will require redevelopment of sections of existing paved trails in the park and construction of new boardwalks or culvert crossings to allow passage over areas that are flooded during high water events. In addition to recreation elements, a new overflow structure at the south end of Ravine Lake will be installed as part of the overflow project. These improvements will be paid for and developed as part of the overflow project and are not included in the cost estimates for the master plan.

Improvements to County Road 19 at the southwest corner of the park incorporate the new park entrance road between County Road 19 and the lakeshore development area. These improvements include removing the existing park roadway and parking lots and reconstructing a new park entrance road off of County Road 19 that will extend to the new parking lot on the east side of Ravine Lake. The road will be moved south around the lake shore and it will be raised several feet to bring it out of the flood zone. The old park entrance will be removed and a new trail connection will be developed at that area. In addition to the new park road, an independent, paved trail will be constructed between the new park entrance and the lakeshore development area adjacent to the park road.

SWWD Easement for Park Use

The South Washington Watershed District will be working with Washington County on an easement to develop the Central Draw Storage Facility overflow project through the park. The easement will contain language that describe the long-term maintenance responsibilities of the SWWD, which will include trail structure maintenance and managing the vegetation in the overflow facility, including clearing storm debris and monitoring for disease and die-off.

Estimated Construction Costs

The following four construction cost estimates have been developed with the understanding that park development will occur in phases. The estimates include the overlook development area, the new park entrance road and paved trail, the lakeside development area and park-wide improvements including soft-surface trails, trail lighting, user amenities such as picnic tables and natural resource enhancements and restoration costs. The cost estimates include contingencies for design, engineering and construction and use 2016 construction dollars.

Park Road Improvements

The Park Road Improvements estimate includes several upgrades to the developed area to the park. Improvements include the removal of both existing parking lots and the park road. The existing playground will also be removed to make room for the new park road and parking lot. The park road will be reconstructed between the Lakeside Development Area and the new park entrance along County Road 19. The main parking lot in the Lakeside Development Area will include concrete sidewalks that will extend to the current

picnic shelter, which is the site of the future four-season park building. Two additional parking lots will be constructed near the south end of Ravine Lake. One will be located adjacent to the canoe landing and the other parking lot will be reconstructed at the location of the existing parking lot on top of the slope on the southwest side of the lake. A ten-foot, paved trail will be constructed adjacent to the park road that will extend from the park entrance to the Lakeside Development Area. The proposed pedestrian bridge, canoe launch and second fishing pier will be developed in a future development phase. The estimated cost for these improvements, including contingencies for design, engineering and construction is \$3,209,000.

Park-Wide Improvements

Park-Wide Improvements identified in this estimate include elements within the park that will be developed separately from the proposed park road reconstruction and the CDSF Overflow Project. The improvements include re-aligning several cross-country ski trails to provide independent loops of varying difficulty and distance, and bollard-style lighting for the ski trails. The trail location along the northeast corner of Ravine Lake is too narrow to accommodate side-by-side paved and soft-surface trails so a retaining wall and new paved and soft-surface trails in this location are included in these improvements. The extension of the paved trail between the Park Development Area and the old park entrance, which will not be developed as part of the park entrance road project is included. The master plan identifies the potential for installing camper cabins at some location within the park. These elements are included in the Park-Wide Improvements estimate, however, further study will be needed to identify the site within the park for their location.

Natural resource enhancements and restoration costs are incorporated in the park-wide improvement category. These include buckthorn removal and follow-up, prescriptive burns in select areas of the park, and restoration and enhancement to prairie and oak savanna landscapes. The estimated cost for these improvements, including contingencies for design, engineering and construction is \$5,279,000.

Overlook Development Area

The Overlook Development Area will include new facilities adjacent to the new park entrance including park operations and public amenities. A park contact station with public restrooms will be developed for park staff to manage park activities and to collect entrance fees. Public facilities in the development area will include a new playground, picnic shelter, overlook structure, park amenities such as picnic tables and landscaping. The estimated cost for these improvements, including contingencies for design, engineering and construction is \$2,123,000.

Lakeside Development Area

The Lakeside Development Area will include replacing the outdated picnic shelter and installing new picnic facilities, playground and amenities. The existing park shelter will be removed and replaced with a four-season park building with restrooms. Two new small-group picnic shelters will be developed next to a new playground. Several amenities along the south shore of Ravine Lake will be considered, including a boardwalk along the trail, a pedestrian bridge, a new fishing pier and a canoe/kayak launch. The estimated cost for these improvements, including contingencies for design, engineering and construction is \$3,876,000.

UNIT LEGEND: LS=Lump Sum, SF=Square Feet, SY=Square Yard, EA=Each,
LF=Lineal Foot, CY=Cubic Yards, AC=Acre

**Cottage Grove Ravine: Park Road Improvements
Preliminary Construction Estimate (2016 Dollars)**

Notes	Removals	Unit	Unit Price (in Dollars)	Esimtated Quantity	Total (In Dollars)
	Remove Bituminous Parking Lot	SY	\$4	5,021	\$20,085
	Remove Bituminous Roadway	SY	\$4	13,376	\$53,504
5	Remove Playground Equipment	LS	\$2,000	1	\$2,000
Subtotal					\$75,589
Notes	Trail and Roadway Elements		Unit Price (in Dollars)		Total (In Dollars)
6	Bituminous Roadway	SY	\$40	15,262	\$610,480
6	Bituminous Parking Lot	SY	\$60	5,230	\$313,800
8	Concrete Sidewalk (10' width)	LF	\$48	7,057	\$338,736
7	Bituminous Trail	LF	\$85	6,800	\$578,000
Subtotal					\$1,841,016
SUBTOTAL IMPROVEMENTS*					\$1,920,000
Erosion Control, 3%*					\$58,000
Construction Surveying, 8%*					\$154,000
Mobilization, 5%*					\$96,000
SUBTOTAL 2					\$2,228,000
Construction Contingency, 20%*					\$446,000
SUBTOTAL 3					\$2,674,000
Design & Engineering Contingency, 20%*					\$535,000
GRAND TOTAL					\$3,209,000

* Figure has been rounded.

UNIT LEGEND: LS=Lump Sum, SF=Square Feet, SY=Square Yard, EA=Each,
LF=Lineal Foot, CY=Cubic Yards, AC=Acre

**Cottage Grove Ravine: Park Wide Improvements
Preliminary Construction Estimate (2016 Dollars)**

Notes	Trail Elements		Unit Price (in Dollars)		Total (In Dollars)
	Remove Concrete Block Retaining Wall	LF	\$15	200	\$3,000
	Prefabricated Modular Block Retaining Wall	SF	\$50	2,250	\$112,500
7	Bituminous Trail	LF	\$85	7,550	\$641,750
9	Natural Surface Trail (14' width)	LF	\$10	29,853	\$298,534
9	Natural Surface Trail (3'-4' wide foot path)	LF	\$5	2,582	\$12,910
Subtotal					\$953,193
Notes	Other Elements		Unit Price (in Dollars)		Total (In Dollars)
14	Camper Cabins	EA	\$90,000	3	\$270,000
16	Ski Trail Lighting	EA	\$3,500	295	\$1,032,500
Subtotal					\$1,302,500
Notes	Natural Resource Enhancements and Restoration		Unit Price (in Dollars)		Total (In Dollars)
	Initial Buckthorn Removal	AC	\$2,200	270	\$594,000
	Buckthorn Removal Follow-up	AC	\$600	270	\$162,000
	Prescriptive Burn	AC	\$400	270	\$108,000
	Prairie Enhancement	AC	\$800	14	\$11,200
	Oak Savanna Restoration	AC	\$1,000	25	\$25,000
Subtotal					\$900,200
SUBTOTAL IMPROVEMENTS*					\$3,160,000
Erosion Control, 3%*					\$95,000
Construction Surveying, 8%*					\$253,000
Mobilization, 5%*					\$158,000
SUBTOTAL 2					\$3,666,000
Construction Contingency, 20%*					\$733,000
SUBTOTAL 3					\$4,399,000
Design & Engineering Contingency, 20%*					\$880,000
GRAND TOTAL					\$5,279,000

* Figure has been rounded.

UNIT LEGEND: LS=Lump Sum, SF=Square Feet, SY=Square Yard, EA=Each,
LF=Lineal Foot, CY=Cubic Yards, AC=Acre

**Overlook Development Area
Preliminary Construction Estimate (2016 Dollars)**

Notes	Trail, Roadway and Circulation Elements		Unit Price (in Dollars)		Total (In Dollars)
8	Concrete Sidewalk (10' width)	LF	\$48	1440	\$69,120
8	Concrete Plaza	SF	\$5	750	\$3,750
Subtotal					\$72,870
Notes	Architectural Elements		Unit Price (in Dollars)		Total (In Dollars)
10	Overlook Structure (400 sf)	LS	\$50,000	1	\$50,000
11	Picnic Shelter (1600 sf)	LS	\$350,000	1	\$350,000
12	Contact Station Building (1500 sf)	LS	\$450,000	1	\$450,000
Subtotal					\$850,000
Notes	Park Elements		Unit Price (in Dollars)		Total (In Dollars)
17	2-5 Playground	EA	\$110,000	1	\$110,000
17	5-12 Playground	EA	\$190,000	1	\$190,000
Subtotal					\$300,000
Notes	Site Furnishings		Unit Price (in Dollars)		Total (In Dollars)
	Picnic Table	EA	\$1,600	7	\$11,200
Subtotal					\$11,200
Notes	Landscaping		Unit Price (in Dollars)		Total (In Dollars)
	Deciduous Tree	EA	\$500	13	\$6,500
	Turf Establishment	AC	\$6,000	1.5	\$9,000
	Upland Prairie Landscape Restoration	AC	\$2,000	9	\$18,000
Subtotal					\$33,500
SUBTOTAL IMPROVEMENTS*					\$1,270,000
Erosion Control, 3%*					\$38,000
Construction Surveying, 8%*					\$102,000
Mobilization, 5%*					\$64,000
SUBTOTAL 2					\$1,474,000
Construction Contingency, 20%*					\$295,000
SUBTOTAL 3					\$1,769,000
Design & Engineering Contingency, 20%*					\$354,000
GRAND TOTAL					\$2,123,000

* Figure has been rounded.

UNIT LEGEND: LS=Lump Sum, SF=Square Feet, SY=Square Yard, EA=Each,
LF=Lineal Foot, CY=Cubic Yards, AC=Acre

**Lakeside Development Area
Preliminary Construction Estimate (2016 Dollars)**

Notes	Trail, Roadway and Circulation Elements		Unit Price (in Dollars)		Total (In Dollars)
8	Concrete Sidewalk (10' width)	LF	\$48	2,120	\$101,760
8	Concrete Plaza	SF	\$5	2,500	\$12,500
9	Natural Surface Trail (14' width)	LF	\$10	550	\$5,500
Subtotal					\$114,260
Notes	Architectural Elements		Unit Price (in Dollars)		Total (In Dollars)
4	Remove Large Shelter	LS	\$15,000	1	\$15,000
11	Picnic Shelter (1600 sf)	LS	\$350,000	2	\$700,000
13	Large 4-Season Park Building	LS	\$1,000,000	1	\$1,000,000
15	Trail Bridge for south end of Ravine Lake	LS	\$190,000	1	\$190,000
Subtotal					\$1,905,000
Notes	Park Elements		Unit Price (in Dollars)		Total (In Dollars)
17	2-5 Playground	EA	\$70,000	1	\$70,000
17	5-12 Playground	EA	\$105,000	1	\$105,000
18	Fishing Pier/Overlook	LF	\$300	110	\$33,000
18	Boardwalk	LF	\$300	150	\$45,000
Subtotal					\$253,000
Notes	Site Furnishings		Unit Price (in Dollars)		Total (In Dollars)
	Picnic Table	EA	\$1,600	3	\$4,800
Subtotal					\$4,800
Notes	Landscaping		Unit Price (in Dollars)		Total (In Dollars)
	Deciduous Tree	EA	\$500	66	\$33,000
	Turf Establishment	AC	\$6,000	2	\$12,000
Subtotal					\$45,000
SUBTOTAL IMPROVEMENTS*					\$2,320,000
Erosion Control, 3%*					\$70,000
Construction Surveying, 8%*					\$186,000
Mobilization, 5%*					\$116,000
SUBTOTAL 2					\$2,692,000
Construction Contingency, 20%*					\$538,000
SUBTOTAL 3					\$3,230,000
Design & Engineering Contingency, 20%*					\$646,000
GRAND TOTAL					\$3,876,000

* Figure has been rounded.

Cost Estimate Notes

1. Construction cost estimate includes a 20 percent design and engineering contingency and an additional 20 percent construction contingency for unknown costs.
2. Estimates are based on 2016 construction costs Add 5 percent per year for adjusted inflation costs.
3. Assume no additional cost for private utility relocation.
4. Removal includes all utilities and materials.
5. Includes base removal.
6. Assumes two 3" lifts for 6" pavement thickness. Base material and concrete curb and gutter included.
7. Includes base material and 3" thick asphalt trail surface. Assumes trail is ten feet wide.
8. Assumes 4" concrete thickness.
9. Includes clearing and grubbing of vegetation.
10. Assumes structure size of 20'x20' for small group picnic shelter. Includes concrete slab.
11. Assumes large group picnic shelter size is 30'x53'. Approximate capacity of 125 people.
12. Assumes park contact station size of 1,500 square feet. Building includes office space, storage and public restrooms for adjacent picnic area and playground.
13. Assumes this building will be a four-season structure similar to Lake Elmo Nordic Center. Structure will include restrooms, catering-style kitchen facilities and a large open group space.
14. Camper cabins include one-room structures with electricity, bunk beds and small gathering area, based on concept at MNDNR State Parks. Cost includes construction with no plumbing but a proportional amount of the cost of shared vault restroom.
15. Assumes trail bridge will be a 50-foot long, prefabricated steel truss structure with wood deck and concrete abutments.
16. Cost assumes 100-foot spacing of bollard style lights. Each unit includes concrete footing, conduit, wiring, mounting pole and LED light fixture.
17. Playground cost includes age-appropriate play structure, concrete curb and wood mulch.
18. Boardwalk cost assumes the structure will be constructed to an H-10 load limit capable of handling pickup maintenance vehicles and emergency vehicles. Assumes a 12-foot width, wood and metal mesh railings and helical pile footings included.
19. Prairie enhancement includes prairie planting and increasing forb diversity.
20. Converting old fields to prairie/oak savanna.

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References

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Minnesota Department of Natural Resources, "Minnesota's State Comprehensive Outdoor Recreation Plan 2014-2018". Minnesota Department of Natural Resources, St. Paul, MN 2014.

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Appendix

- Appendix A: Vegetation Analysis Report
- Appendix B: 2004 Existing Drainage Features Report
- Appendix C: South Washington Watershed District Ravine Park Stabilization and Outlet Concept Design Report
- Appendix D: Metropolitan Council Comments on Draft South Washington Watershed District Ravine Park Stabilization and Outlet Design Report
- Appendix E: Metropolitan Council Comments on Central Draw Storage Facility Phase II-V EAW
- Appendix F: South Washington Watershed District Conceptual Overflow Design Letter
- Appendix G: 2008 Land Exchange Agreement
- Appendix H: 2016 Amendment to Land Exchange Agreement

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Appendix A: Vegetation Analysis Report



FLOODING IMPACTS

High precipitation occurrences carrying a volume of water (145 cfs) will overflow from the CDSF to the Park property and impact existing vegetation. Estimates are that 40 acres of park property could be flooded for up to 4 weeks at a time. While it is difficult to predict flooding impacts to individual trees, basic flood tolerance characteristics are recognized within the tree care and forestry communities.

- The longer trees are exposed to flood conditions, the higher the potential for substantial root injury which will result in tree decline and death.
- Flood events during the growing season are more harmful to deciduous trees than events that occur during the dormant season.
- Flooding will create anaerobic soil conditions where soils are devoid of oxygen resulting in root death and inhibition of tree growth.
- Deposition of sediments from flooding events will reduce soil pore space around the root systems of trees and contribute to long-term problems with soil aeration.
- Toxic compounds will be produced in waterlogged soils (e.g. hydrogen sulfide and alcohols) due to the anaerobic decomposition of organic matter.
- Waterlogged soils reduce the tree roots' ability to remain anchored making them more vulnerable to windthrow.
- Roots exposed by flooding currents to the ambient air are vulnerable to drying and mechanical injury from high velocity floating objects.
- Trees stressed by the flooding are more susceptible to insects and pathogens. This vulnerability remains at least 5 years post flood event. Opportunistic soil borne pathogens *Phytophthora*, *Pythium*, and *Armillaria* are abundant in post flooding water saturated soils. Wood borers, emerald ash borer (EAB), two-lined chestnut borer and others, are attracted to and survive better in trees stressed from flooding.

PARK FLOODING IMPACTS - TREE DISTRIBUTION

Houston Engineering Inc. conducted an inventory of trees in the high impact water volume overflow area from the CDSF to the park. Table 1, provides an analysis of the data collected in the inventory.

Significant aspects of the tree analysis in relation to flood tolerance are summarized. Graph 1, demonstrates that 70% of the trees are from 2 different genera: ash and elm. While both of these trees are relatively tolerant of flooding events they are also both susceptible to significant landscape pathogens (Dutch elm disease (DED) & EAB, respectively).



Graphs 2 & 3, illustrate that 80% of the trees inventoried that are larger than 20” in diameter are oak trees. This size classification is important as it denotes a tree reaching full maturity. Protection of these large canopy-defining trees during the conveyance and structural installation is crucial to minimize long-term damage from the project.

Graph 1 & Table 1, indicate that only 1% of the trees inventoried are known to be of a genus that is tolerant to flooding. However, close to 90% have intermediate tolerance to flooding.

Note that these figures may provide a vision of flooding tolerance that is inexact. Inventoried trees were described to genera and it is well established that individual species within a genus can have disparate tolerances to flooding. One example that could be of concern in this instance are the differences between flooding tolerances within the *Quercus*/Oak genus. Red oaks are known to be much less tolerant of flooding than white oaks while bur oaks and pin oaks have an intermediate tolerance of flooding events.

CONSTRUCTION OF LINED CHANNEL IMPACTS

Based on the tree inventory, protection of oak trees along the proposed conveyance system is crucial. The oaks, which provide the largest number of mature trees and are part of the climax plant community, are a vegetation anchor for the entire project. Protection for the oak trees, and other large significant trees, adjacent to or within the construction limits of the conveyance system should include the following preventative measures:

- Design a system to minimize the footprint of excavations and topographical changes. This will minimize root damage to trees needed for structural support.
- Clearly define access points to enter and exit the required construction areas. This should minimize tree removals and damage to understory and ground-level plant communities.
- Time construction activities, e.g. major excavation and hauling of material, to occur during the dormant season when the ground is frozen. This will minimize damage to tree roots.
- Create a reasonable workspace for equipment and supplies that is designed to minimize impact to trees both in the area (horizontally) and in height (vertically) to minimize potential for damage to trees. This is particularly important for the oaks. Mitigating the potential for spreading oak wilt should be of paramount importance during the construction phase of the project.



- Prune nearby trees to create a vertical workspace for the conveyance installation. Pruning should be done by a certified arborist with experience in natural target pruning using the most up to date ANSI A300 Standards.

CONSTRUCTION OF LINED CHANNEL IMPACTS ON CONIFER PLANTATION

Construction of the lined channel will impact the evergreen stands that are a relic of previous efforts to plant and manage the trees as a wood product resource. The evergreen plantations are composed of coniferous tree species that are intolerant of flooding.

The tree inventory from Houston Engineering does not contain any data from the evergreen stand. Therefore, the impacts of construction activities can only be described terms of the aesthetic impact to park users utilizing nearby trails. The decline of impacted trees will be significant in areas where trail and plantations intersect. Construction will certainly change the unique experience for trail users that is found nowhere else in the park.

Due to the dense linear plantation arrangement of the evergreens, losses of trees on the edges of the plantings will have effects on other trees within the plantings. As these changes occur, affected trees on the “new” edges will be more susceptible to windthrow and pest problems, such as bark beetles. While impacts may not be observable immediately after construction, the remaining trees will certainly be damaged through a chain of responses due to the loss and or damage to their surroundings.

CONSTRUCTION OF LINED CHANNEL - TREE DISTRIBUTION

Based on Houston Engineering’s inventory of trees in the flooding area, Tables 2 & 3 provides an analysis of the data collected in the inventory focusing on the proposed construction areas (Table 2) and an immediately adjacent 40’ buffer area (Table 3). Note that these tables do not contain any data regarding implementation of necessary construction area access pathways. The additional impact from the installation of these pathways will need to be evaluated once construction plans are finalized.

Significant aspects of the tree analysis in relation to the construction of lined channels are summarized. Graph 5, demonstrates that between 65% and 70% of the total number of trees that comprise the most numerous two genera: elm and oak. Both of these trees are susceptible to important landscape pathogens (DED & Oak Wilt, respectively) that thrive on trees in stressed condition.



Graph 6, illustrates that 54% of the larger than 20” in diameter oak trees are within the cleared construction and adjacent buffer areas. Once again, this size classification is important as it denotes a tree reaching full maturity. The protection of these large canopy-defining trees during the conveyance and structural installation is crucial to minimize long-term damage from the project.

145 CFS FLOODING EVENT IMPACT - TREE DISTRIBUTION

Based on Houston Engineering’s inventory of trees in the flooding area, Tables 4 provides an analysis of the data collected in the inventory focusing on a 145 CFS event. Similar to the previously analyzed areas, the majority of the total number trees are comprised of two genera (elm and oak), while the largest number of mature specimens are overwhelmingly comprised of oak trees, As mentioned before, both of these tree species are susceptible to important landscape pathogens (DED & Oak Wilt, respectively) that thrive on trees in stressed conditions.

MANAGEMENT OF THE FLOOD AREA

Management of the defined flood areas due to the conveyance construction will require more management than existing non-impacted areas. The areas of new flood impact will be forced to shift from an oak savanna to a wetland ecosystem. This change will be dramatic as the existing flood intolerant trees die, followed by trees of intermediate flood tolerance. The existing trees and associated vegetation will be replaced with new flood tolerant early colonizer species eventually reaching the successional climax state of a riparian woodland.

- Plantings for the purpose of conveyance related construction restoration should be selected with the new ecosystem in mind. These plants will become the seed sources for the long-term ecosystem transition as the intermediate tolerant trees are slowly phased out. New plantings within the flood area should also be selected with the new transition in mind, matching plant needs for successful establishment with existing site-specific conditions.
- Species selection of flood tolerant trees should initially have a balanced mix of early and late successional species to aid in biodiversity and kick start the successional change. This targeted restoration approach will minimize the overall ecosystem transition to the untrained eye, minimizing the aesthetic impact on the park users.



- Invasive species are adept at colonizing disturbed areas with gaps in tree canopy. Increases in management resources will be required for managing invasive species introduced through conveyance construction.
- Routine inspections of the conveyance construction areas should be conducted to assure success in the restoration plantings. These inspections should also include management efforts for invasive plants colonizing the disturbed areas.
- Herbivore control is essential for establishment of restoration plantings in the conveyance construction areas as well as in the flood areas. It is essential to aid in establishing a reliable seed source for flood tolerant plants in the flood areas to assist in the ecological transition of the flood area.

PATHOGEN MANAGEMENT OF THE FLOOD AREA AND ADJACENT AREAS OF THE PARK

Periodic surveys of the flood areas should be conducted to check for tree mortality of current dominant tree species due to pathogens: oak wilt (for oaks), EAB (for ash), DED (for elm). Management of these pathogens should focus on minimization of pathogen spread as indicated by tree care and forestry BMP's. Failure to manage pathogen spread in the flood and conveyance areas will result in exponential pathogen pressure well beyond normally occurring levels with the current management practices.

The same increased efforts to manage pathogens and pests, as described above, should be considered for the evergreen plantation areas impacted by the conveyance construction. Even if the overall goal of the management of the evergreen stands is to phased them out in the long-term, diligence to minimize short-term hazards to trail users from dead and dying trees must be a priority for all areas including the evergreen stands.



HERITAGE SHADE TREE CONSULTANTS

Number	Common Name	DBH Range	Mean DBH	>20"	>20" (%)	Niche	Flood Tolerance
34	Ash	4	27	10.7	3	8.8	Colonizer Tolerant
1	Aspen	5	5	5.0	0	0.0	Colonizer Intermediate
7	Basswood	8	20	10.9	1	14.3	Colonizer Intolerant
4	Birch	6	17	11.6	0	0.0	Colonizer Intermediate
289	Black Cherry	3	25	9.8	3	1.0	Climax Intolerant
122	Boxelder	3	23	9.8	9	7.4	Colonizer Intermediate
67	Buckthorn	3	20	5.8	1	1.5	Invasive Intermediate
28	Cedar	4	11	6.3	0	0.0	Colonizer Intolerant
37	Cottonwood	4	48	13.0	3	8.1	Colonizer Intermediate
1614	Elm	3	27	6.4	7	0.4	Colonizer Intermediate
288	Hackberry	3	20	7.5	1	0.3	Colonizer Intermediate
3	Hickory	8	15	11.3	0	0.0	Climax Intolerant
1	Honeysuckle	3	3	3.0	0	0.0	Invasive Intermediate
46	Ironwood	3	25	6.9	1	2.2	Colonizer Intolerant
7	Maple	4	30	9.8	3	42.9	Climax Intermediate
3	Mulberry	4	10	6.1	0	0.0	Colonizer Intermediate
1253	Oak	3	42	13.0	249	19.9	Climax Intermediate
309	Poplar	3	22	9.0	1	0.3	Colonizer Intermediate
14	Unknown	3	9	1.0	0	0.0	Unknown Unknown
33	Walnut	3	14	7.0	0	0.0	Climax Intolerant
Successional breakdown			Ecological Successional Value				
Climax	1585	38%	Anchor Species = Oaks & Black Cherry				
Colonizer	2493	60%	Desirable Species = Hickory, Birch, Basswood, Maple, Walnut, Ironwood				
Invasive	68	2%	Useful Species = Aspen, Cottonwood, Boxelder, Hackberry, Poplar, Cedar				
Unknown	14	<1%	Problem Species = Ash, Elm, & Mulberry				
			Invasive Species = Honeysuckle, Buckthorn				

Table 1. Number of trees per genera, with statistical and biological information. Note the number of trees per ecological successional category. A Problem species' is one that is very readily susceptible to a disease or insect agent, such as DED or EAB, that reduces its ability to be a long term ecological asset.

HERITAGE SHADE TREE CONSULTANTS

Tree Common Name	# of Trees	Average DBH	DBH Range		>20" DBH	% >20" DBH
Ash	7	11.9	4.0	26.5	1	14
Basswood	5	9.8	8.0	11.0	0	0
Birch	3	13.5	11.3	16.5	0	0
Black Cherry	74	9.2	3.8	17.0	0	0
Boxelder	32	9.7	3.3	16.0	0	0
Buckthorn	23	4.7	3.0	13.0	0	0
Cedar	1	4.5	na	na	0	0
Cottonwood	1	13.8	na	na	0	0
Elm	555	6.2	3.0	20.5	1	0
Hackberry	69	7.4	3.0	18.8	0	0
Ironwood	14	6.8	3.0	14.3	0	0
Mulberry	2	7	4.3	9.8	0	0
Oak	353	11.3	3.0	29.5	23	7
Poplar	53	11.1	3.8	19.3	0	0
unk	2	0	na	na	0	0
Unk	1	3.8	na	na	0	0
Walnut	4	6.2	4.0	8.3	0	0

Table 2. Number of trees per genera for the trees in the construction (clearing) areas, with statistical and biological information.

Tree Common Name	# of Trees	Average DBH	DBH Range		>20" DBH	% >20" DBH
Ash	12	11.7	4.3	21.5	2	17
Basswood	1	19.5	na	na	1	100
Black Cherry	72	9.6	4.0	18.0	0	0
Boxelder	30	8.6	3.0	21.6	1	3
Buckthorn	7	4.7	3.8	6.3	0	0
Cedar	7	7.0	5.0	11.0	0	0
Cottonwood	4	28.3	10.5	48.0	3	75
Elm	496	6.3	3.0	21.0	1	0
Hackberry	87	7.4	3.0	19.5	0	0
Ironwood	13	8.1	5.0	17.0	0	0
Oak	456	14.5	3.0	33.5	109	24
Poplar	64	10.5	4.5	21.5	1	2
Unk	1	6.5	na	na	0	0
Walnut	14	7.0	3.5	11.8	0	0

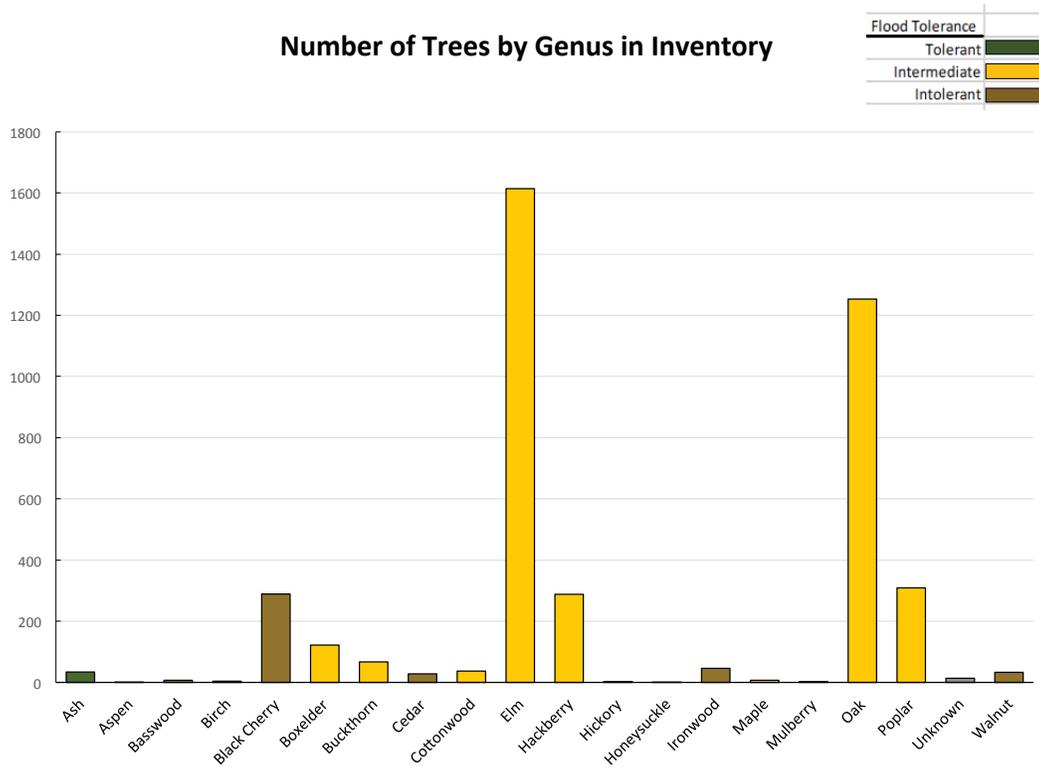
Table 3. Number of trees per genera for the trees in the buffer areas surrounding the construction (clearing) areas, with statistical and biological information.



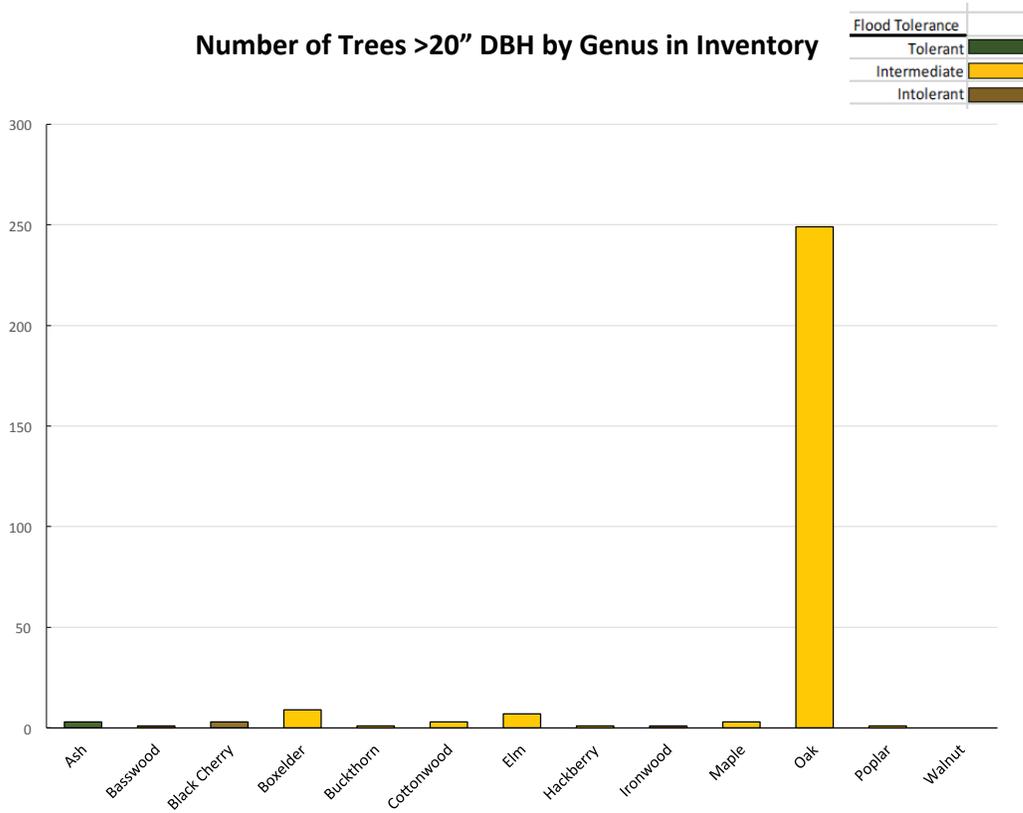
HERITAGE SHADE TREE
CONSULTANTS

Tree Common Name	# of Trees	Average DBH	DBH Range		>20" DBH	>20" (%) DBH
Ash	13	10	5	17	0	0
Aspen	1	5	5	5	0	0
Basswood	1	20	20	20	1	100
Birch	1	6	6	6	0	0
Black Cherry	49	9	5	16	0	0
Boxelder	51	11	3	23	5	10
Buckthorn	25	7	4	19	0	0
Cedar	8	6	4	8	0	0
Cottonwood	26	12	4	19	0	0
Elm	295	7	3	21	3	1
Hackberry	93	8	3	17	0	0
Hickory	3	11	8	15	0	0
Honeysuckle	1	3	3	3	0	0
Ironwood	8	5	4	7	0	0
Maple	4	19	8	30	2	50
Oak	253	15	3	42	85	34
Poplar	163	7	3	16	0	0
Walnut	8	9	4	14	0	0
Unknown	5	0	0	0	0	0

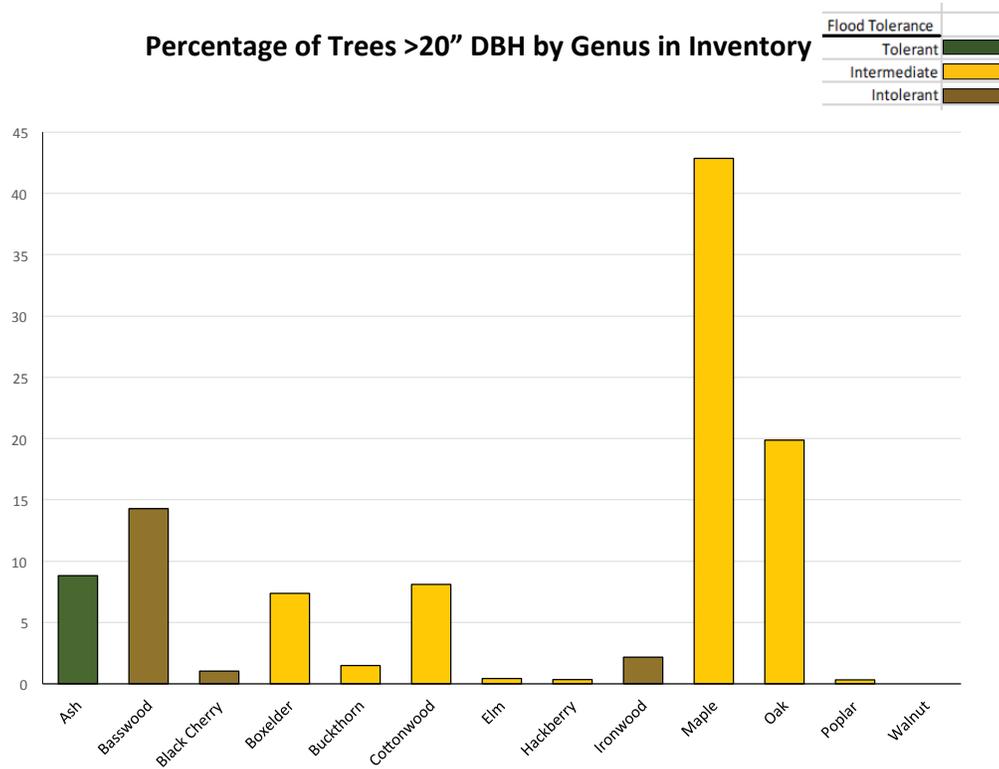
Table 4. Number of trees per genera for the trees in the area impacted by a 145 CFS event, with statistical and biological information.



Graph 1. Number of trees per genus. Note they are colored according to their flood tolerance.

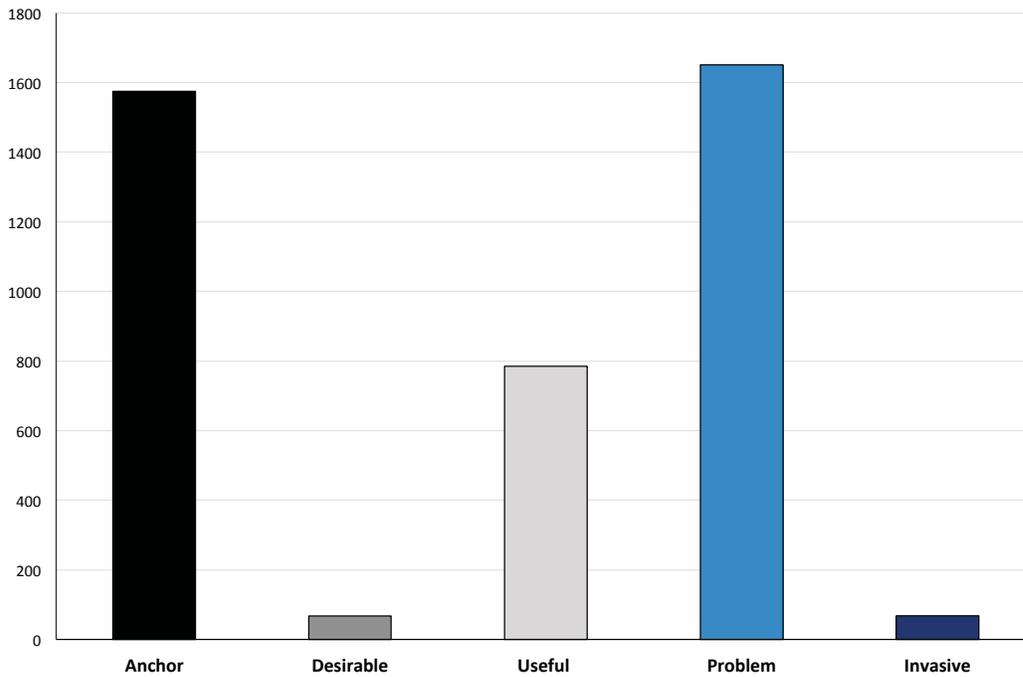


Graph 2. Number of trees greater than 20" diameter, per genus. Note they are colored according to their flood tolerance.

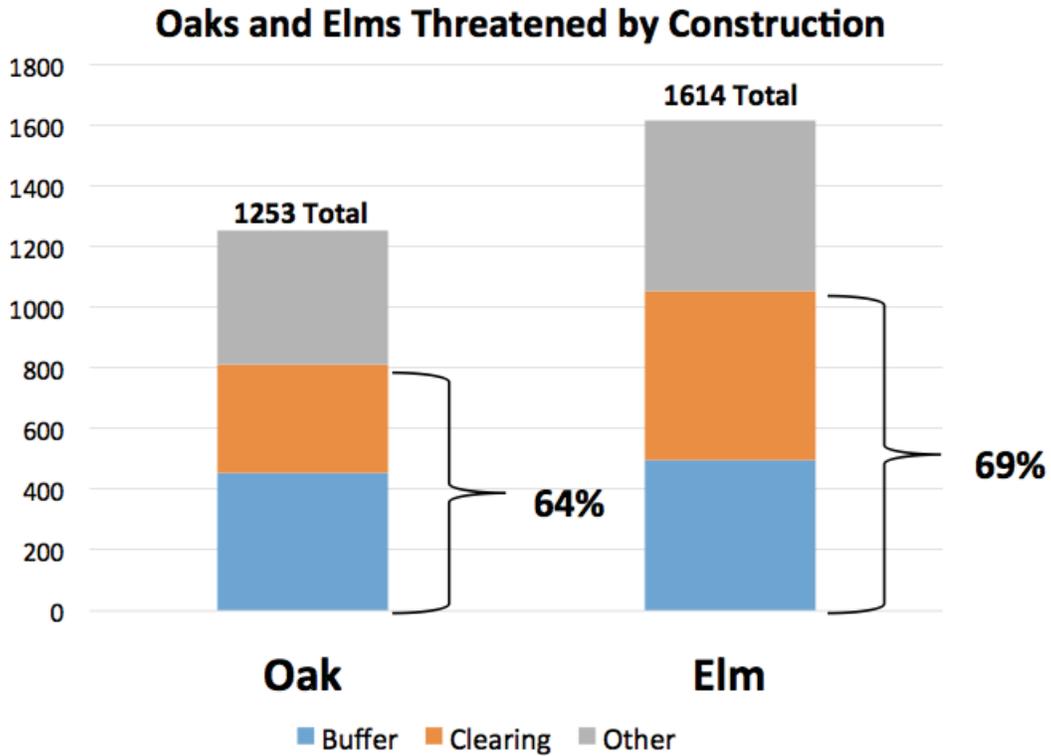


Graph 3. Percentage of trees greater than 20" diameter, per genus. Note they are colored according to their flood tolerance.

Inventoried Trees by Ecological and Successional Value

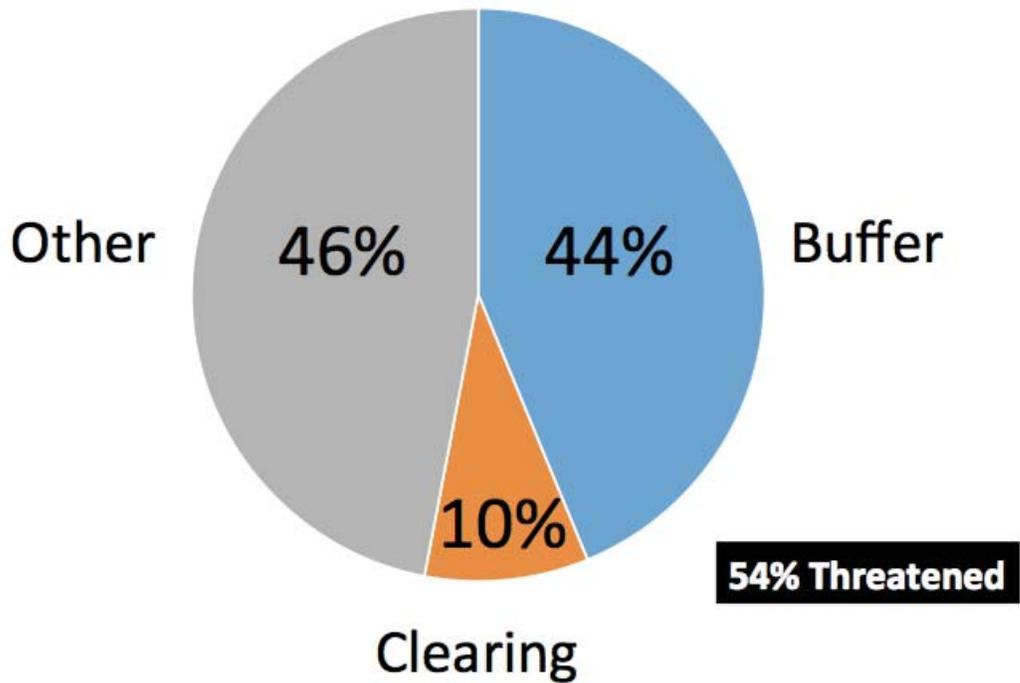


Graph 4. Number of trees per ecological successional value. A Problem species' is one that is very readily susceptible to a disease or insect agent, such as DED or EAB, that reduces its ability to be a long term ecological asset.



Graph 5. Number of trees in both the construction clearance area and the adjacent buffer area that comprise the most numerous two genera: oak and elm. Note the percentage of the total trees inventoried of each genera in both areas.

Oaks with DBH > 20"



Graph 6. Number of oak trees over 20" DBH in both the construction clearance area and the adjacent buffer area. Note that over half of the large oaks will either be removed (cleared construction areas) or close enough to construction activities to be adversely impacted.

Appendix B: Cottage Grove Ravine Regional Park Drainage Features

Cottage Grove Ravine Regional Park

Natural Resources Inventory: Existing Drainage Features

November 2004



Prepared by:



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The purpose of this report is to inventory and evaluate existing drainage features in Cottage Grove Ravine (CGR) Regional Park and connected drainage features that exist outside park boundaries. The study area includes much of the southern end of the park and is bounded by Kimbro Avenue South to the east. All of the drainage features in the study area drain to Ravine Lake, which is located in the southern portion of the park. The Washington Conservation District (WCD) inventoried and evaluated the drainage features in the study area for Washington County Parks in November 2004.

CGR Regional Park is located in south-central Washington County. The park consists of 506 acres and includes areas of heavily wooded hills and ravines, the predominant features within the study area. The quality of Ravine Lake is degraded, and sediment carried from several ravines may be the cause of the degradation.



Typical Wooded Landscape and Trail, Cottage Grove Ravine Regional Park

2.0 Methods

Onsite natural resource data was collected using GPS technology. The main drainage channels, other drainage channels, and related features were field-inventoried.

2.1 Terminology

The following terminology is used in this inventory:

Sediment Delivery Site: A sediment delivery site is any area where concentration of water occurs. This line feature is mapped to illustrate where water flows concentrate, and therefore where sediment may be carried through the system. All sediment delivery sites mapped have only intermittent water flows. Sediment delivery sites are significant in that sediment discharged from these areas into Ravine Lake has potential harmful effects. In this report, sediment delivery sites are described as channels, gullies, and ravines. Channel is a generic term used to describe an area where a concentration of flowing water occurs. Gullies are channels that have been worn into the ground by running water and may have unstable sides and/or bottoms. Ravines are narrow-sided channels that are steeper than gullies and have more potential for erosion. Sediment delivery sites are further described by identifying their Severity Index.

Severity Index: The Severity Index is a mapped feature that uses three categories (labeled slight, moderate, and severe) to describe the amount of erosion occurring within the sediment delivery site. The severity index is a relative measurement limited to an observation of the amount of erosion (soil movement and/or instability) occurring within the bottom and sides of the sediment delivery site. The severity index is relative in that it is a comparison of sediment delivery sites *within* the study area. This index is not intended to quantify the amount of erosion occurring, but rather provides a simple assessment tool. The severity index can be used to prioritize areas that may warrant further site investigation to determine what remedial action is needed.

Sedimentation Sites: These area features are mapped to identify areas where sediment settles due to the deceleration of water within a sediment delivery site. Sedimentation sites include significant in-stream pools and riparian deposition areas. In this report, they may also be referred to as sediment basins. Existing sediment basins may have the potential to eliminate or mitigate sedimentation into Ravine Lake.

Features: Natural and human-made features that could affect erosion or impact water quality are shown as points on the maps. These features are mapped along sediment delivery sites or sedimentation sites in order to provide information on quantities, types, and locations within the study area. Mapped features are identified by type, and are further identified by a description.

- **Type** of feature is divided into categories, including culverts, nick points (the point where flowing water is actively eroding the channel to a new base level; also called overfalls, nick points migrate upstream), other features, paths and roads, bridges, and fences. Features are mapped if they dissect the sediment delivery site or if they are adjacent to or above the primary mapping feature.
- **Description** explains features. Some examples of this include extent or dimensions of human-made features, material, or condition of the feature. See the tables on Maps 5-8.

3.0 Conclusions and Recommendations

3.1 Severity

At the time of this inventory, “severe” erosion is occurring in only one section of Sediment Delivery Area 4. All other sediment delivery sites are classified as either “moderate” or “slight”.

Sediment Delivery Area 1: West of Ravine Lake (See Appendix, Map 1)

- Most of the sediment delivery sites in this sediment delivery area are rated as “slight.” A few gullies classified as “moderate” are scattered throughout the area.
- The gully starting at the edge of the upper parking lot is rated as “moderate”, but could become “severe” if nothing is done to correct the erosion in this area. Currently, a paved channel delivers water away from the parking lot. At the end of the paved channel, the sandy soils have eroded and formed a gully. Sediment from the parking lot and eroded soils from the gully are being deposited in a nearby low area. See Figure 1 and Figure 2.

Sediment Delivery Area 2: East of Ravine Lake (See Appendix, Map 2)

- “Slight” erosion rating throughout most of this sediment delivery area.
- “Slight” erosion rating for the main channel of this sediment delivery area, starting just northwest of the parking loop, is due to bedrock substrate. Future erosion potential in this area is limited.
- Sandy sediment noted in the main bedrock channel, probably due to upstream erosion. This area is not a sedimentation site.

Sediment Delivery Area 3: North of Sediment Delivery Area 2 (See Appendix, Map 3)

- “Slight” erosion rating throughout the majority of this sediment delivery area. Most “moderate” ratings occurred in side channels.
- A small sediment basin is mapped near the eastern end of the southernmost side channel. Two overfalls are also present in this side channel.
- “Moderate” erosion rating areas exist along the main channel and southernmost side channel.
- Sandy sediment noted in the main channel, probably due to upstream erosion.

Sediment Delivery Area 4: North of Sediment Delivery Area 3 (See Appendix, Map 4)

- Most of this sediment delivery area is located outside park boundaries. Most of the channels are rated either “moderate” or “severe”. The erosion continues outside of the study area, to the east of Kimbro Avenue South.
- The only “severe” erosion rating occurred in this area; the ravine is on private land outside the park boundary. The landowner contacted WCD about the problem before this inventory was conducted. The “severe” area is actively and significantly eroding. See Figure 3 for an example of typical bank erosion occurring in this ravine.
- Two sediment basins are located in this sediment delivery area, both on private property outside the park boundary. The channel through this sediment basin is intermittent, and ranges from “slight” to “moderate.” Heavy sediment deposits characterize the smaller sediment basin.

3.2 Recommendations

Although only one of the sediment delivery areas had “severe” erosion at the time of the survey, other sediment delivery sites are areas of concern. The following are recommendations for the study area:

- Sediment Delivery Area 1 contains a majority of sediment delivery sites with a severity index of “slight.” These sediment delivery sites should be monitored periodically to determine if erosion is degrading the existing channels or if sediment is reaching Ravine Lake in this area. Two short, steep ravines with “moderate” ratings enter Ravine Lake from the west and should be monitored regularly to determine if they are worsening or contributing sediment directly to the lake.
- Sediment Delivery Area 2 contains a majority of sediment delivery sites with a severity index of “slight.” These sediment delivery sites should be monitored periodically to determine if erosion is degrading the existing channels. The main channel that enters Ravine Lake near the lower parking loop is exposed bedrock in this area, so there is not much potential for further erosion.

- The gullies rated as “moderate” in Sediment Delivery Area 3 would benefit from regular monitoring to determine if erosion is degrading the existing channels. Sediment is present in the main channel, but it is not clear if all of the sediment is being carried from Sediment Delivery Area 4 or if some of the sediment originates in Sediment Delivery Area 3.

The southernmost side channel in Sediment Delivery Area 3 could be contributing a significant amount of sediment to the main channel, based on the “moderate” rating given to about half of the side channel. A small sediment basin is mapped in this gully, and there are other sites along the gully that would be good locations for erosion control structures, including some areas within park boundaries. Sedimentation sites in this area could be analyzed to determine the location of future sediment treatment facilities or to determine the effectiveness of current sedimentation sites. Landowners along the side channel should be contacted to determine their level of interest in erosion control projects.

- Sediment Delivery Area 4 contains the majority of the “moderate” and all of the “severe” erosion sites. Regular monitoring should be conducted in these areas. Because a large sediment basin exists upstream of some of the worst ravine erosion, it should be possible to stop further erosion from happening with the use of erosion control structures in the basin. Restoration of the eroded ravines in the “severe” and some “moderate” areas, in conjunction with erosion control projects, should be considered a priority. Landowners in the area should be contacted to determine their level of interest in restoration and erosion control projects. One landowner is already in contact with WCD.

3.3 Other Issues of Concern

3.3.1 Mapped Features

Culverts, nick points, other features, and paths and roads are shown on Maps 5-8 along with tables that describe each individual feature. Individual features are numbered by FID (Feature ID).

3.3.1.1 Culverts – Of the 18 culvert points (13 total pipes) located in the study area (See Map 5), three had significant erosion problems. Culvert 6 is undermined, meaning that the soil that supports the culvert is eroding. This culvert should be reset so that damage to the pipe does not take place. Culvert 12 is filling with sediment and should be cleaned. Culvert 13 outlets about two feet above ground level. Outlet protection such as riprap should be considered for this location. The other culverts should be monitored so that minor erosion problems can be corrected before major damage occurs.

3.3.1.2 Overfalls (Nick Points) – Seven overfalls within the study area are shown on Map 6. Overfall #3 occurs in bedrock and is stable. The other overfalls occur in soils and are eroding upstream. Overfalls should be monitored closely to determine how much erosion is taking place over time. Erosion control structures could be installed to stop the progress of the worst overfalls. Most of the overfalls in the study area are located outside park boundaries.

3.3.1.3 Other Features – Other features shown on Map 7 include a marked point where foot traffic is causing erosion, an area of ponding water, and an area where garbage has been

dumped. Some of these features are areas of concern and are mentioned elsewhere in this report.

3.3.1.4 Paths and Roads – The paths and roads shown on Map 8 are either adjacent to or cross sediment delivery sites. Although the crossings inside park boundaries include culverts, some crossings on private property do not have water conveyance structures. Minor erosion is taking place at these locations, where the channel flows over the road/path. Landowners could install culverts to control this erosion.

3.3.2 Exotic Species Control

Buckthorn is present throughout CGR Regional Park. A buckthorn management plan and active implementation is recommended for the park.

Infestations of garlic mustard weed are present in several locations. Removal of these infestations before they become more established is recommended.

3.3.2 Trash

Gullies and depressions have historically been locations for dumping of used farm equipment and materials; this is evident only in Sediment Delivery Area 4, outside of CGR Regional Park. Most trash consisted of metal farm equipment, concrete chunks, empty barrels, glass jars, and other non-biodegradable items. Because the trash is located just upstream of the most “severe” gully erosion and sedimentation in the study area, removal of this material will become an issue during the design and construction of sediment or erosion control projects in the immediate area.

3.3.3 Erosion Caused by Park Use

In some areas, paths leading from the established park trails into sediment delivery sites are evident. Foot traffic on eroding banks can lead to accelerated erosion because plants cannot establish themselves on the paths and the disturbed soil erodes very easily. It is recommended that management techniques be considered to discourage non-approved paths. Any trails considered for construction that are located near or within sediment delivery sites must be designed to prevent erosion.



Figure 1: View from upper parking lot, Sediment Delivery Area 1 (see Map 7, FID 0)



Figure 2: View from eroding ditch, Sediment Delivery Area 1 (See Map 8, FID 4)



Figure 3: Typical severely eroding bank, Sediment Delivery Area 4

4.2 Maps

- Map 1 – Sediment Delivery Area 1
- Map 2 – Sediment Delivery Area 2
- Map 3 – Sediment Delivery Area 3
- Map 4 – Sediment Delivery Area 4
- Map 5 – Culverts
- Map 6 – Nick Points
- Map 7 – Other Features
- Map 8 – Paths and Roads

Sediment Delivery Area 1 - West of Ravine Lake

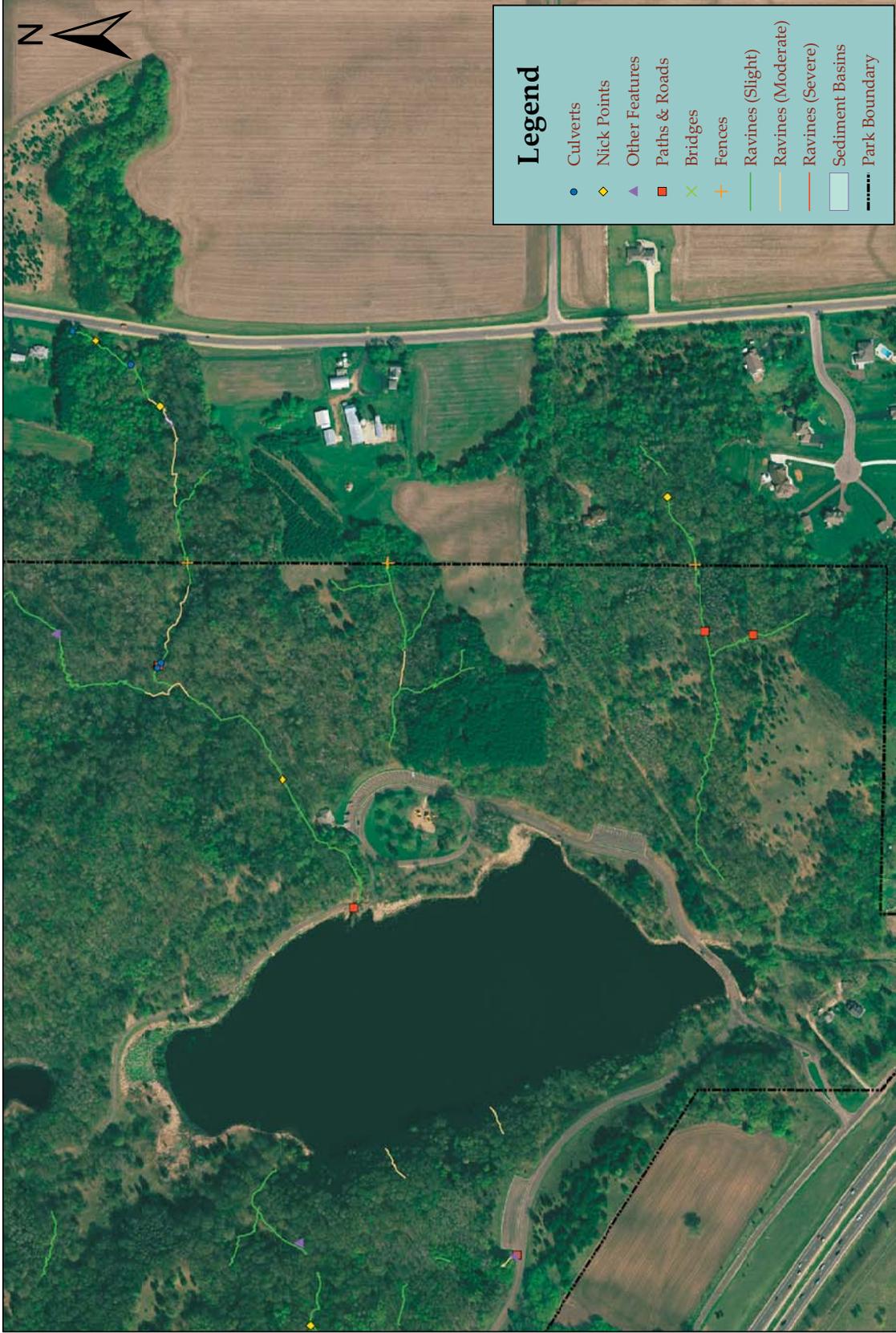
Cottage Grove Ravine Regional Park 2004 NRI



Map 1

Sediment Delivery Area 2 - East of Ravine Lake

Cottage Grove Ravine Regional Park 2004 NRI



Map 2

Prepared By:

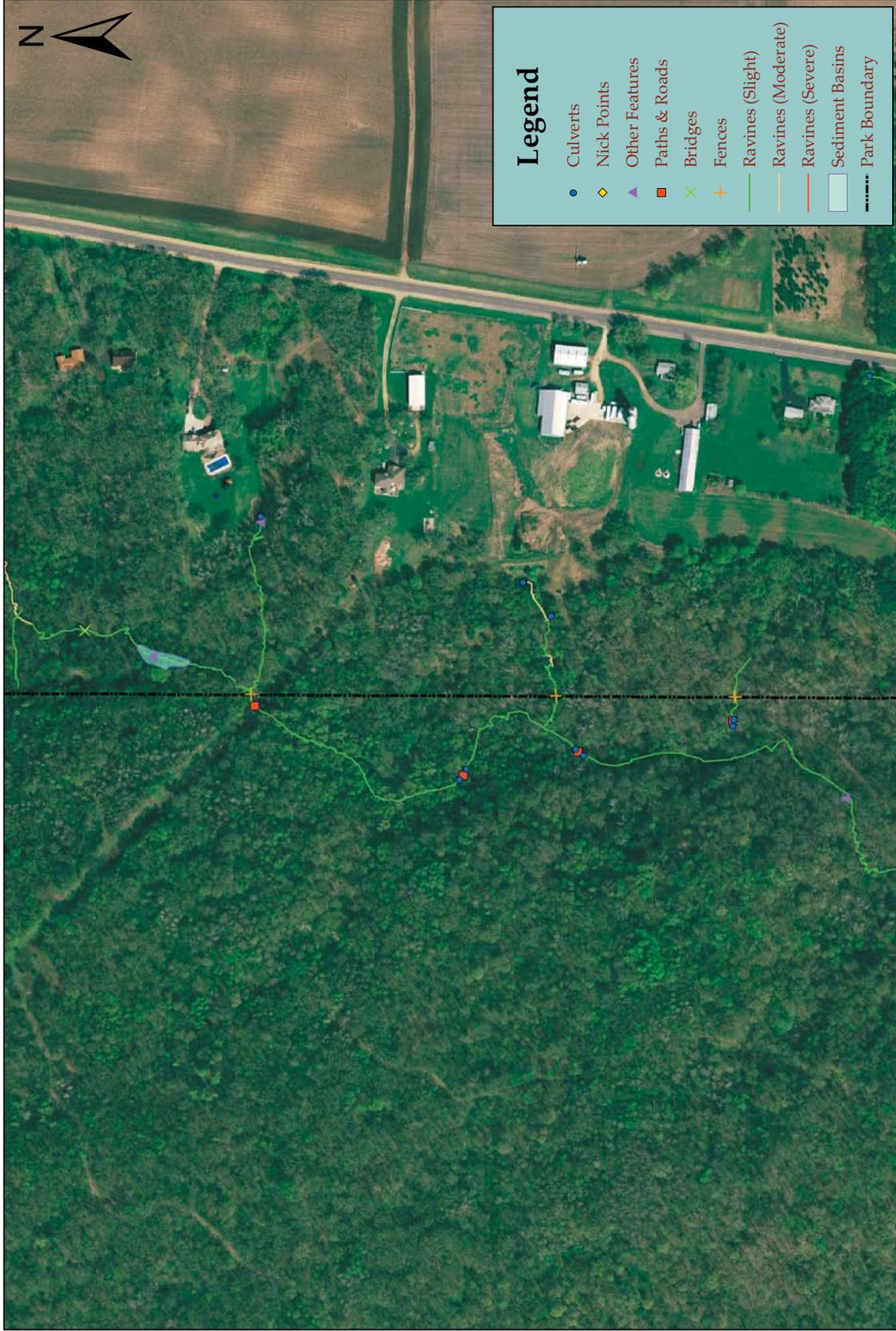


November 2004

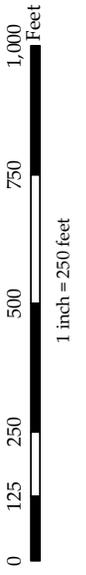
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Revisions: PT

ment Delivery Area 3 - North of Sediment Delivery Area 2

Cottage Grove Ravine Regional Park 2004 NRI



Map 3



Prepared By:



November 2004

Drawn: PT
Revisions: PT

Sediment Delivery Area 4 - North of Sediment Delivery Area 3

Cottage Grove Ravine Regional Park 2004 NRI



Map 4

Prepared By:



November 2004

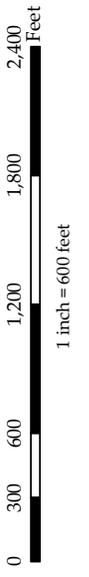
Drawn: PT
Revisions: PT

Study Area Culvert Locations And Details

Cottage Grove Ravine Regional Park 2004 NRI



Map 5



Prepared By:



November 2004

Drawn: PT
Revisions: PT



Study Area Nick Point Locations And Details

Cottage Grove Ravine Regional Park 2004 NRI



Prepared By:



November 2004

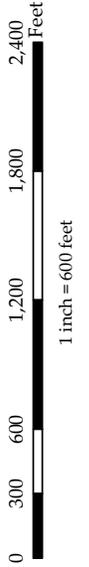
Drawn: PT
Revisions: PT

Study Area Unclassified Feature Locations And Details

Cottage Grove Ravine Regional Park 2004 NRI



Map 7



Prepared By:

 WASHINGTON CONSERVATION DISTRICT
 November 2004
 Drawn:
 Revisions:

Study Area Path/Road Crossing Locations And Details

Cottage Grove Ravine Regional Park 2004 NRI



Map 8

Appendix C: South Washington Watershed District Ravine Park Stabilization and Outlet Concept Design Report



RAVINE PARK STABILIZATION AND OUTLET CONCEPT DESIGN

Addendum to Cottage Grove Ravine Regional
Park Erosion Analysis (March 31, 2014)

RAVINE PARK STABILIZATION AND OUTLET CONCEPT DESIGN

Addendum to Cottage Grove Ravine Park
Erosion Analysis (March 31, 2014)

February 4, 2016
Amended August 26, 2016



Houston Engineering, Inc.
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Maple Grove, MN 55369
Phone # 763.493.4522

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision, and that I am a Registered Professional Engineer under the laws of the State of Minnesota.

A handwritten signature in black ink that reads "Greg Bowles".

Greg Bowles, PE, Project Manager
MN: 41929

8-26-2016

Date

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AMENDMENTS

The following revisions were made subsequent to February 4th and are included in the August 26, 2016 amended report: the clearing layer in shown in the Appendix A figures was revised to display more neatly; a page index and the tree inventory were added to the Appendix A Figures.

1 INTRODUCTION

The purpose of this project is to develop a concept design to replace the Ravine Lake outlet structure, improve existing erosion conditions, and provide future channel stability in East Ravine, from Highway 61 upstream to the Ravine Regional Park (park) boundary (approximately 85th Street South). This project is Phase III and IV of the Overflow Project.

The Overflow Project is comprised of five phases. A figure of these phases can be found within the report titled, "Cottage Grove Ravine Regional Park Erosion Analysis," Dated March 31, 2014. (2014 Study) [1]. Phase I is now complete; this phase consisted of connecting the CDSF to the Cottage Grove stormwater network and constructing a 72" pipe from the CDSF to a second storage area, called CP4-3. Phases II is substantially complete and consisted of stabilizing East Ravine downstream of Highway 61 to the outlet at the Mississippi River. Phases III through V consist of designing the Ravine Lake outlet structure (Phase III); providing stabilization to the ravine upstream of Ravine Lake (Phase IV); and constructing the last pipe segment of the Overflow Project from storage area CD 4-3 to the north boundary of Cottage Grove Ravine Regional Park (Phase V). **Figure 1** shows the limits of the analysis within the project area and the location of the site.

This report focuses on phases III and IV of the Overflow Project and is intended to serve as an update and follow-up to the 2014 Study.

Analysis has shown that the existing Ravine Lake outlet structure is undersized for even the minimum design criteria (2-year event) [2]. The restricted outlet capacity causes a large bounce to Ravine Lake in water elevation during larger storm events; this results in frequent flooding of the park entrance road as well as flooding of other areas along the Ravine Lake shoreline. Release of water through the proposed Ravine Lake outlet structure will also need to account for downstream impacts associated with flooding upstream of the Highway 61 stream crossing.

The channel stability within the ravine through the Cottage Grove Ravine Regional Park was identified as a potential impact of the CDSF Overflow Project within the report titled *Environmental Assessment for County Road 19 Corridor* and dated January 18, 2002 [3]. The ravine in its existing condition is highly susceptible to erosion based on soil types and area topography. Nearby ravines with similar slopes, hydrologic properties, and soil conditions have resulted in large sediment transports once a knickpoint is initialized during a large runoff event. The need for this project is driven by erosion potential under existing conditions and watershed development, not the Overflow Project in singularity.

The project area is the open channel of the East Ravine and Ravine Lake, from the Regional Park boundary (approximately 85th Street South) to Highway 61. The length of the project is approximately 10,400 feet. Land along the project is owned by the Washington County Parks.

This preliminary design document will be used to work with stakeholders, document previous stakeholder input, prepare preliminary opinion of probable construction costs, and move into final design. Final design of the project, including the development of construction plans, specifications, and construction management will be completed following this report.

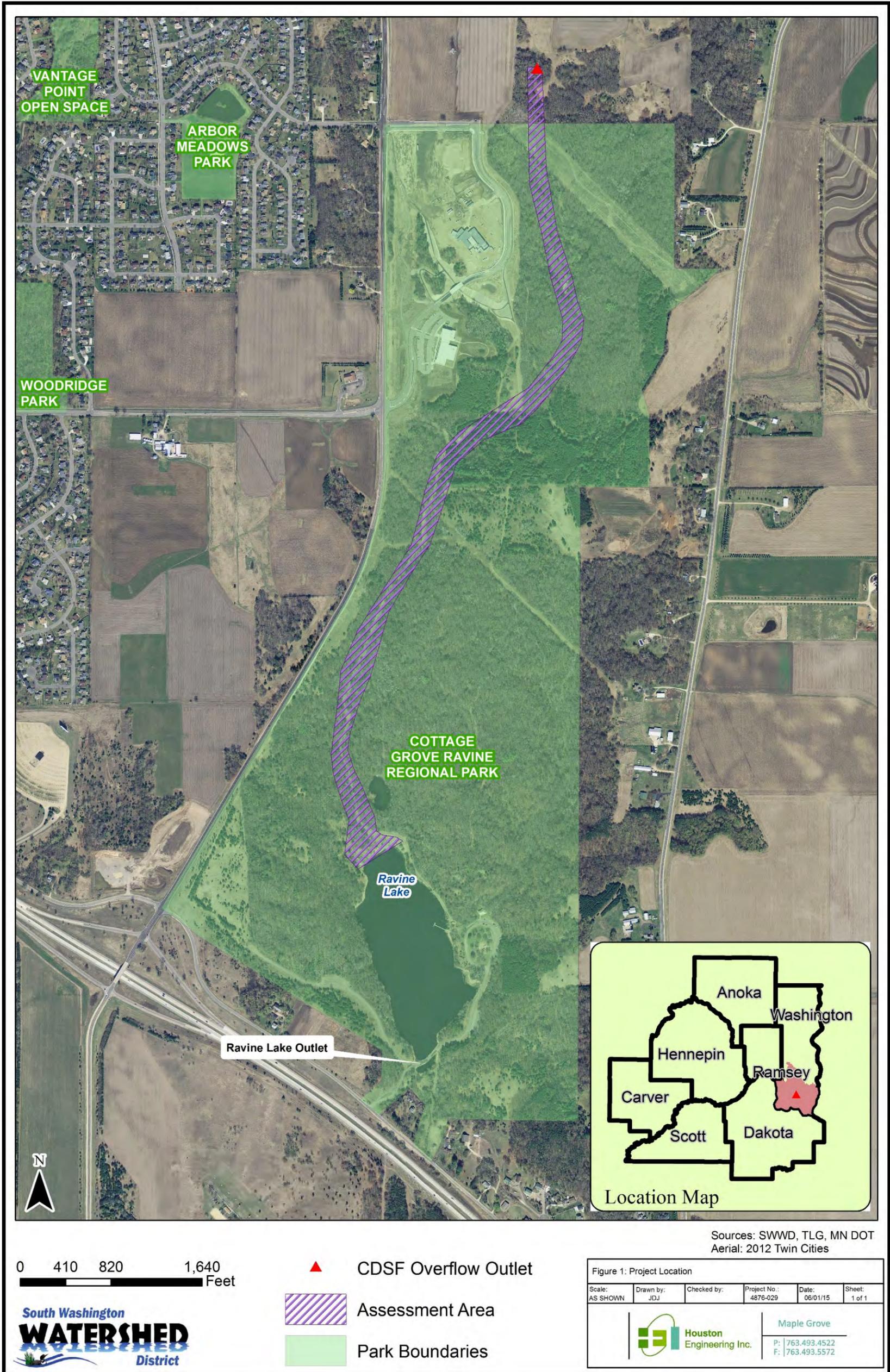


Figure 1: Project Area

2 PROJECT GOALS AND DESIGN CONSIDERATIONS

Project goals are established to ensure that all the stakeholders involved understand and agree with the desired outcome of the project. The primary goal of this project is to develop and define a final design for 1) the stabilization of East Ravine (from the regional park boundary (approximately 85th Street South) to Highway 61) by correcting existing erosion problems and providing geomorphic channel stability for the future hydrologic condition, all while maintaining natural aesthetics within the park 2) a Ravine Lake outlet structure that sustainably matches the natural hydrologic processes during various storm events, with consideration of future hydrologic conditions.

Technical objectives are established as actions needed to obtain the project goals. The specific technical objectives for the two part project goal are as follows:

1. Stabilized Channel
 - 1) Establishing channel characteristics such that the shear stress and velocities are reduced or alternatively modifying the substrate or vegetation such that the permissible shear stress and velocities are increased to minimize potential of erosion.
 - 2) Establishing a stable open channel system with a natural appearing aesthetic, using geomorphologic principals as guidance.
 - 3) Establishing vegetation approaching a natural and sustainable ecological community. Vegetation management will function as a first step in concurrence with the long-term stewardship plans of other stakeholders.
 - 4) Minimizing disturbance and impact to surrounding areas.
 - 5) Designing ravine stabilization specifications consistent with previous projects within [1] and downstream of Ravine Park. [4]
2. Replaced Lake Outlet Structure
 - 1) Designing an outlet structure for Ravine Lake that minimizes surrounding impacts including: 1) bounce of Ravine Lake during storm events; 2) downstream flooding concerns; 3) and will pass the CDSF baseflow discharge of 145 cfs.

The preliminary design of the Ravine Park Stabilization Project will be incorporated into the Ravine Park Master Plan, which is being completed by SRF Consulting through the Washington County Parks Department. As a part of the parks future planning, many existing paved and grassed ski trails will be relocated or raised. Throughout the preliminary design process, several meetings have taken place with Washington County Parks, SRF Consulting, SWWD, and Houston Engineering representatives. These meetings were used to coordinate trail master plan concept design and the Ravine Park stabilization project features.

Impacts to existing trees are a significant concern to the land owner, the Washington County Parks. These concerns are related to both tree impacts during construction and during future flooding. Therefore, significant effort was made to reduce impacts to trees by:

- Utilizing the results of a tree survey to adjust the channel and check dam locations;
- Maintaining current location of the park trail where feasible; and
- Utilizing future trail location as identified within master plan concept design for access to proposed features.

The existing trail is located along a corridor that was previously cleared of trees during installation of a forcemain pipe that was installed by Minnesota Mining and Manufacturing (3M.) It is necessary that this pipe maintain

adequate cover and not be impacted by construction activities. The location of project stabilization features was designed such that no excavation would take place above the 3M pipe.

Project design criteria are developed to set quantitative metrics for achieving the technical objectives. These design criteria form the basis for developing the alternatives for analysis and sizing project features, all while considering potential issues within external parts of the system.

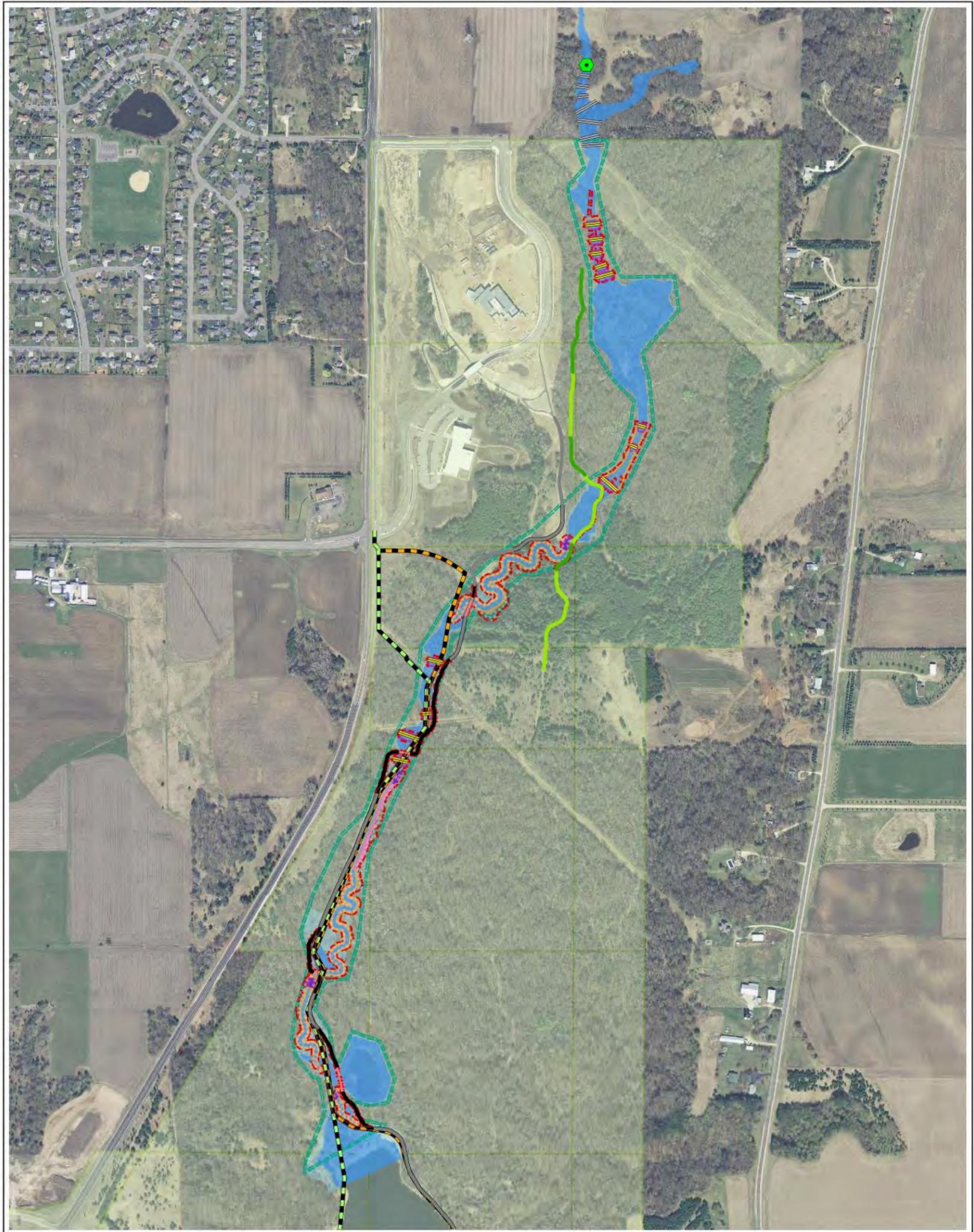
1. Stabilized Channel
 - 1) The stabilization design will include modifications to channel characteristics (dimensions, pattern, profile, substrate, or vegetation) such that the modeled (generalized) channel shear stress and velocities are typically within the permissible range as noted in tables from Fisch Engineering [5] during the 145 cfs baseflow event.
 - 2) The location of specific design features, such as a riffle or revetment on a bank, may be designed to withstand shear stresses and velocities for events greater than or less than the 145 cfs baseflow, such as the 10-yr, 24-hr event. This will be dependent on typical, reasonable design standards for the chosen approach.
 - 3) The design will incorporate principals of natural stream stability as applicable within the primary stabilization design goal.
2. Replaced Lake Outlet Structure
 - 1) The design will incorporate the flows of 145 cfs for the CDSF baseflow discharge and the 2-year, 10-year and 100-year, 24 hour storm events.

3 PRELIMINARY DESIGN

The preliminary placement of features is shown in **Figure 2**. The placement of these features is available in more detail in **Appendix A**. The following sections will discuss the placement, sizing, and other design dimensions that are part of the preliminary design. Several crossings, raised trails, and moved trails are included in the design. The modeling, erosion analysis, and floodplain mapping completed during the 2014 study was updated based on the proposed design; these updates are shown in **Appendix C**, **Appendix D**, **Appendix E**, and **Appendix F**.

The preliminary design includes:

- 12 check dams with a maximum height of 3 feet and 3:1 side slopes on both the upstream and downstream sides
- 4300 linear feet of excavated channel (generally 8 feet bottom width with 3:1 side slopes and an approximately 2.8 foot depth).
- 4 boulder riffle drops
- Raised trails and channel crossings



Legend

Outlet Location	Berm
Paved Trail (Existing Location - Reconstructed)	Boulder Riffle Drop
Trail Removal	Boulder Revetment
Raised Trail	Temporary Erosion Control Blanket
Paved Trail (Existing Location)	Reinforced Slopes (TRM or Rock)
Paved Trail (New Location)	Approximate Location of Gas Line
Unpaved Trail (Existing Location)	Permanent Erosion Control Blanket
Unpaved Trail (New Location)	Clearing
Check Dams (to be installed during later phase)	Vegetation Management Extent
Check Dams	Proposed 145 cfs Flood Inundation Area
Utility Lines (Abandoned)	Proposed 100-yr Flood Inundation Area
Utility Lines	Washington County Parcels
Existing Channel Centerline	
Excavation Extents	



South Washington Watershed District

0 145290 580 870 1,160 Feet

South Washington Watershed District
Ravine Park Stabilization
Preliminary Design Feature Placement

Scale: AS SHOWN	Drawn by: LDO	Checked by:	Project No.: 4876-029	Date: 1/19/2016	Sheet:
			Maple Grove		
			P: 762.493.4522 F: 762.493.2572		

Figure 2: Preliminary Placement of Features

3.1 CHANNEL STABILIZATION

The following sections describe preliminary design features utilized for channel design.

3.1.1 CONSTRUCTED LINED CHANNEL

Throughout most of the project area, there is no existing channel distinguishable by sight. There are no distinguishable banks or floodplain. As a result, under existing conditions a wide area will experience shallow flooding during a flood event. This channel geometry is not consistent with studied geomorphically stable channels with similar discharges. Below the existing vegetation, the soil types are generally sandy with little cohesion. If during a significant runoff event the existing vegetation becomes breached, a defined channel will begin to form until it reaches a typical stable channel dimension. This could result in a significant amount of erosion and sand deposits downstream.

Nearby ravines have already experienced this erosive phenomenon. **Figure 3** below shows a channel established during a large rain event east of Ravine Lake. The existing conditions 2-yr discharge (modeled by XP-SWMM) in this ravine is approximately 71 cfs. At the location measured, the channel had an approximately 6-7 foot bottom width, 18-20 foot top width, and 3-4 depth.



Figure 3: Nearby Ravine Naturally Established Channel

The CDSF baseflow discharge of 145 cfs was used as the design discharge for channel design throughout the project extents. This discharge was used to calculate channel dimensions and channel pattern characteristics. The calculated channel dimensions are an 8 ft bottom width with 3:1 side slopes and a 2.8 ft depth. This results in a top width of 25.0 feet. To contain the flow within the channel and limit

velocities, with the calculated channel dimensions, the goal proposed condition channel slope is approximately 0.008 ft/ft with a radius of curvature ranging from 33 to 99 feet for meanders. In areas where steeper or less steep channel slope was needed to transition the channel or better fit existing topography, the channel dimensions were revised to contain the baseflow within the channel. This resulted in varying channel bottom widths that range from 8 to 16 feet. The proposed 145 cfs channel design is shown in **Figure 4**.

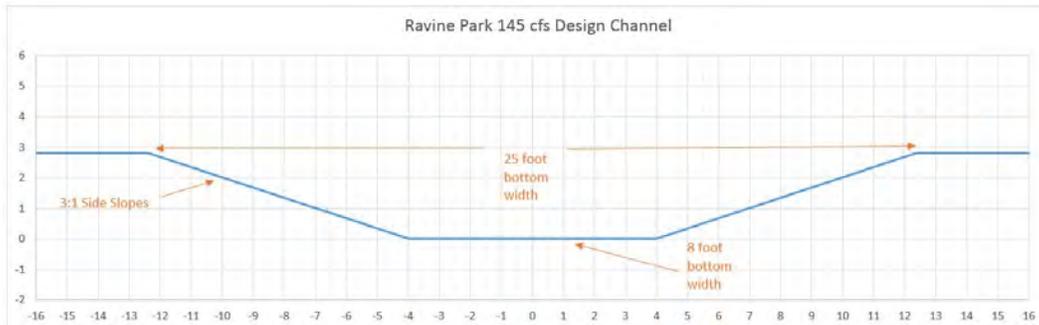


Figure 4: Ravine Park Design Channel

During a baseflow event of 145 cfs, the discharge will be entirely contained within the channel, which will reduce the number of trees flooded compared to the existing condition. During larger events, the discharge will leave the banks and utilize the floodplain, thus reducing inundation for larger events.

To reduce the velocities within the baseflow channel, the channel slope must be reduced. The preliminary plan reduces the channel slope using two methods: boulder riffle drops and remeandering of the channel. The boulder riffle drops isolate drops in grade to an armored area, allowing more gentle slopes in and out of the boulder drops. The remeandering of the channel increases the channel length, thus reducing the channel slopes. In areas where channel velocities are still above the thresholds of natural vegetation, additional channel stabilization will be utilized (permanent erosion control blanket). In areas where steeper side slopes are needed to limit excavation into the valley slopes a boulder revetment will be utilized to stabilize the banks.

The 4 proposed boulder riffle drops will be individually designed based on local upstream and downstream slopes and spaced during final design. The NRCS Design Procedures for Rock-Lined Chute [6] will be utilized for chute dimensions and rock sizes. An angular stone material will be used, set to mimic local bedrock structure, to maintain natural aesthetic. Round stone generally results in a 40% larger D_{50} rock size compared to angular rock. The boulders will be arranged in an arched shape to direct discharges towards the center of the channel. The maximum drop used will be 3.0 feet, however some drops may be smaller. The riffle slopes will be approximately 12:1. It is anticipated that larger boulders (36-inches) will be used to create the arches and drops with smaller boulders (18-inches) in-between.

Generally during channel pattern design it is preferable to find a template along the same channel or a channel with similar hydrology, dimensions, and profile; however a template channel was not available for the Ravine. The Stream Restoration Design National Engineering Handbook [7] was used to calculate the channel meander length, maximum angle, meander wavelength range, and radius of curvature range. These values, combined with the existing topography and minimizing impacts to large trees, were used to

determine a channel alignment through the remainder areas. **Figure 5** shows a rendering of what the constructed channel may look like along the trail corridor.

3.1.2 CHECK DAMS

Another planned stabilization method is check dams across the channel. The check dam is a grade stabilization structure that reduces the effective grade upstream and dissipates the excess energy over the structure. The check dams will be approximately 3 feet high and consist of appropriately sized rock or turf reinforcement mat at approximately a 3:1 slope on the upstream and downstream faces spanning the channel. The final selected height will depend on the specific location. **Figure 7** shows a rendering of what the rock riffle may look like within the park.

The check dams are most applicable where grades are moderate and the channel is narrow, as these characteristics reduce the number and length of check dams. Check dams are proposed to be utilized upstream of the pine plantation, where the floodplain is narrow and slopes are generally 0.013–0.017ft/ft. This area is upstream of any existing or proposed paved trail, so incorporation with the trail is not a concern. Check dams are also proposed to be utilized downstream of the pine plantation in areas where channel excavation is not feasible. In these areas, either only small segments of the stream were calculated to have high erosion potential or existing utilities made excavation of a channel not feasible.

3.1.3 LINED EXISTING CHANNEL

Lining the existing channel with permanent erosion control blankets or turf reinforcement matting (TRM) is also proposed to stabilize the ravine. This measure is utilized in areas where the channel is already narrow, so channel excavation is not practical, and steep slopes make a series of check dams infeasible. This practice can be placed around specific large existing trees, if desired. Clearing of brush and grubbing will need to take place to facilitate the placement of erosion control. The lining will be buried with top soil and vegetated to maintain a natural aesthetic. **Figure 6** shows a rendering of what the lined existing channel may look like within the project.

3.1.4 VEGETATION MANAGEMENT

Throughout the entire project area vegetation management will be utilized to improve the channel stability and area ecology. Vegetation management will be completed to thin out the tree canopy. This will allow sunlight to reach the forest floor and native habitat to propagate. This vegetation will provide the necessary erosion protection. This stabilization alternative would require removal of the buckthorn, box elder, other thick underbrush, removal of deadfall, and removal of mostly live nonnative trees to open the canopy. The area would then be seeded with native grasses. **Figure 8** shows a rendering of what this may look like along the trail corridor.

3.1.5 PARK TRAILS AND CROSSINGS

Generally the trails are planned to be moved outside the baseflow floodplain, however in some areas the trails will cross the floodplain or proposed channel. In those areas, a raised trail will be constructed similar to a boardwalk or a pedestrian bridge. **Figure 9** below shows an example of what this raised boardwalk may look like. The existing trails are anticipated to be used for equipment access to the project features and during construction activities.

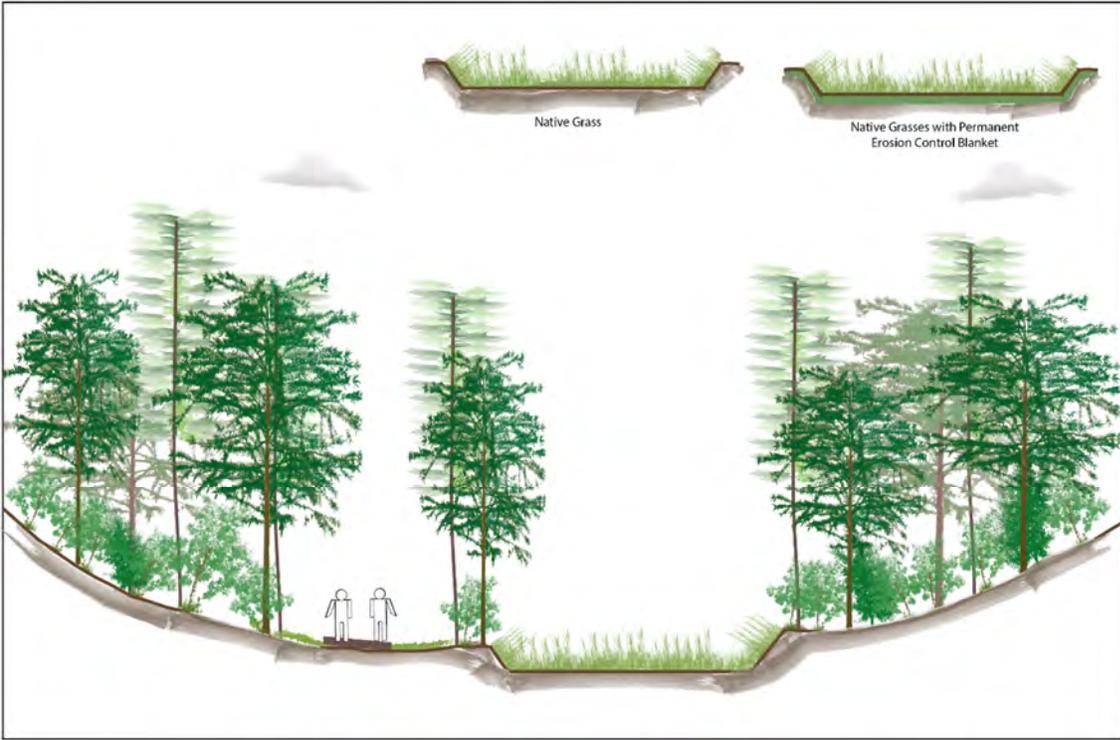


Figure 5: Rendering Showing the Use Lined Constructed Channel.



Figure 6: Rendering Showing the Use Lined Existing Channel.

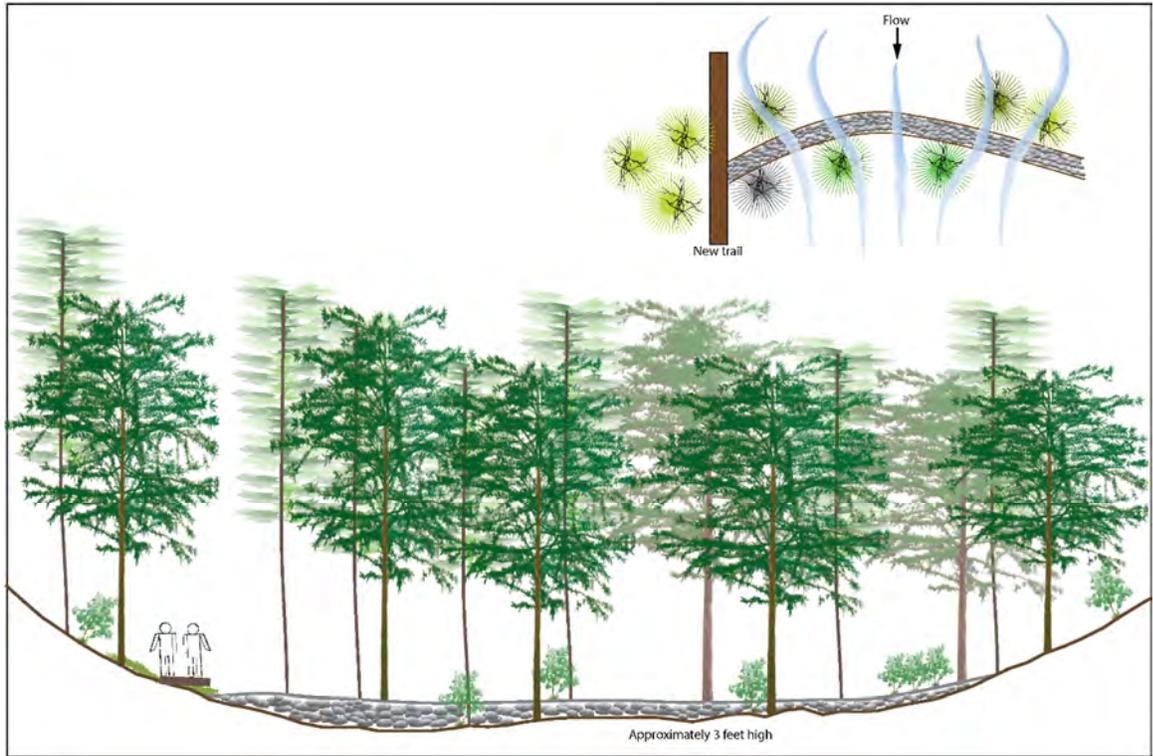


Figure 7: Rendering Showing the Use of Check Dam and Trail Relocation.



Figure 8: Rendering Showing the Use of Vegetation Management.



Figure 9: Proposed Boardwalk Crossing Example

3.2 OUTLET STRUCTURE

3.2.1 EXISTING CONDITION

The existing Ravine Lake outlet configuration is shown in **Figure 10**. Currently, low flow discharge leaving the lake passes through a series of three culverts south of the lake. The first, most upstream, culvert is located under the park entrance road; the second and third culverts are located under former service roads to the south of the entrance road. All three of these culverts are 18-inch. The middle culvert appears to be the low flow hydraulic control for the lake. All three culverts service low flow conditions; during high flow conditions, water overtops both the park entrance road and the former service roads. Information for these three culverts is given in **Table 1**. An additional important downstream hydraulic structure is the culvert passing under East Point Douglas Road and MN Highway 61. This structure is summarized in **Table 2**.

3.2.2 EXISTING HYDROLOGY AND HYDRAULICS

Preliminary analysis of the hydrology and hydraulics associated with Ravine Lake outlet structure has been performed by Houston Engineering Inc., however, the final design of the outlet structure will be designed by others, in coordination with Washington County CSAH 19 reconstruction. The XP-SWMM model discussed in detail in the 2014 Study [1] was utilized. Several updates were made to the existing conditions model including, incorporating Atlas 14 rainfall depths, updating stage-area curves for Ravine Lake and the outlet area, and updating outlet invert elevations based on survey and LiDAR data. **Table 3** and **Table 4** show the peak existing conditions discharges and water surface elevations produced by the XP-SWMM model.

3.2.3 KEY DESIGN ELEMENTS

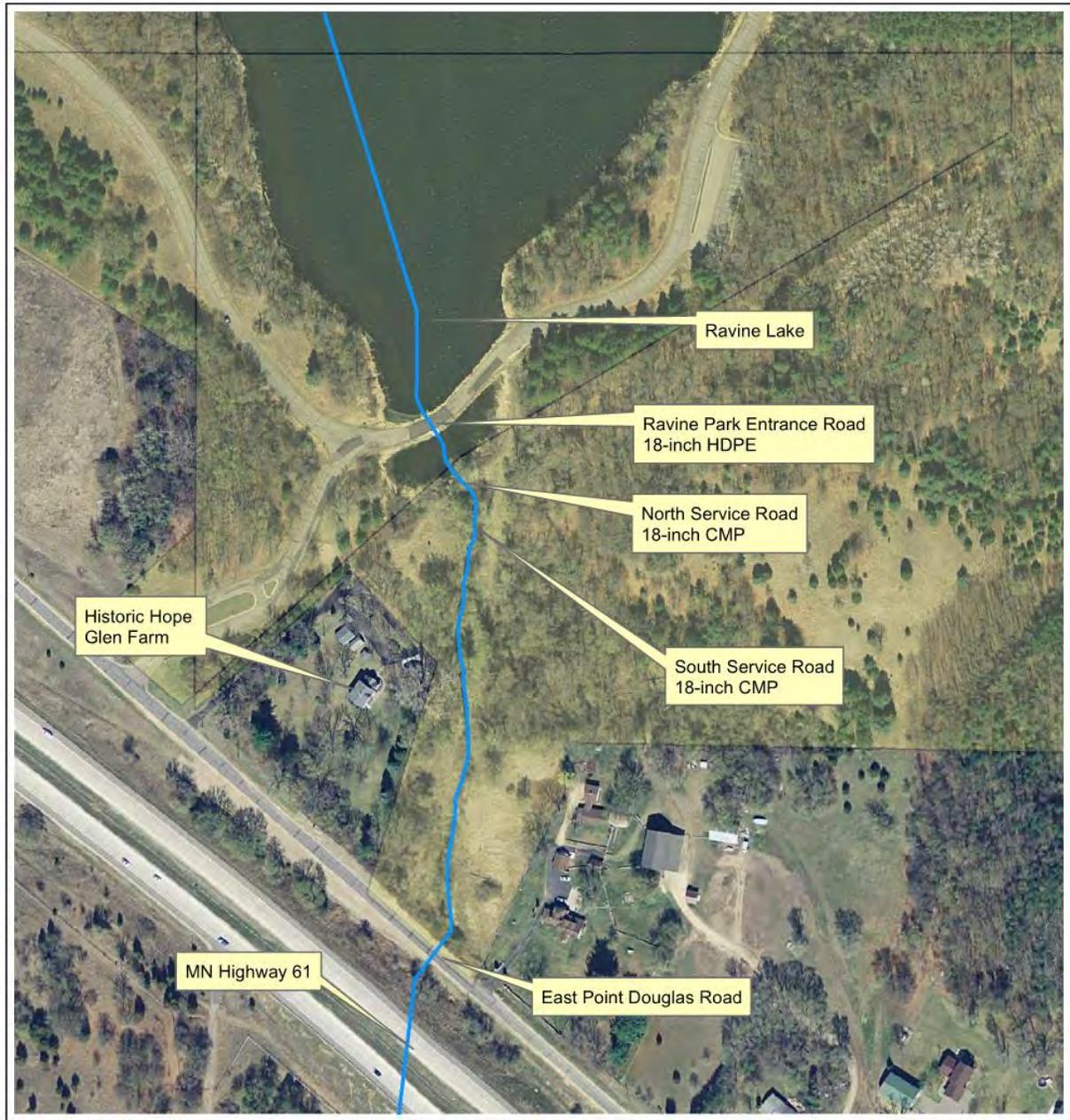
In order to perform design modeling for future outlet structure alternatives, several design criteria need to be evaluated and finalized. Preliminary analysis of the outlet and development of design criteria were prepared in a memorandum to the CSAH 19 and Cottage Grove Ravine Park project team (HEI, 2015). (**Appendix B**)

During sustained high discharges leaving Ravine Lake, the crossings under East Point Douglas Road and MN Highway 61 will cause water to back up. This puts the buildings around this area at risk of flood inundation (including the Historic Hope Glen Farm, listed on the Historic Register). Inundation of buildings begins at an elevation of approximately 772.0 (NAVD 88), based on building location as compared to LiDAR data. Modeling indicates that potential building inundation between Ravine Lake and Highway 61 is currently caused by a combination of outflows from Ravine Lake and local runoff. This local runoff and branch inflow enters the system between the Ravine Lake outlet and Highway 61. The areas that contribute these additional inflows are outside of the proposed project area and are therefore not manageable through the design of the Ravine Lake outlet. Modeling indicates that these branch and local inflows alone (without Ravine Lake outlet inflow) are significant enough to cause flooding upstream of Highway 61 during a 100-year, 24-hour event. Therefore, reducing the peak outflow from Ravine Lake alone cannot be used as a means to eliminate flooding between Ravine Lake and Highway 61 during a 100-year, 24-hour event. Reducing the Ravine Lake peak outflow can only help to reduce the severity of flooding at the storage location; additional volume or peak runoff measures could be taken within the branch inflow areas (along with the Ravine Lake outlet design) to eliminate the 100-year, 24-hour flooding upstream of Highway 61 (**Appendix B**).

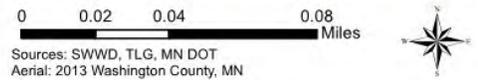
The proposed outlet design will not increase flooding beyond existing conditions. This design criteria assumes that modification of the hydraulic structure under East Point Douglas Road and MN Highway 61 is not an option.

Additionally, if it is desired that the flood risk be reduced beyond the existing condition, the acceptable flooding frequency should be determined.

If a reduction in the severity of the potential flooding during large storm events is desired between Ravine Lake and Highway 61, the peak outflow from Ravine Lake will need to be buffered. To do this, the lake elevation will need to be allowed to bounce during large storm events. Currently, this bounce is mitigated by the overtopping of the park entrance road. The combination of the elevation of the newly constructed entrance road and the hydraulic structure underneath it will determine the overall bounce in Ravine Lake. The existing East Point Douglas road overtopping elevation is 775.00 (NAVD 88). The ordinary high water level (OHWL) of Ravine Lake is 770.88. Prior to final design, the acceptable bounce in Ravine Lake and frequency must be determined.



Legend	
	Existing Channel Centerline
	Washington County Parcels



South Washington Watershed District Ravine Park Stabilization Ravine Lake Outlet Location				
Scale: AS SHOWN	Drawn by: LDO	Checked by:	Project No.: 4876-027	Date: 12/30/2015
Houston Engineering Inc.			Maple Grove	
			P: 763.493.4522 F: 763.493.5572	
			Sheet: 1	

Figure 10: Ravine Park Outlet Location

Table 1: Existing Ravine Lake Outlet Information

Existing Outlet Hydraulic Data	
Roadway Name	Ravine Park Entrance Road
Watercourse Name	East Ravine
Crossing Description	18-inch HDPE ¹
Waterway Area (square feet)	1.77
Flowline Elevation (NAVD88)	769.72 ²
Roadway Overtopping Elevation (NAVD88)	772.80 ²
Approximate Roadway Overtopping Frequency	>50%
Roadway Name	North Service Road
Watercourse Name	East Ravine
Crossing Description	18-inch CMP
Waterway Area (square feet)	1.77
Flowline Elevation (NAVD88)	770.50 ²
Roadway Overtopping Elevation (NAVD88)	773.50 ²
Approximate Roadway Overtopping Frequency	>50%
Roadway Name	South Service Road
Watercourse Name	East Ravine
Crossing Description	18-inch CMP
Waterway Area (square feet)	1.77
Flowline Elevation (NAVD88)	770.33 ²
Roadway Overtopping Elevation (NAVD88)	772.40 ²
Approximate Roadway Overtopping Frequency	>50%

¹ Thought to be 24-inch pipe, survey indicates 18" pipe.

² Based on survey data from Washington County, 2015.

Table 2: Existing East Point Douglas Road & Highway 61 Structure Information

Existing Downstream Structure Information	
Approximate Distance Downstream (ft)	860
Crossing Description	72-inch by 72-inch box culvert reduced to a 72-inch circular outlet ¹
Waterway Area (square feet)	36 (28.26 outlet)
Flowline Elevation (NAVD88)	765.39 ¹
Roadway Overtopping Elevation (NAVD88)	775.00 ¹ (East Point Douglas Road)
Approximate Roadway Overtopping Frequency	2% - 4% ²

¹ Based on survey data from Washington County, 2015.

² Estimation. Modeling indicates roadway overtopping during the 100-year 24-hour event (1%) but does not indicate roadway overtopping during the 10-year, 24-hour event (10%).

Table 3: Existing Peak Flows

Location Event	Existing Peak Flows (cfs)		
	Ravine Lake Inflow	Ravine Lake Outflow	Under East Point Douglas Road and Highway 61
2-year, 24-hour (2.8 inches)	163.7	38.2 ¹	86.6
10-year, 24-hour (4.2 inches)	380.2	208.9 ¹	244.2
100-year, 24-hour (7.4 inches)	1090.6	442.2 ¹	485.6

¹ Based on park entrance roadway overtopping flow only.

Table 4: Existing Peak Water Surface Elevations

Location Event	Existing Peak Water Surface Elevations (NAVD88)	
	Ravine Lake (OHWL = 770.88)	Upstream East Point Douglas Road and Highway 61
2-year, 24-hour (2.8 inches)	773.63	767.89
10-year, 24-hour (4.2 inches)	774.00	770.67
100-year, 24-hour (7.4 inches)	777.84	777.77

The existing Ravine Park entrance road experiences overtopping during small rainfall events. The roadway effectively acts as a weir and is responsible for the majority of the peak outflow from the lake during storm events. Therefore, raising the entrance roadway elevation is a significant factor in controlling the peak outflow from Ravine Lake. This allows the structure under the roadway to perform more of the hydraulic control during lower flows. Raising the roadway, however, both increases the cost to build the roadway and increases the magnitude of bounce in Ravine Lake during storm events. Prior to final design determination, the overtopping design frequency of the road (with consideration of acceptable cost to build up the roadway) and evaluation of the acceptability of the associated Ravine Lake bounce must be completed.

3.2.4 OUTLET STRUCTURE SUMMARY

The main concerns of the SWWD regarding the Ravine Lake outlet design are that it will minimize surrounding impacts including: 1) bounce of Ravine Lake; 2) downstream flooding concerns; 3) and will pass the CDSF baseflow discharge of 145 cfs.

4 TREE IMPACTS

Impacts to trees from the CDSF Overflow Project were identified as a potential problem in the report titled *Environmental Assessment County Road 19 Corridor* [3]. There were concerns that existing Oak, Cherry, and Aspen trees would be subject to mortality due to flooding if the project was in place. The 2014 Study [1] discussed tree impacts from the CDSF Overflow Project in greater detail.

Many of the proposed features lie outside the 2014 tree survey, therefore additional survey was needed to better define project impacts. The following section provides the updated methodology that was used to determine project impacts to existing trees.

4.1 TREE INVENTORY

A tree inventory within Ravine Park was conducted in the fall of 2015 for the area shown in **Figure 11**. The extents of the tree inventory area were two feet in elevation above the 100-year, 24 hour storm event. For the inventory, each tree (3 inches DBH and greater) within the Inventory Area was classified (species), measured (diameter at breast height, DBH) and individually numbered using 1.25" aluminum tree tags. Invasive species (buckthorn) and deadfall were not inventoried. Trees were tagged generally on the south side of the trunk, however for visibility, the tags were angled towards the trail in the areas where the trail bisected the Inventory Area. A total of 4,093 trees were described for the inventory. In addition to the full inventory, the pine plantation area in the central portion of the park was further investigated. The plantation includes a mix of spruce and white pine, and the tree survey area contains approximately 140 spruce and 100 white pine species. The following **Table 5** summarizes the inventory results. The table also shows the trees removed due to the project and separates the trees removed only due to trail construction, compared to both trail construction and stabilization feature installation. If more trails are reconstructed in their existing locations, the number of removed trees will be reduced.

Trees were located using survey-grade equipment. **Figure 11** (tree species) describes the results of the tree inventory. The forest is dominated by elm and oak species throughout, and poplar becomes increasingly dominant on the southern end of the corridor towards the lake.

The inventory completed in 2015 was compared to the inventory that was completed in 2003 and it was found that species composition remains the same. Invasive buckthorn (*Rhamnus spp.*) is abundant throughout the forest community; plants observed in Ravine Park are some of the largest observed by the inventory crew, with many individual buckthorn plants reaching upwards of 8-10 inches DBH.

4.2 TREE IMPACTS

A number of trees will be removed for access and installation of the proposed features. Following the tree survey, the proposed features (such as trails and channels) were revised to minimize impacts. The proposed clearing extent is shown in **Figure 2** and **Appendix A. Table 5** below shows the proposed impact to surveyed trees. Some of the trees are proposed to be removed for access. The contractor may opt to work around some large trees rather than remove them.

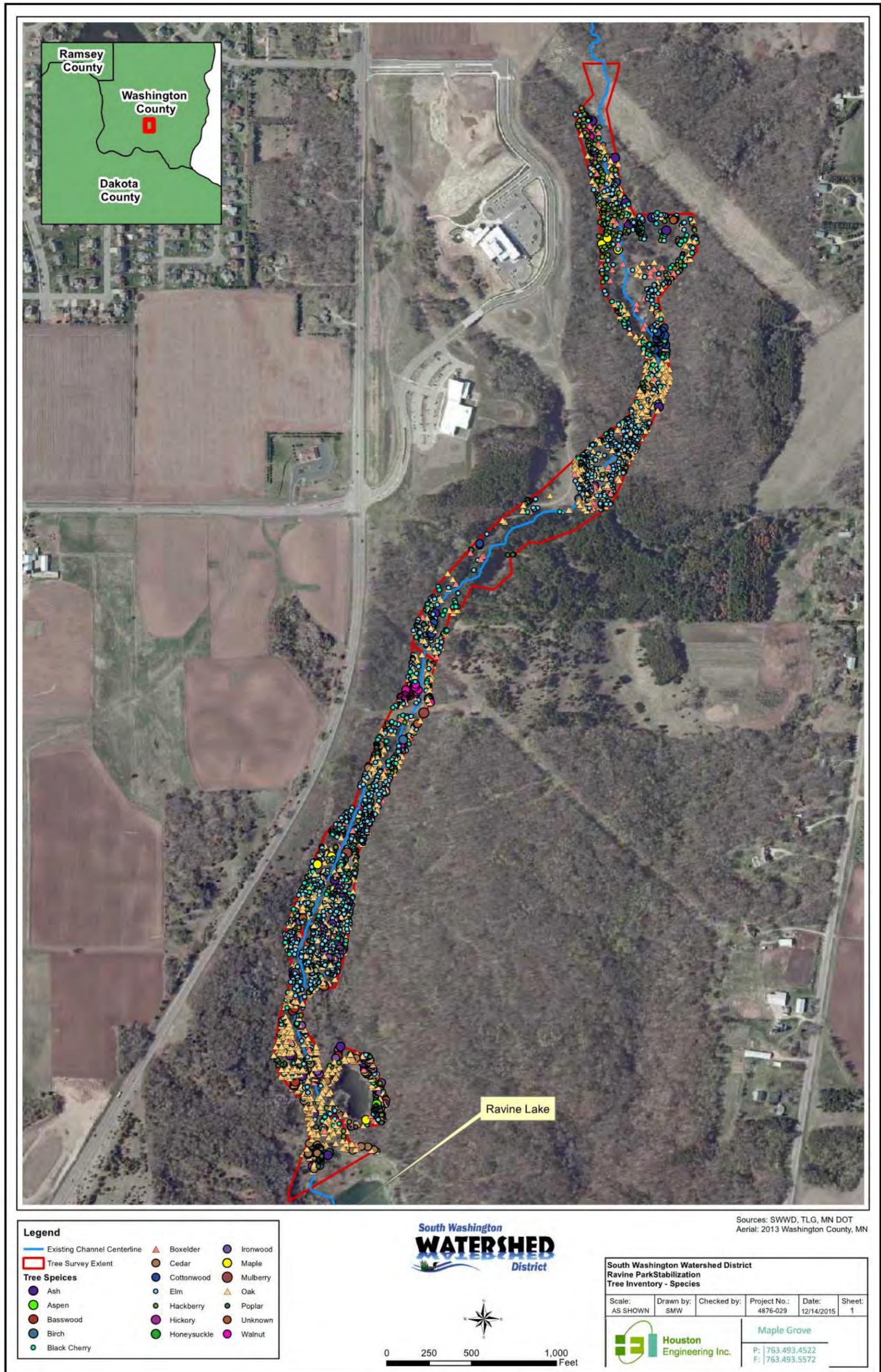


Figure 11: Tree Species

Table 5: Species Count and Summary from 2015 Tree Survey and Estimated Tree Species Removed

Tree Species	Total within Survey Area	Total Removed (Features and Trail)	Total Removed (Trail)	Tree Species	Total within Survey Area	Total Removed (Features and Trail)	Total Removed (Trail)
Ash	27	7	1	Hickory	3	0	0
Basswood	7	5	1	Honeysuckle	1	0	0
Birch	4	3	3	Ironwood	46	14	4
Black Cherry	288	74	9	Maple	7	0	0
Boxelder	125	32	4	Mulberry	3	2	1
Cedar	27	1	1	Oak	1255	353	58
Cottonwood	43	1	0	Poplar	306	53	12
Elm	1648	555	35	Unk	3	3	1
Hackberry	303	69	4	Walnut	34	4	2
Tree Size	Total within Survey Area	Total Removed (Features and Trail)	Total Removed (Trail)	Tree Size	Total within Survey Area	Total Removed (Features and Trail)	Total Removed (Trail)
3+ to 12 inches	3124	991	109	24+ to 30 inches	84	7	0
12+ to 18 inches	621	173	26	30+ to 36 inches	8	0	0
18+ to 24 inches	250	28	1	36+ inches	6	0	0

5 PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST

Preliminary Opinion of Probable Construction Costs (POPCC) for the stabilization is provided **Table 6**. A 20% construction contingency is included in the POPCC. The 20% construction contingency is to account for the fact that final design of the project is yet to occur and potential unforeseen construction circumstances.

Table 6: Preliminary Opinion of Probable Construction Cost

Item*	Item Description	Unit	Quantity	Unit Price	Extension
1	MOBILIZATION	LUMP SUM	1	\$100,000.00	\$ 100,000
2	TRAFFIC CONTROL	LUMP SUM	1	\$ 8,000.00	\$ 8,000
3	CLEARING & GRUBBING	ACRE	11.04	\$ 6,000.00	\$ 66,221
4	CHIPPING AND DISPOSAL ONSITE	ACRE	41.82	\$ 1,600.00	\$ 66,910
5	REMOVE AND DISPOSE OF BITUMINOUS	SY	554.56	\$5.00	\$ 2,773
6	COMMON EXCAVATION	CY	25,884	\$8.00	\$ 207,069
7	3" BITUMINOUS TRAIL	SY	519	\$ 60.00	\$ 31,121
8	AGGREGATE CLASS 5 (CV)	CY	1,037	\$ 30.00	\$ 31,121
9	HAUL AND PLACE SOIL ONSITE (CV)	CY	416	\$ 18.00	\$ 7,486
10	HAUL AND DISPOSE OF EXCESS SOIL OFFSITE (CV)	CY	25,468	\$ 12.00	\$ 305,613
11	TOPSOIL BORROW	CY	571.28	\$ 19.00	\$ 10,854
12	TOPSOIL SALVAGE AND RESPREAD	CY	4,151	\$8.00	\$ 33,209
13	RANDOM RIPRAP, CLASS III	CY	84	\$ 75.00	\$ 6,297
14	12 FOOT WIDE RAISED BOARDWALK TRAIL	SF	4,797	\$ 105.00	\$ 503,714
15	Boulders (18"-24") - ROCK DROP AND REVETMENT	CY	1,984	\$ 100.00	\$ 198,421
16	Boulders (30"-42") - ROCK DROP	EACH	45	\$ 200.00	\$ 9,000
17	REINFORCED SLOPES (TRM OR ROCK)**	CY	4,432	\$ 100.00	\$ 443,212
18	COARSE AGGREGATE BEDDING	SY	1,299.14	\$ 30.00	\$ 38,974
19	RIVER ROCK (1-3 INCH)	CY	27.78	\$ 100.00	\$ 2,778
20	SILT FENCE, TYPE PA	LF	300	\$2.50	\$ 750
21	SILT FENCE, TYPE HI	LF	600	\$ 10.00	\$ 6,000
22	9" BIOROLL FILTER LOG, TYPE STRAW	LF	300	\$5.00	\$ 1,500
23	STABILIZED CONSTRUCTION ENTRENCE	EACH	1	\$ 5,000.00	\$ 5,000
24	SEEDING	ACRE	17.80	\$ 3,000.00	\$ 53,400
25	SEED MIX (MnDOT 36-211)	LBS	623.00	\$ 48.00	\$ 29,904
26	HYDRAULIC MATRIX, FIBER BONDED HYDRO-MULCH	Acre	5.00	\$ 4,000.00	\$ 19,985
27	PERMANENT EROSION CONTROL BLANKET	SY	19,548	\$5.50	\$ 107,513
28	EROSION CONTROL BLANKETS CATEGORY 3 (WOOD FIBER NATURAL NET)	SY	3,272.78	\$3.00	\$ 9,818
	* This estimate does not include vegetation management or the Ravine Lake outlet structure.				
	**This estimate assumes rock will be used for slope reinforcement on check dams.				
				SUBTOTAL BASE BID	\$ 2,306,643
				20% CONTINGENCY	\$ 461,329
				Total	\$ 2,767,972

6 PERMITTING

6.1 LOCAL AUTHORITIES

Local governments that may have regulatory oversight for the project include the City of Cottage Grove, Washington County and SWWD. SWWD implements its standards through the municipalities within the district. The project has been reviewed and is consistent with the watershed management plan and Municipal Local Surface Water Management Plans. The City and/or County may regulate activities within floodplain or shoreland districts by ordinance. Activities that would involve vegetation removal, grading, or filling within a shoreland district above the OHW may require approval by the zoning authority. Activities within designated regulatory floodplains that would impact flood elevations are managed through a local floodplain ordinance. The activities associated with this project that may require floodplain approvals include grading, filling, and temporary storage of materials.

The project has considered the *Cottage Grove Ravine Regional Park Master Plan*. The project includes activities and features within the park that will be incorporated into the Master Plan, through a plan amendment. SWWD has identified the need to work with Washington County Parks and the Metropolitan Council on a plan amendment. All three parties have agreed to work together to assure that the plan amendment is completed. In addition, SWWD will work with Washington County Parks and Metropolitan Council when developing the final design and establishing a permanent easement for the specific practices and permanent features contemplated by the project. The Metropolitan Council will review and approve these final features as part of the Master Plan Amendment prior to beginning construction activities. The permanent easement boundary is to be defined as two feet in elevation above the 100-year, 24 hour storm event which is sufficient to construct the features and provide future feature and vegetation maintenance. SWWD will work with Washington County Parks to record the easement.

6.2 STATE AGENCIES

6.2.1 MNDNR

6.2.1.1 PUBLIC WATERS PRESENT

There are two public waters present within the project area, including Ravine Lake with an Ordinary High Water (OHW) Mark of 770.7 (NGVD 29) and the channel bottom, which is identified as an intermittent stream within the Public Waters Inventory (PWI). The MnDNR Public Waters Work Permit will be required for work completed within the stream, including the material excavation (Mn Rules 6115.0200), riffles, remainder, and revetments (Mn Rules 6115.0215).

The permit application must provide sufficient detail to justify that the project meets the general and specific provisions for each of these activities and the subject rule. In addition it will be important to highlight the compliance with the applicable plans, partners, and the public purpose/outcomes of the project. The MnDNR has no jurisdiction regarding construction activities above the OHW of Ravine Lake, and above the banks of the channel. In addition the permit application will need to discuss impacts and improvements to Ravine Lake from the change in frequency and quantity of water flowing to the lake.

6.2.2 SOUTH WASHINGTON WATERSHED DISTRICT (WETLAND CONSERVATION ACT LOCAL GOVERNMENT UNIT)

One wetland (non-Public Water) is present and is an isolated Type 5 open water basin in the southern end of the project area. No project features are proposed within this basin, therefore a state Wetland Conservation Act permit from the South Washington Watershed District will not be necessary.

6.3 FEDERAL AGENCIES

6.3.1 USACE

Section 404 of the Clean Water Act (CWA) requires a permit from the US Army Corps of Engineers (USACE). A CWA permit will be necessary for all work completed within the ravine channel. As with the Lower East Ravine project, the Ravine Park project will likely meet the qualifications for a Letter-of-Permission (LOP) permit, as opposed to a full Individual Permit.

The USACE cannot issue a permit without a determination regarding compliance with Section 7 of the Endangered Species Act (ESA) and Section 106 of the National Historic Preservation Act (NHPA) if appropriate. The USACE will consult with the US Fish and Wildlife Service with regard to the recently listed threatened northern long-eared bat (NLEB). Because the project will involve tree removals and construction activity, the USFWS will be consulted to determine that the proposed project is compliant with the ESA. Restrictions may be put in place to be compliant with the ESA, including limiting construction timing to outside of the bats pup season and reducing tree removals.

With regard to the NHPA, an archaeological survey was completed for the park in September of 1990. To expedite the NHPA compliance determination process, we will provide this survey report along with the permit application.

7 ENGINEER'S RECOMMENDATION

Prior to final design it is recommended that more thorough survey of utilities and soils take place, as well as confirmation of the raise trail design criteria with stakeholders.

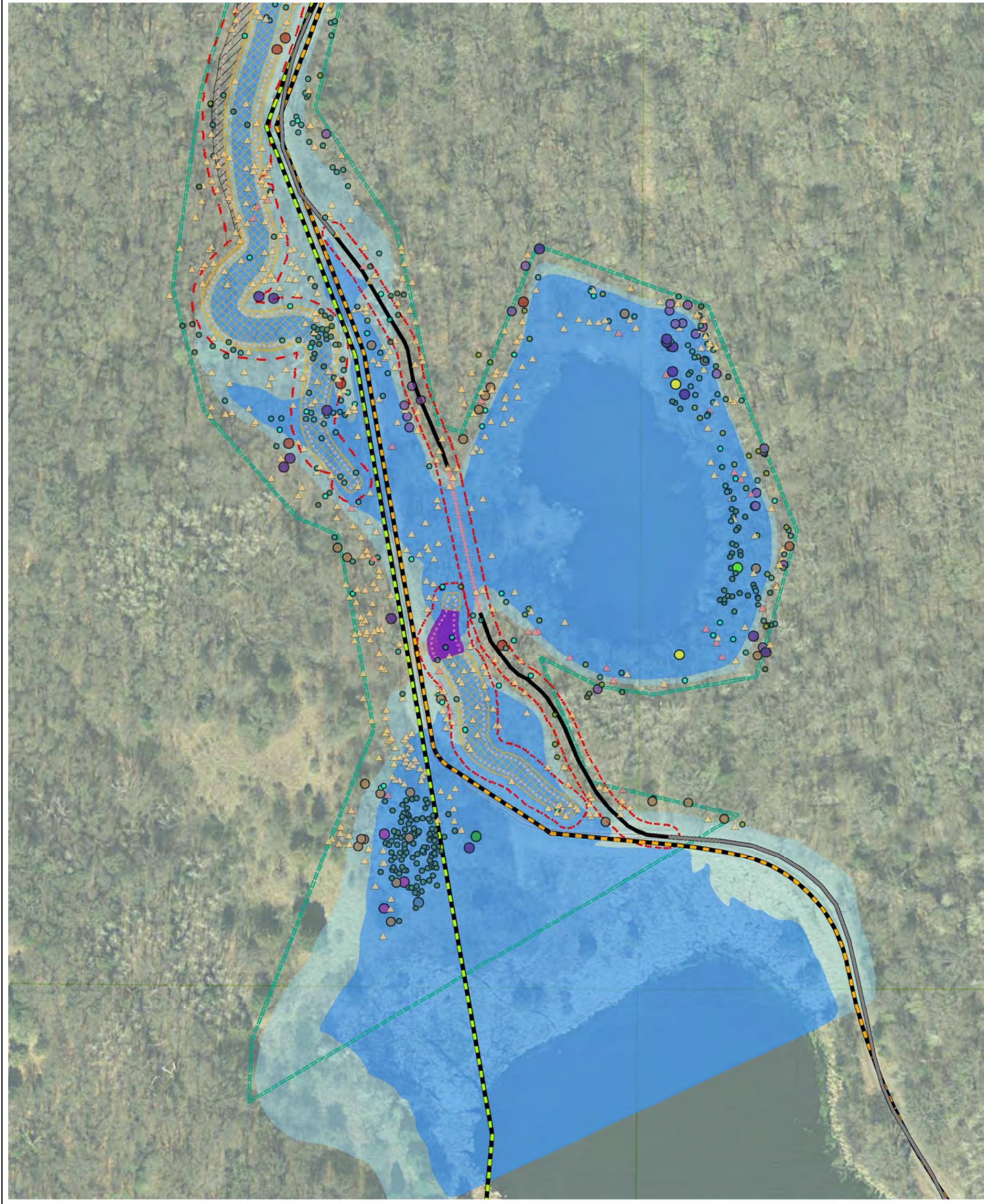
There is an existing force main and gas line on the site with approximate locations known, based on the cleared tree corridors. The proposed project features have been designed to not impede access for maintenance or impact these utilities. It is recommended that potholing take place prior to final design to confirm utility locations and elevations.

For the purpose of this preliminary design, it was assumed that a timber boardwalk style raised trail would be utilized in areas flooded by the base flood (145 cfs) condition. If these trails are not intended to support vehicle traffic, this style boardwalk trail may be unnecessary. Additionally for shorter crossings, a prefabricated steel bridge may be a more economical crossing and should be considered for the final design.

REFERENCES

- [1] Houston Engineering, South Washington Watershed District, "Cottage Grove Ravine Regional Park Erosion Analysis," March 31, 2014.
- [2] HR Green, "Memo: Ravine Park Flooding," 2010.
- [3] EOR, "Environmental Assessment County Road 19 Corridor Phase I and II Report," 2002a.
- [4] Houston Engineering, *Specifications/Bid Package for Lower East Ravine Stabilization Project*, April, 2015.
- [5] C. Fischenich, "Stability Thresholds for Stream Restoration Materials," May, 2001.
- [6] National Resources Conservation Service, "Engineering Field Handbook - Part 650," 2006.
- [7] United States National Resources Conservation Service, "Part 654 Stream Restoration Design National Engineering Handbook, Chapter 12, Channel Alignment and Variability Design," August, 2001.
- [8] Houston Engineering, Inc., "Draft-Lower East Ravine Stabilization," South Washington Watershed District, September 8, 2014.

APPENDIX A: PRELIMINARY PLACEMENT OF FEATURES

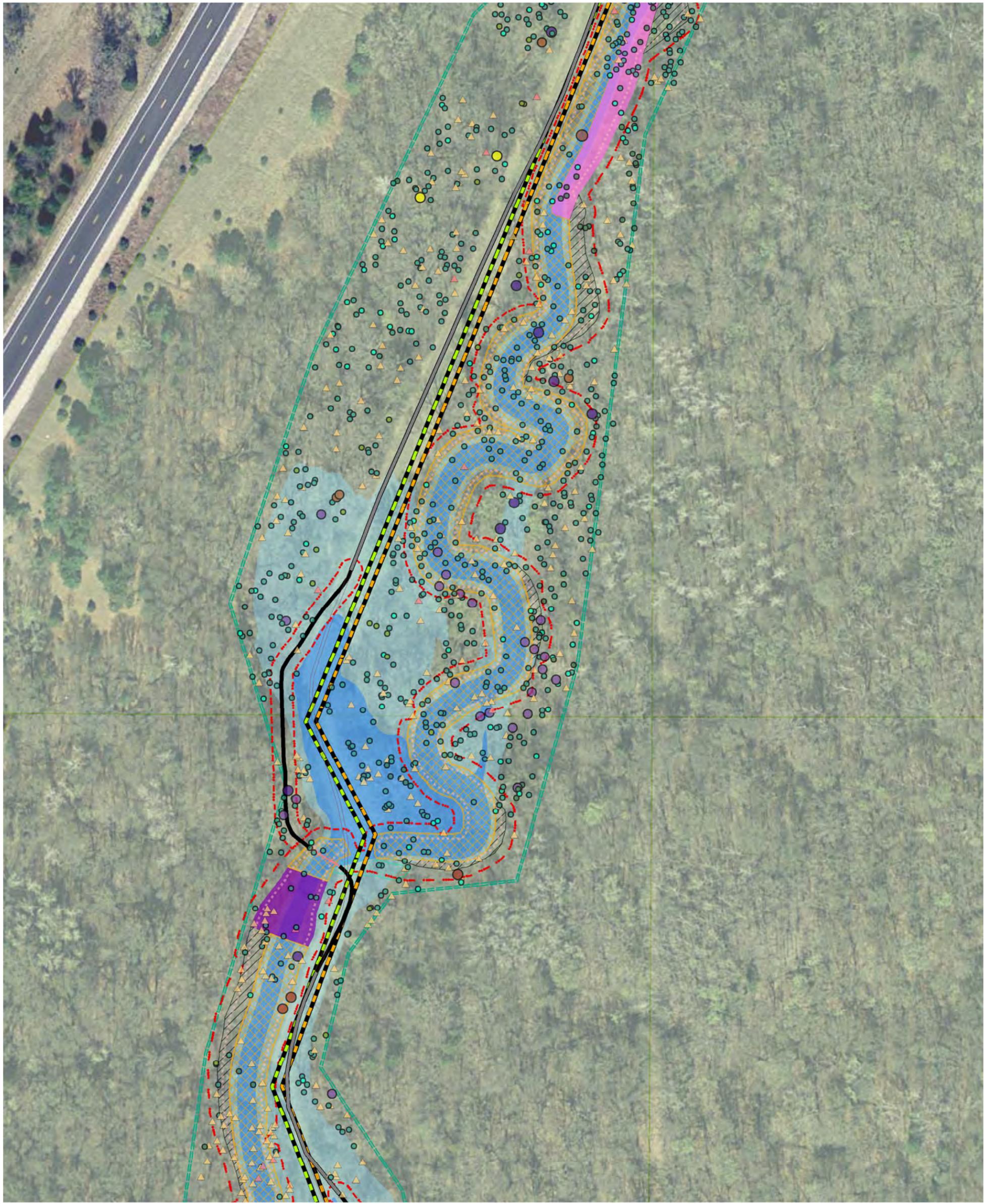


Legend

Tree Species		Other Features	
● Ash	● Aspen	● Outlet Location	— Existing Channel Centerline
● Basswood	● Birch	— Paved Trail (Existing Location - Reconstructed)	— Excavation Extents
● Black Cherry	● Boxelder	— Trail Removal	— Berm
● Cedar	● Cottonwood	— Raised Trail	— Boulder Riffle Drop
● Elm	● Hackberry	— Paved Trail (Existing Location)	— Boulder Revetment
● Honeysuckle	● Ironwood	— Paved Trail (New Location)	— Temporary Erosion Control Blanket
● Maple	● Mulberry	— Unpaved Trail (Existing Location)	— Reinforced Slopes (TRM or Rock)
● Oak	● Poplar	— Unpaved Trail (New Location)	— Approximate Location of Gas Line
● Unknown	● Walnut	— Check Dams (to be installed during later phase)	— Permanent Erosion Control Blanket
		— Check Dams	— Clearing
		— Utility Lines (Abandoned)	— Vegetation Management Extent
		— Utility Lines	— Proposed 145 cfs Flood Inundation Area
			— Proposed 100-yr Flood Inundation Area
			— Washington County Parcels



South Washington Watershed District Ravine Park Stabilization Preliminary Design Feature Placement					
Scale: AS SHOWN	Drawn by: LDO	Checked by:	Project No.: 4876-029	Date: 8/24/2016	Sheet: 1
			Maple Grove P: 763.493.4522 F: 763.493.5572		

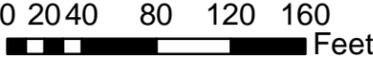


Legend

Tree Species		Other Features	
● Ash	● Aspen	● Outlet Location	— Existing Channel Centerline
● Basswood	● Birch	— Paved Trail (Existing Location - Reconstructed)	— Excavation Extents
● Black Cherry	● Boxelder	— Trail Removal	— Berm
● Cedar	● Cottonwood	— Raised Trail	— Boulder Riffle Drop
● Elm	● Hackberry	— Paved Trail (Existing Location)	— Boulder Revetment
● Honeysuckle	● Ironwood	— Paved Trail (New Location)	— Temporary Erosion Control Blanket
● Maple	● Mulberry	— Unpaved Trail (Existing Location)	— Reinforced Slopes (TRM or Rock)
● Oak	● Poplar	— Unpaved Trail (New Location)	— Approximate Location of Gas Line
● Unknown	● Walnut	— Check Dams (to be installed during later phase)	— Permanent Erosion Control Blanket
		— Check Dams	— Clearing
		— Utility Lines (Abandoned)	— Vegetation Management Extent
		— Utility Lines	— Proposed 145 cfs Flood Inundation Area
			— Proposed 100-yr Flood Inundation Area
			— Washington County Parcels





South Washington Watershed District
Ravine Park Stabilization
Preliminary Design Feature Placement

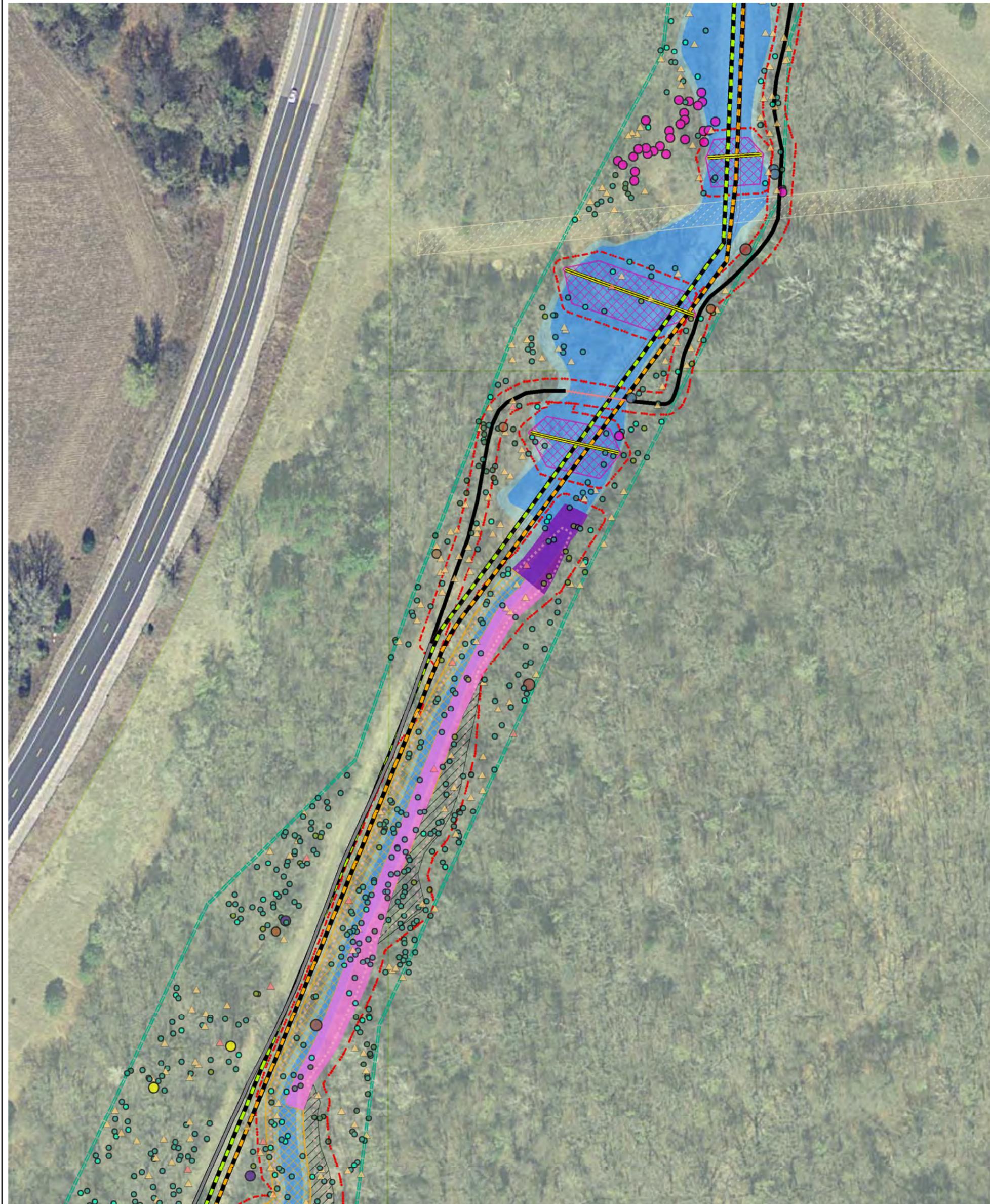
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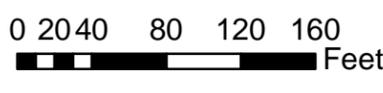


Legend

Tree Species		Other Features	
● Ash	● Aspen	● Outlet Location	— Existing Channel Centerline
● Basswood	● Birch	— Paved Trail (Existing Location - Reconstructed)	— Excavation Extents
● Black Cherry	● Black Cherry	— Trail Removal	— Berm
▲ Boxelder	● Cedar	— Raised Trail	— Boulder Riffle Drop
● Cedar	● Cottonwood	— Paved Trail (Existing Location)	— Boulder Revetment
● Elm	● Elm	— Paved Trail (New Location)	— Temporary Erosion Control Blanket
● Hackberry	● Hackberry	— Unpaved Trail (Existing Location)	— Reinforced Slopes (TRM or Rock)
● Honeysuckle	● Ironwood	— Unpaved Trail (New Location)	— Approximate Location of Gas Line
● Ironwood	● Maple	— Check Dams (to be installed during later phase)	— Permanent Erosion Control Blanket
● Maple	● Mulberry	— Check Dams	— Clearing
● Mulberry	▲ Oak	— Utility Lines (Abandoned)	— Vegetation Management Extent
▲ Oak	● Poplar	— Utility Lines	— Proposed 145 cfs Flood Inundation Area
● Poplar	● Unknown		— Proposed 100-yr Flood Inundation Area
● Unknown	● Walnut		— Washington County Parcels
● Walnut			





South Washington Watershed District
Ravine Park Stabilization
Preliminary Design Feature Placement

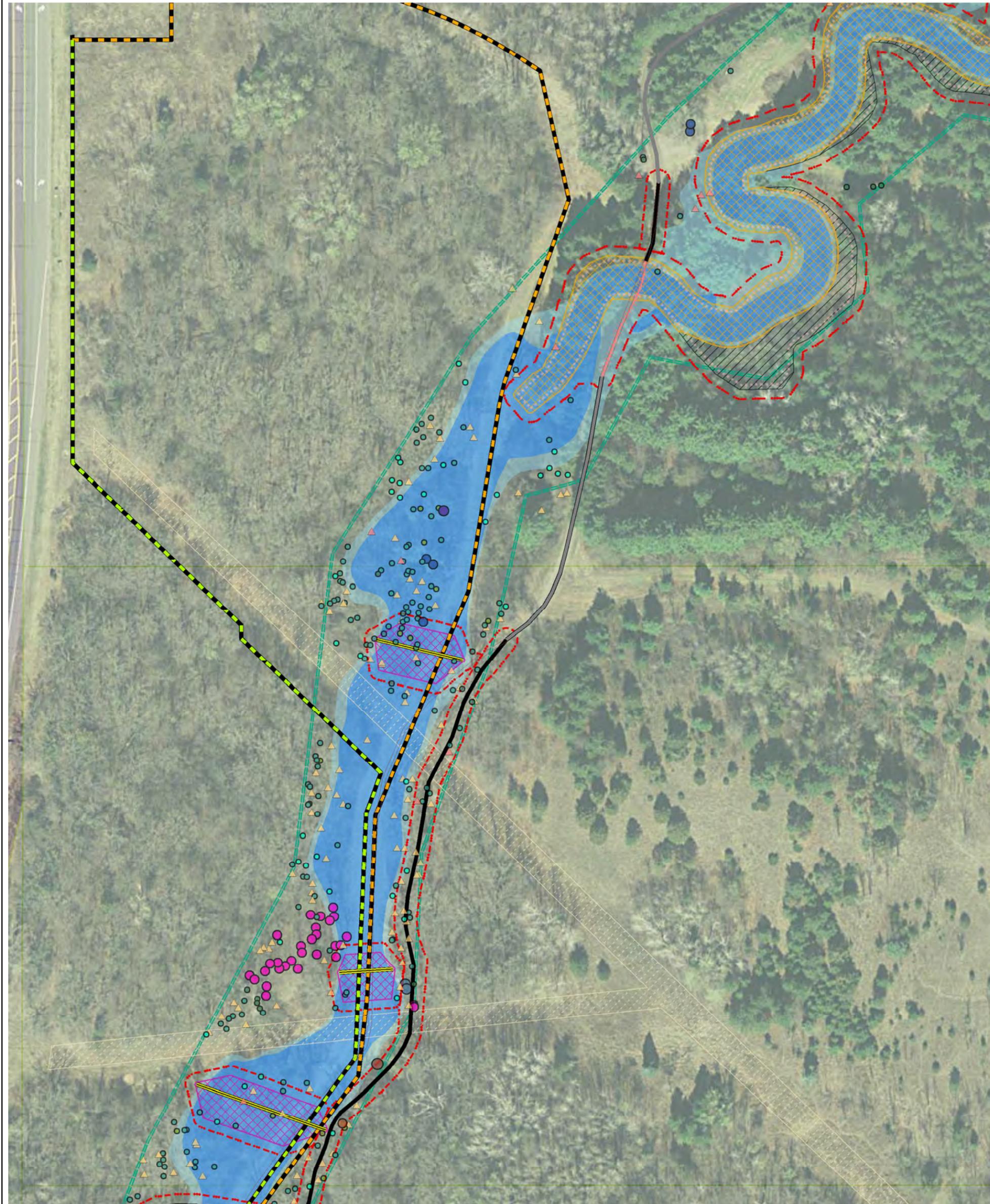
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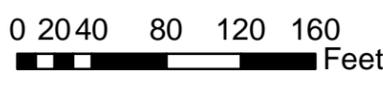


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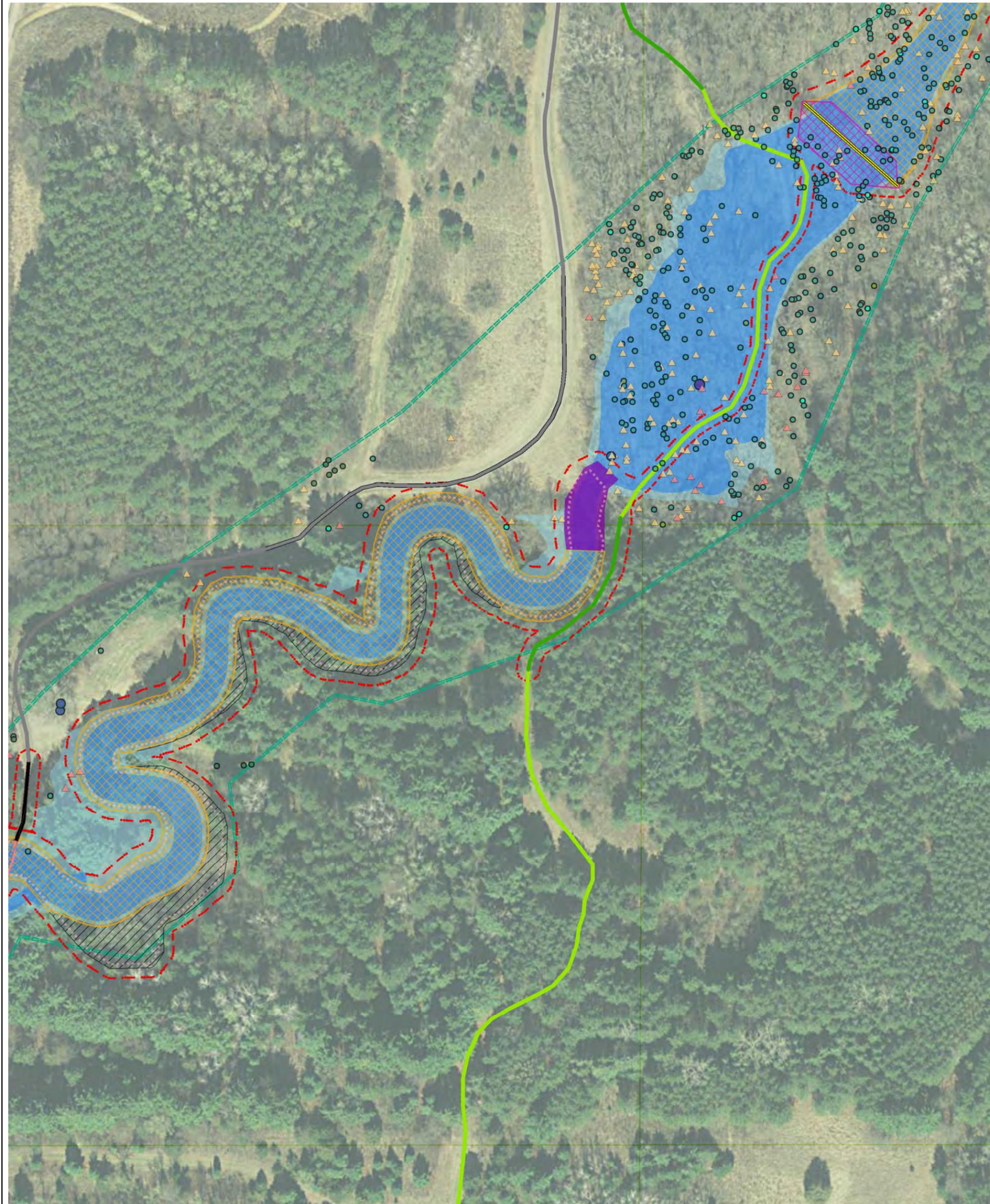
Tree Species		Other Features	
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● Basswood	● Birch	— Paved Trail (Existing Location - Reconstructed)	— Excavation Extents
● Black Cherry	● Boxelder	— Trail Removal	— Berm
● Cedar	● Cottonwood	— Raised Trail	— Boulder Riffle Drop
● Elm	● Hackberry	— Paved Trail (Existing Location)	— Boulder Revetment
● Honeysuckle	● Ironwood	— Paved Trail (New Location)	— Temporary Erosion Control Blanket
● Maple	● Mulberry	— Unpaved Trail (Existing Location)	— Reinforced Slopes (TRM or Rock)
● Oak	● Poplar	— Unpaved Trail (New Location)	— Approximate Location of Gas Line
● Unknown	● Walnut	— Check Dams (to be installed during later phase)	— Permanent Erosion Control Blanket
		— Check Dams	— Clearing
		— Utility Lines (Abandoned)	— Vegetation Management Extent
		— Utility Lines	— Proposed 145 cfs Flood Inundation Area
			— Proposed 100-yr Flood Inundation Area
			— Washington County Parcels





South Washington Watershed District					
Ravine Park Stabilization					
Preliminary Design Feature Placement					
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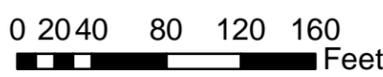


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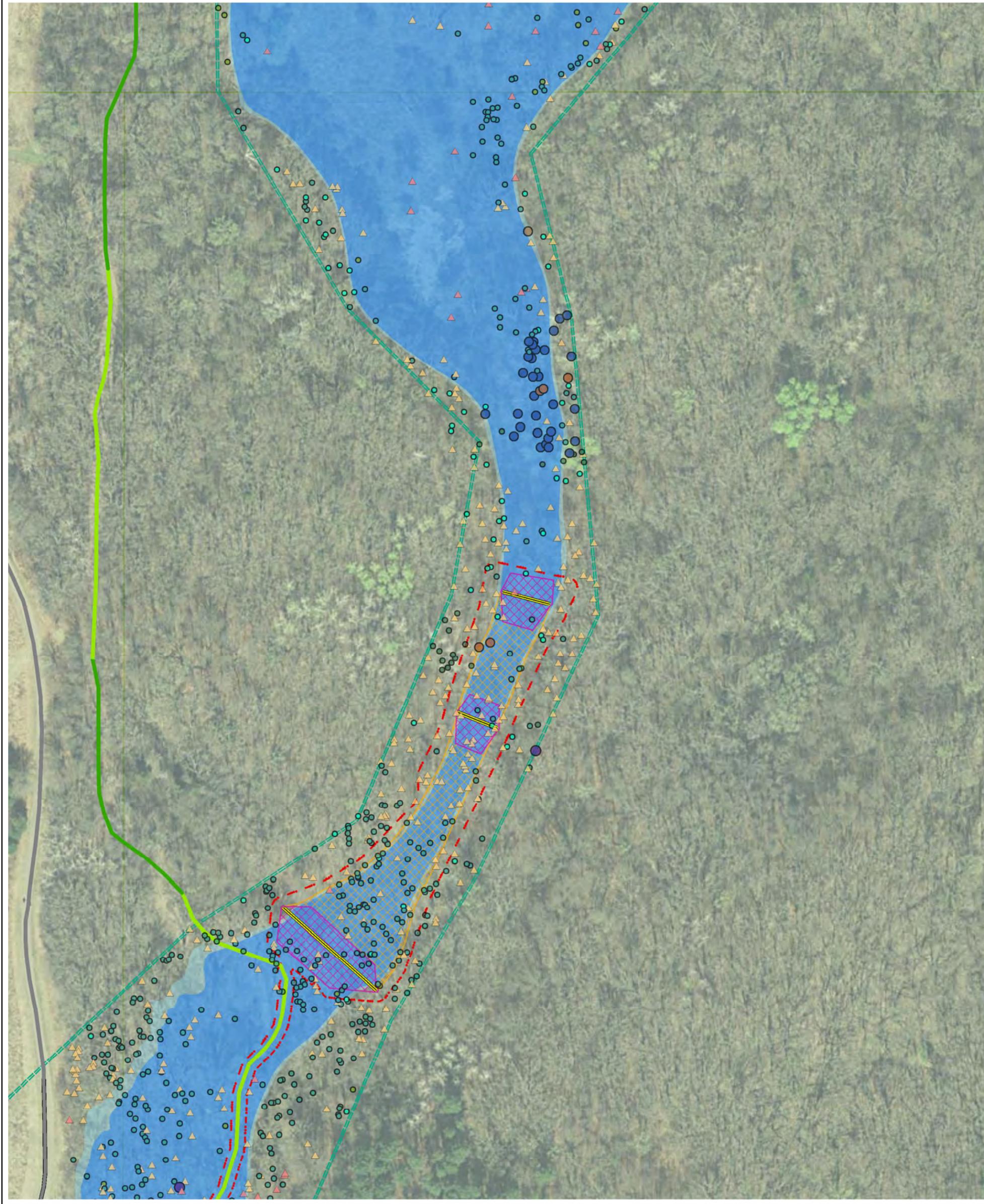
Tree Species		Engineering Features	
● Ash	● Outlet Location	— Existing Channel Centerline	— Excavation Extents
● Aspen	— Paved Trail (Existing Location - Reconstructed)	— Berm	— Boulder Riffle Drop
● Basswood	— Trail Removal	— Boulder Revetment	— Temporary Erosion Control Blanket
● Birch	— Raised Trail	— Reinforced Slopes (TRM or Rock)	— Approximate Location of Gas Line
● Black Cherry	— Paved Trail (Existing Location)	— Permanent Erosion Control Blanket	— Clearing
● Boxelder	— Paved Trail (New Location)	— Vegetation Management Extent	— Proposed 145 cfs Flood Inundation Area
● Cedar	— Unpaved Trail (Existing Location)	— Proposed 100-yr Flood Inundation Area	— Washington County Parcels
● Cottonwood	— Unpaved Trail (New Location)		
● Elm	— Check Dams (to be installed during later phase)		
● Hackberry	— Check Dams		
● Honeysuckle	— Utility Lines (Abandoned)		
● Ironwood	— Utility Lines		
● Maple			
● Mulberry			
● Oak			
● Poplar			
● Unknown			
● Walnut			





South Washington Watershed District					
Ravine Park Stabilization					
Preliminary Design Feature Placement					
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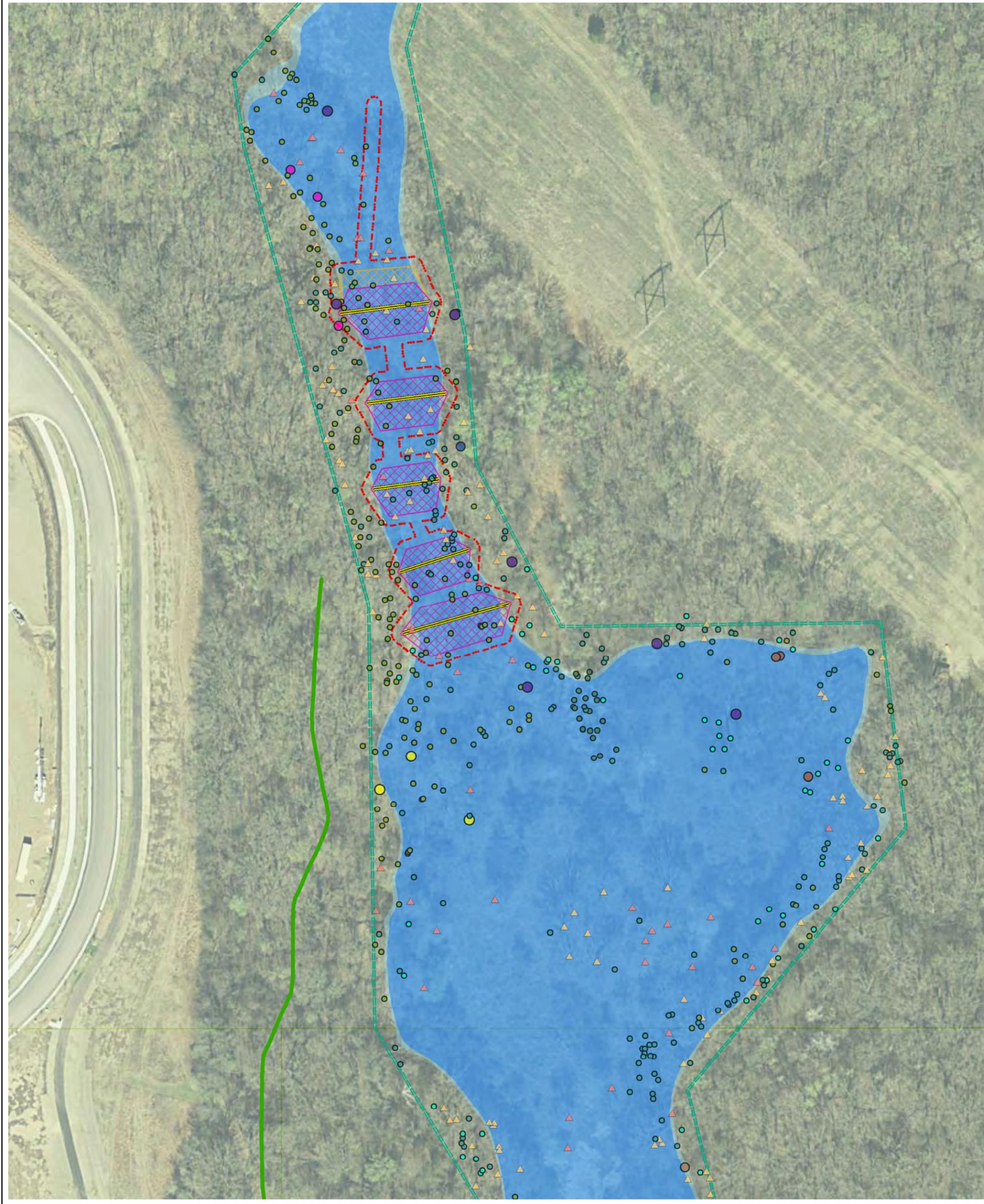


Legend

Tree Species	Outlet Location	Existing Channel Centerline
Ash	Paved Trail (Existing Location - Reconstructed)	Excavation Extents
Aspen	Trail Removal	Berm
Basswood	Raised Trail	Boulder Riffle Drop
Birch	Paved Trail (Existing Location)	Boulder Revetment
Black Cherry	Paved Trail (New Location)	Temporary Erosion Control Blanket
Boxelder	Unpaved Trail (Existing Location)	Reinforced Slopes (TRM or Rock)
Cedar	Unpaved Trail (New Location)	Approximate Location of Gas Line
Cottonwood	Check Dams (to be installed during later phase)	Permanent Erosion Control Blanket
Elm	Check Dams	Clearing
Hackberry	Utility Lines (Abandoned)	Vegetation Management Extent
Hickory	Utility Lines	Proposed 145 cfs Flood Inundation Area
Honeysuckle		Proposed 100-yr Flood Inundation Area
Ironwood		Washington County Parcels
Maple		
Mulberry		
Oak		
Poplar		
Unknown		
Walnut		



South Washington Watershed District					
Ravine Park Stabilization					
Preliminary Design Feature Placement					
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Legend

Tree Species	Outlet Location	Existing Channel Centerline
Ash	Paved Trail (Existing Location - Reconstructed)	Excavation Extents
Aspen	Trail Removal	Berm
Basswood	Raised Trail	Boulder Riffle Drop
Birch	Paved Trail (Existing Location)	Boulder Revetment
Black Cherry	Paved Trail (New Location)	Temporary Erosion Control Blanket
Boxelder	Unpaved Trail (Existing Location)	Reinforced Slopes (TRM or Rock)
Cedar	Unpaved Trail (New Location)	Approximate Location of Gas Line
Cottonwood	Check Dams (to be installed during later phase)	Permanent Erosion Control Blanket
Elm	Check Dams	Clearing
Hackberry	Utility Lines (Abandoned)	Vegetation Management Extent
Hickory	Utility Lines	Proposed 145 cfs Flood Inundation Area
Honeysuckle		Proposed 100-yr Flood Inundation Area
Ironwood		Washington County Parcels
Maple		
Mulberry		
Oak		
Poplar		
Unknown		
Walnut		

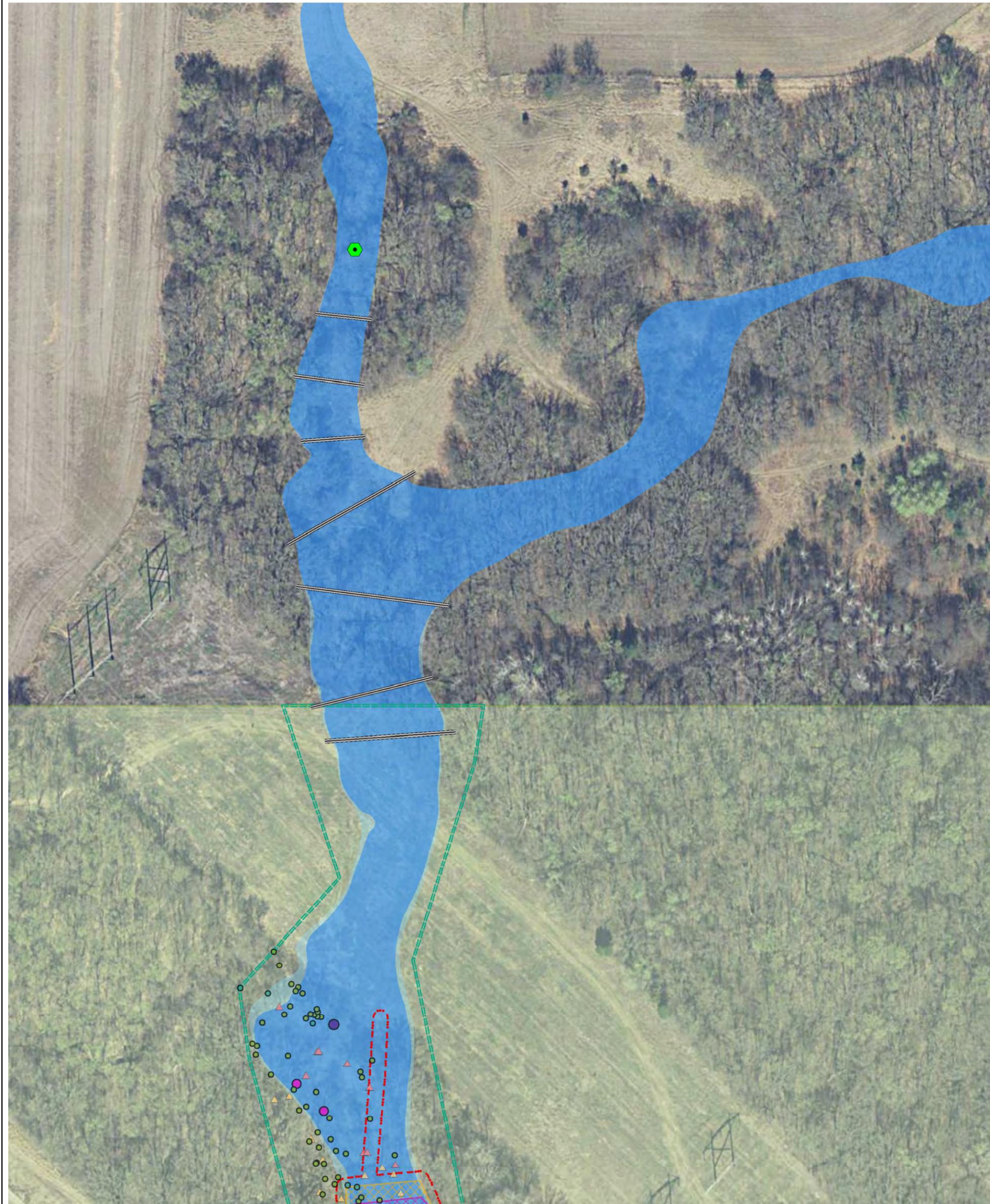


**South Washington Watershed District
Ravine Park Stabilization
Preliminary Design Feature Placement**

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Legend

Tree Species	Outlet Location	Existing Channel Centerline
Ash	Paved Trail (Existing Location - Reconstructed)	Excavation Extents
Aspen	Trail Removal	Berm
Basswood	Raised Trail	Boulder Riffle Drop
Birch	Paved Trail (Existing Location)	Boulder Revetment
Black Cherry	Paved Trail (New Location)	Temporary Erosion Control Blanket
Boxelder	Unpaved Trail (Existing Location)	Reinforced Slopes (TRM or Rock)
Cedar	Unpaved Trail (New Location)	Approximate Location of Gas Line
Cottonwood	Check Dams (to be installed during later phase)	Permanent Erosion Control Blanket
Elm	Check Dams	Clearing
Hackberry	Utility Lines (Abandoned)	Vegetation Management Extent
Hickory	Utility Lines	Proposed 145 cfs Flood Inundation Area
Honeysuckle		Proposed 100-yr Flood Inundation Area
Ironwood		Washington County Parcels
Maple		
Mulberry		
Oak		
Poplar		
Unknown		
Walnut		



South Washington Watershed District					
Ravine Park Stabilization					
Preliminary Design Feature Placement					
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APPENDIX B: PREVIOUS OUTLET MEMORANDUM



TECHNICAL MEMORANDUM

To: PMT Meeting for CSAH 19 and Cottage Grove Ravine Park Improvements

From: Jeremiah Jazdzewski, PE
Houston Engineering, Inc.

Subject: Ravine Lake Outlet Design – Preliminary Modeling Implications

Date: December 3, 2015 (Revised January 26, 2016)

Project: 4876-029 Ravine Park

PURPOSE

The South Washington Watershed District (SWWD) has a hydrologic and hydraulic (H&H) model for the Ravine Lake watershed. Houston Engineering, Inc. (HEI) has been working with the SWWD to provide H&H analysis for the Ravine Lake outlet regarding 1.) increased volume/flow from the Central Draw Storage Facility (CDSF); and 2.) not increasing peak outflow or downstream flooding. HEI utilized the existing condition model to perform preliminary outlet design analysis for Ravine Lake. This brief memo presents some of the results for use in discussion during the December 3, 2015 PMT Meeting for CSAH 19 and Cottage Grove Ravine Park Improvements. This memo includes a packet containing graphs referenced in the memo and maps for general reference.

MODELING

HEI utilized an XP-SWMM model for Ravine Park to model the flows, elevations, and impacts at Ravine Lake and downstream to the East Point Douglas/Highway 61 crossing. The following SCS Type II events were modeled.

- 2-year, 24-hour storm (2.8 inches);
- 10-year, 24-hour storm (4.2 inches); and
- 100-year, 24-hour storm (7.4 inches).

The 100-year, 24-hour storm also includes pumping from the CDSF which is approximately 146 cfs.

KEY DESIGN ELEMENTS

In order to perform design modeling for future outlet structure alternatives, several design criteria need to be evaluated and at least one criterion finalized. The design criteria are discussed in the following sections; all discussion points are based on the existing condition model.

FLOODING ABOVE HIGHWAY 61 CROSSING

The hydraulic control of the structure passing under both East Point Douglas Road and MN Highway 61 will cause water to back up and pond during sustained high flow conditions out of Ravine Lake. This puts the

structures around this area at risk of flood inundation (including the Historic Hope Glen Farm, listed on the Historic Register). Existing high water elevations are shown for the various modeled storm events in **Figure 1**. Also shown is the approximate elevation at which structure inundation occurs. The proposed outlet design should not increase flooding beyond existing conditions. This design criteria assumes that modification of the hydraulic structure under East Point Douglas Road and MN Highway 61 is not an option.

The storage location upstream of Highway 61 (storage location) receives inflow from not only the Ravine Lake outlet, but also from three branch inlets to the east, one branch inlet to the west, and from local drainage directly to the storage location. These additional inflows to the storage location are outside of the project area and not manageable through the design of the Ravine Lake outlet. Under the current Ravine Lake outlet condition, for a 100-year, 24-hour event, approximately 62% of the peak flow to this storage location is provided by the Ravine Lake outlet; the other 38% comes from the branch and local drainage. During a 100-year, 24-hour storm event, these branch drainages and local inflows contribute a peak inflow of approximately 281 cfs to the storage location. These branch and local inflows alone (without Ravine Lake outlet inflow) are significant enough to cause building inundation at the storage location (defined as water levels above the 772 NAVD 88 elevation). As the inflows from the Ravine Lake outlet are reduced during the concept design, these branch and local flows will play a larger role in contributing to flooding. Therefore, based on the modeling, reducing the peak outflow from Ravine Lake alone cannot be used as a means to eliminate flooding at the downstream location during a 100-year, 24-hour event. Reducing the Ravine Lake peak outflow can only help to reduce the severity of flooding at the storage location; additional volume or peak runoff measures could be taken within the branch inflow areas (along with the Ravine Lake outlet design) to eliminate the 100-year, 24-hour flooding.

Action Items

- Determine if flooding is acceptable upstream of Frontage Road/ East Point Douglas Road.
- If so, under what conditions (storm event probability) is flooding acceptable?
- If so, what peak flooding elevation is acceptable?

RAVINE LAKE BOUNCE

If flood reduction is desired above MN Highway 61, the peak outflow from Ravine Lake will need to be buffered. To do this, the lake elevation will need to be allowed to bounce during large storm events. Currently, this bounce is mitigated by the overtopping of the park entrance road. The combination of the elevation of the newly constructed entrance road and the hydraulic structure underneath it will determine the overall bounce in Ravine Lake. The existing model lake elevations are shown in **Figure 2**. Also shown is the existing roadway elevation and the ordinary high water level (OHWL). The existing Ravine Lake outflows are shown in **Figure 3**; the peak outflow downstream flooding trigger flow is also identified. The sustained elevation and flow for the 100-year, 24-hour event is caused by the CDSF overflow pumping.

Action Items

- Determine what is an acceptable bounce in Ravine Lake and under what conditions (storm event probability).

RAVINE PARK ENTRANCE ROADWAY ELEVATION

The existing Ravine Park entrance road experiences significant overtopping during rainfall events (**Figure 2**). The roadway effectively acts as a weir and is responsible for the majority of the peak outflow from the lake. Therefore, raising the entrance roadway elevation is a significant factor in controlling the peak outflow from

Ravine Lake. This allows the structure under the roadway to perform more of the hydraulic control during lower flows. Raising the roadway, however, both increases the cost to build the roadway and increases the magnitude of bounce in Ravine Lake during storm events.

Action Items

- Determine an acceptable entrance roadway elevation and associated acceptable cost to build up the roadway.
- Determine if the Ravine Lake bounce associated with this new roadway is acceptable.
- Is overtopping of the newly constructed road acceptable (i.e., can the roadway still be used as a high flow (weir) structure)?

Figure 1: Upstream of East Point Douglas Road/Highway 61 Water Elevation

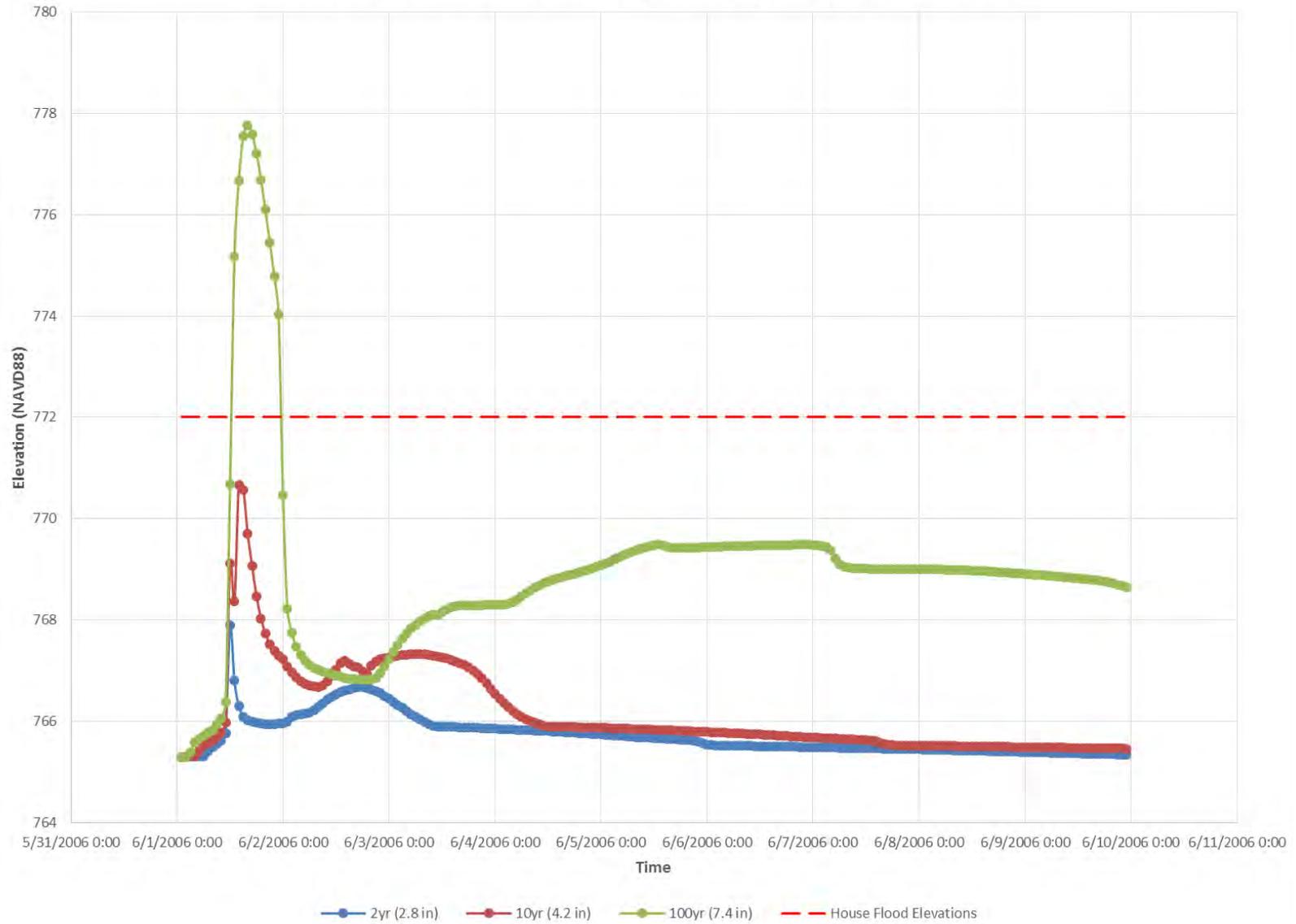


Figure 2: Ravine Lake Water Elevation

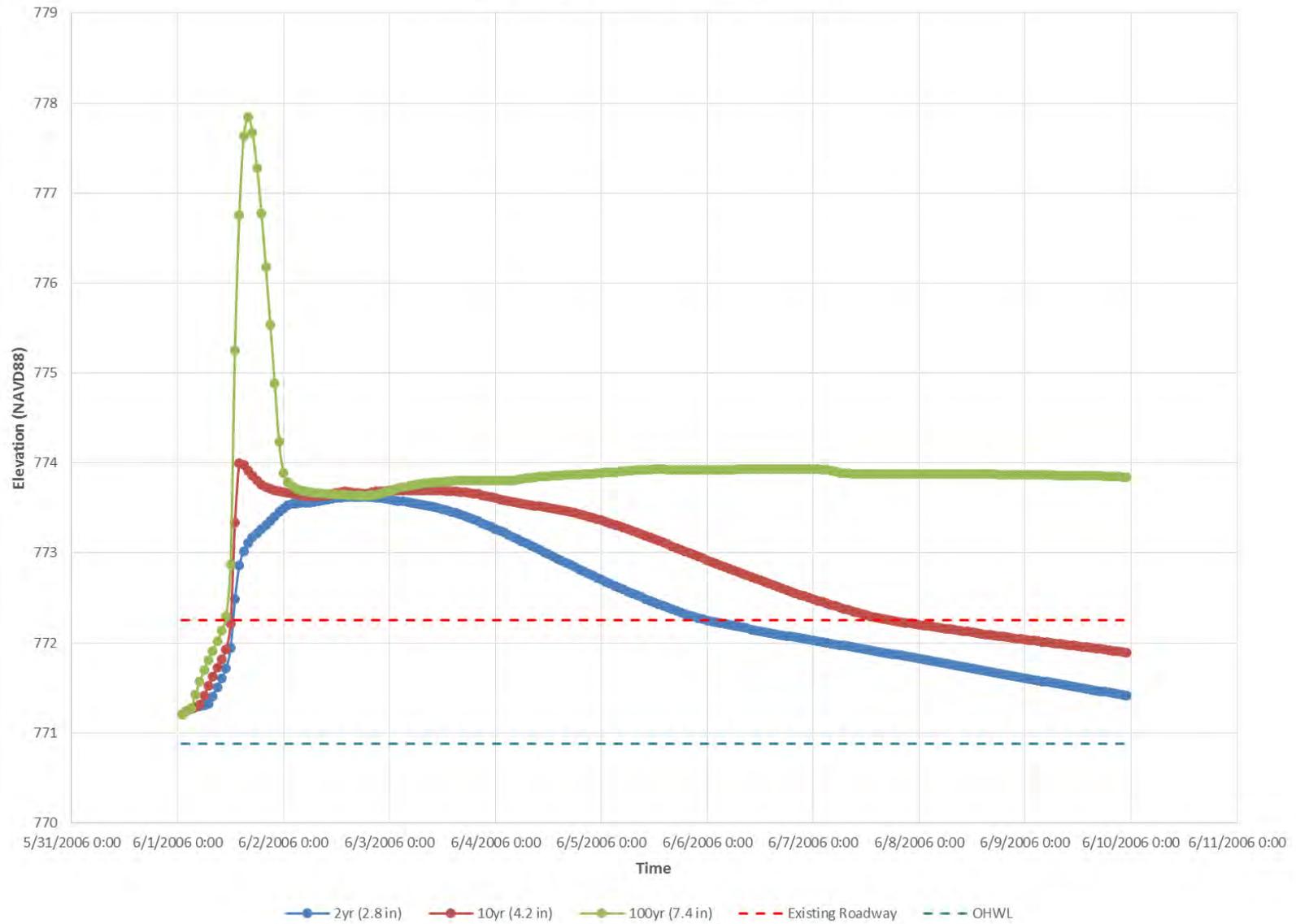
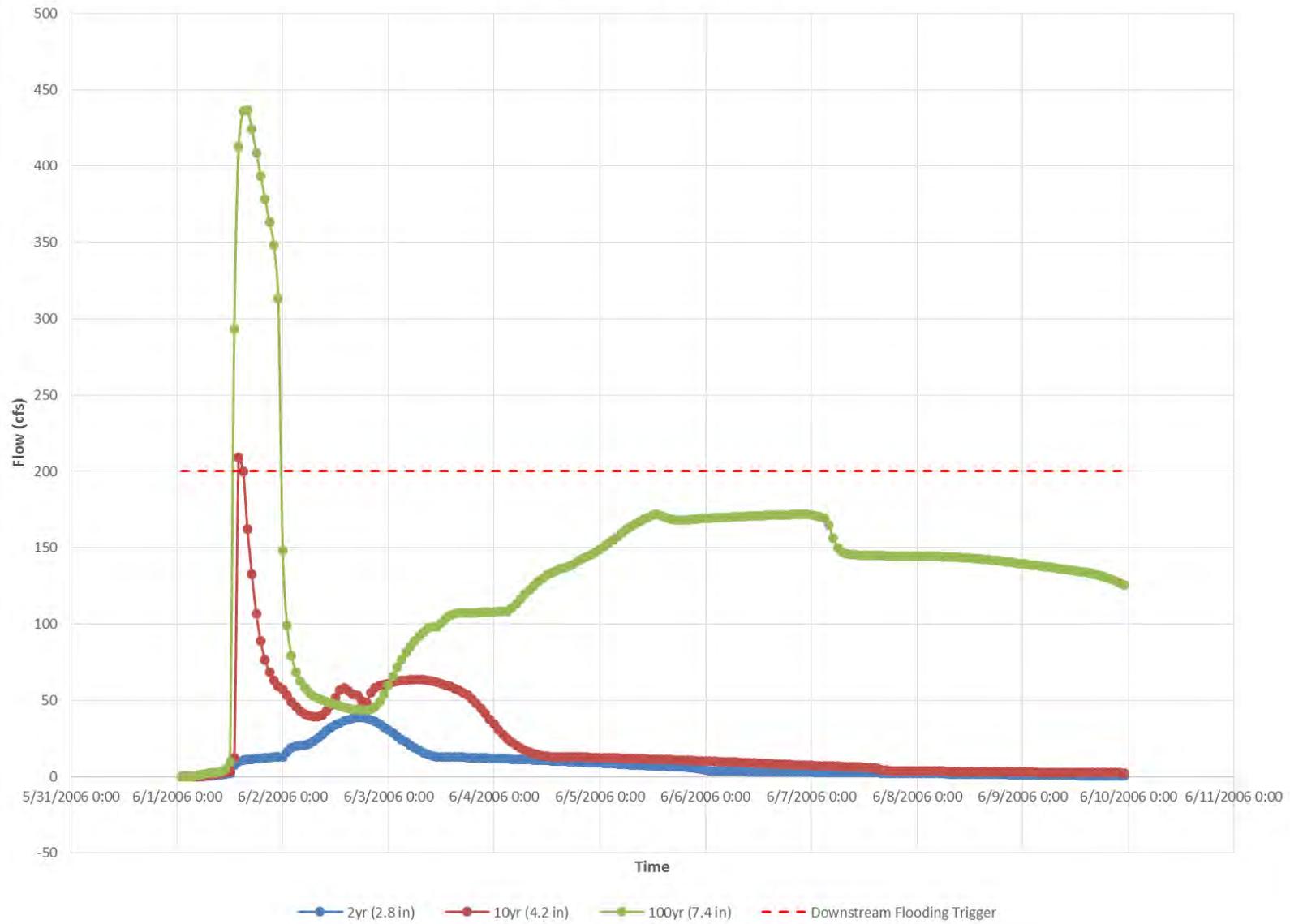


Figure 3: Ravine Lake Outflows



APPENDIX C: HYDRAULIC MODELING UPDATES

The hydrology and hydraulic methods used to complete the hydraulics analysis are discussed in detail in the 2014 Study [1]. The existing conditions HEC-RAS model was revised to include significantly more cross sections and greater detail. This detail was added both to make a more direct comparison to the proposed condition and to remove critical flow results. The model was extended south to include the model developed as part of the Lower East Ravine Stabilization Project (Phase II of the CDSF Overflow Project), thus the boundary condition was revised. [8] The Manning's n-values were revised as follows:

Table C.1: Manning's N-Values

Land Cover	Manning's N-Value
Tree	0.15
Rip Rap	0.045
Grass	0.045
Paved Trail	0.015
Crops	0.055

A schematic of the existing conditions hydraulic model within the project area is shown in **Figure C1**. A schematic of the proposed conditions hydraulic model is shown in **Figure C2**.

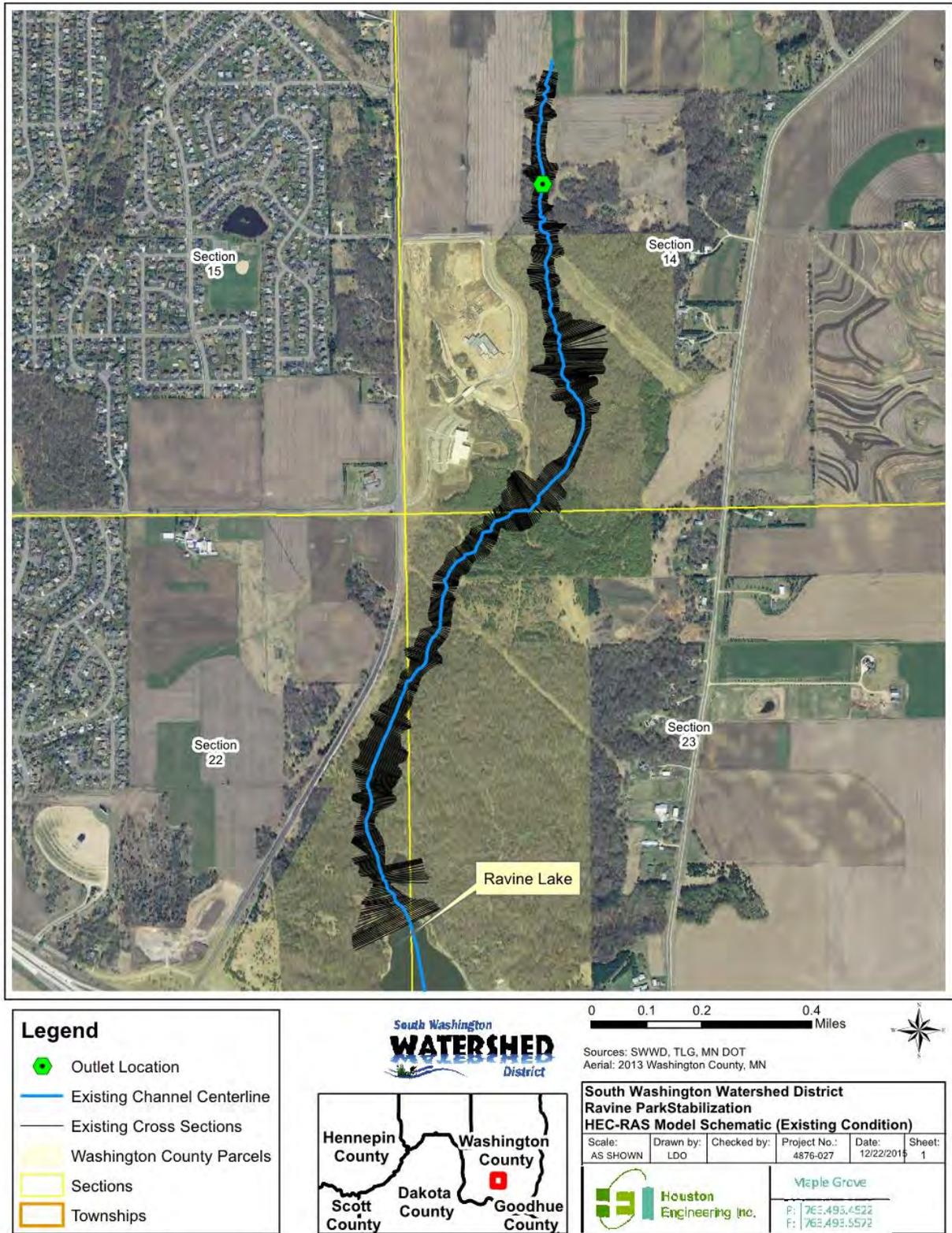


Figure C1: HEC-RAS Model Schematic (Existing Condition)



Figure C2: HEC-RAS Model Schematic (Proposed Condition)

APPENDIX D: FLOODPLAIN MAPPING UPDATES



Legend

- Proposed 145 cfs Floodplain
- Existing Conditions 145 cfs Floodplain
- Outlet Location
- Washington County Parcels

South Washington
WATERSHED
District

0 0.075 0.15 0.3 Miles

Sources: SWWD, TLG, MN DOT
Aerial: 2013 Washington County, MN

Ramsey County

Washington County

Dakota County

**Ravine Park Stabilization
Base Flow (145 cfs) Floodplain Mapping**

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Figure D1: Baseflow Floodplain Mapping

APPENDIX E: EROSION ANALYSIS UPDATES

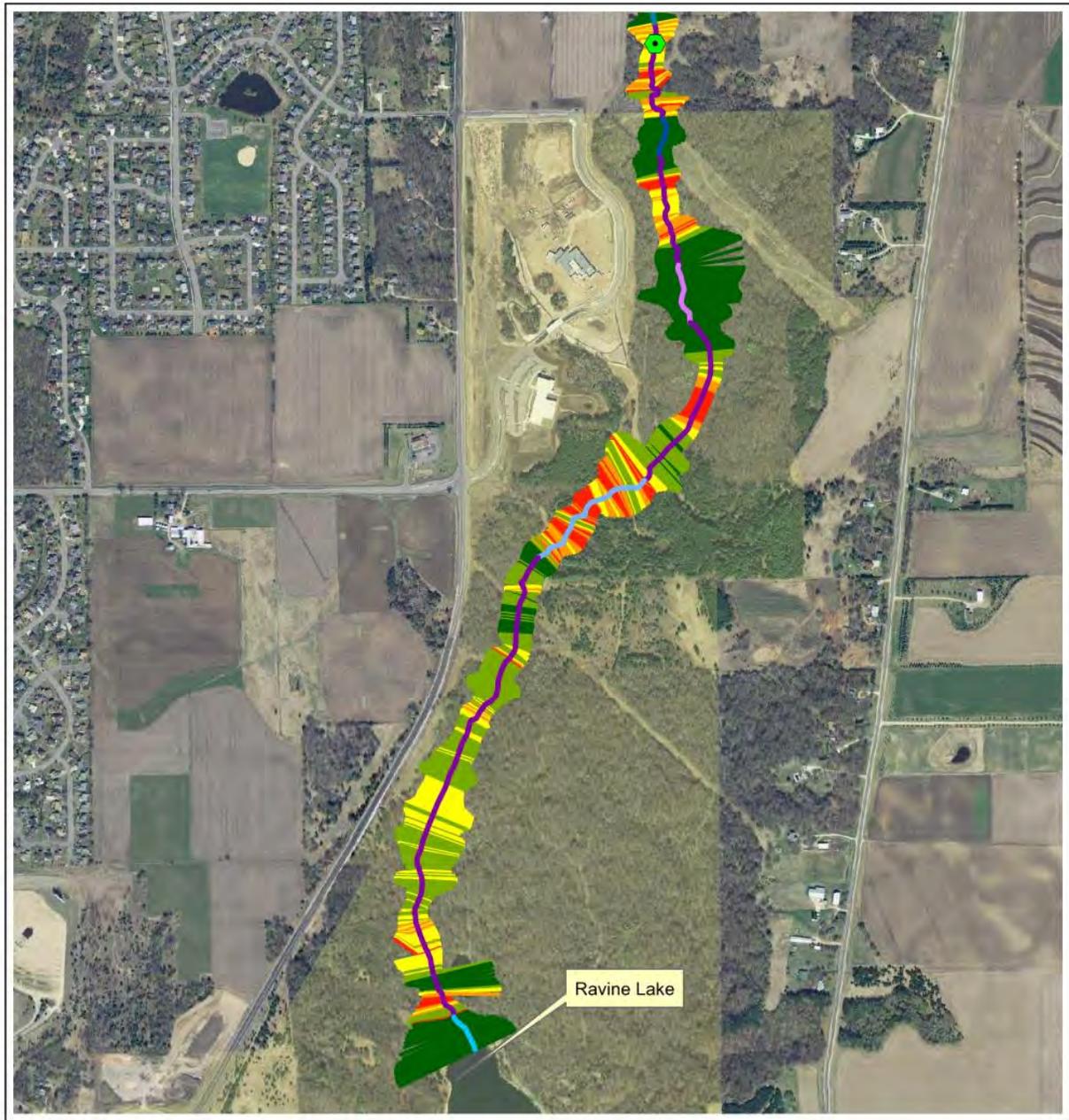
Since more detail was added to the hydraulic model, the erosion calculations provided in the Erosion analysis were updated. The process used to determine the erosion potential in each section of the assessment area is discussed in detail in the 2014 Study [1]. This analysis provides a tool for screening areas of potential erosion and the level of concern, however these results are not necessarily indicative of specific bank stability and sediment transport processes.

The erosion potential classification was calculated using the methodology described in the 2014 Study [1]. The cross sections were similarly classified as follows: Low (Below the lower limit of the threshold range), Medium (Between the lower limit and midpoint of the threshold range), High (Between the midpoint and upper limit of the threshold range), Excessive (Between the upper limit of the shear stress threshold range and 1.5 times the upper limit of the threshold range), and Very Excessive (Above 1.5 times the upper limit of the shear stress threshold range).

Since the hydraulic model was updated, several tables and figures related to erosion analysis were updated. **Table E1** shows the vegetative cover descriptions and associated estimated shear and velocity thresholds. The locations where each of these vegetative covers were utilized in the analysis along with the resultant erosion potential classifications are shown in **Figure E1**, **Figure E2**, **Figure E3**, and **Figure E4**. The results are presented in tabular format in **Appendix F**.

Vegetative Cover	Estimated Shear Threshold (lb/sf)	Estimated Velocity Threshold (fps)
Pasture. Good grass cover.	1.5 - 2.5	6 - 8
Wooded forest. Medium density underbrush. Medium tree density. Medium woody debris.	0.43 - 2.5	4 - 6
Power line corridor. Grass cover. Maintained.	1.5 - 2.5	6 - 8
Weedy area. Reed Canary grass and nettles and forbs.	1.5 - 2.5	4 - 6
Pine Plantation. Light ground cover	0.4 - 1	1.75 - 2
Wetland. High grass.	2.1 - 3.1	3 - 10
Long Native Grasses	1.2 - 1.7	4 - 6
Permanent Erosion Control Blankets or Mats. Partially Established to Fully Vegetated)	4.0 - 8.0	7.5 - 18.0
Rip Rap. 12-inch d_{50} to 18-inch d_{50}	5.1 - 7.6	10 - 16

Table E1: Shear and Velocity Thresholds for Vegetative Cover



Legend

Outlet Location

Shear Code

- Low
- Medium
- High
- Excessive
- Very Excessive

Existing Channel Vegetation Type

- High Grass
- Pasture
- Pine Plantation
- Power Line Corridor
- Weedy Area
- Wooded Forest

South Washington
WATERSHED
District

Ramsey County
Washington County
Dakota County

0 0.075 0.15 0.3 Miles

Sources: SWWD, TLG, MN DOT
Aerial: 2013 Washington County, MN

**Ravine Park Stabilization
Shear Classification (by model cross section)
Existing Condition**

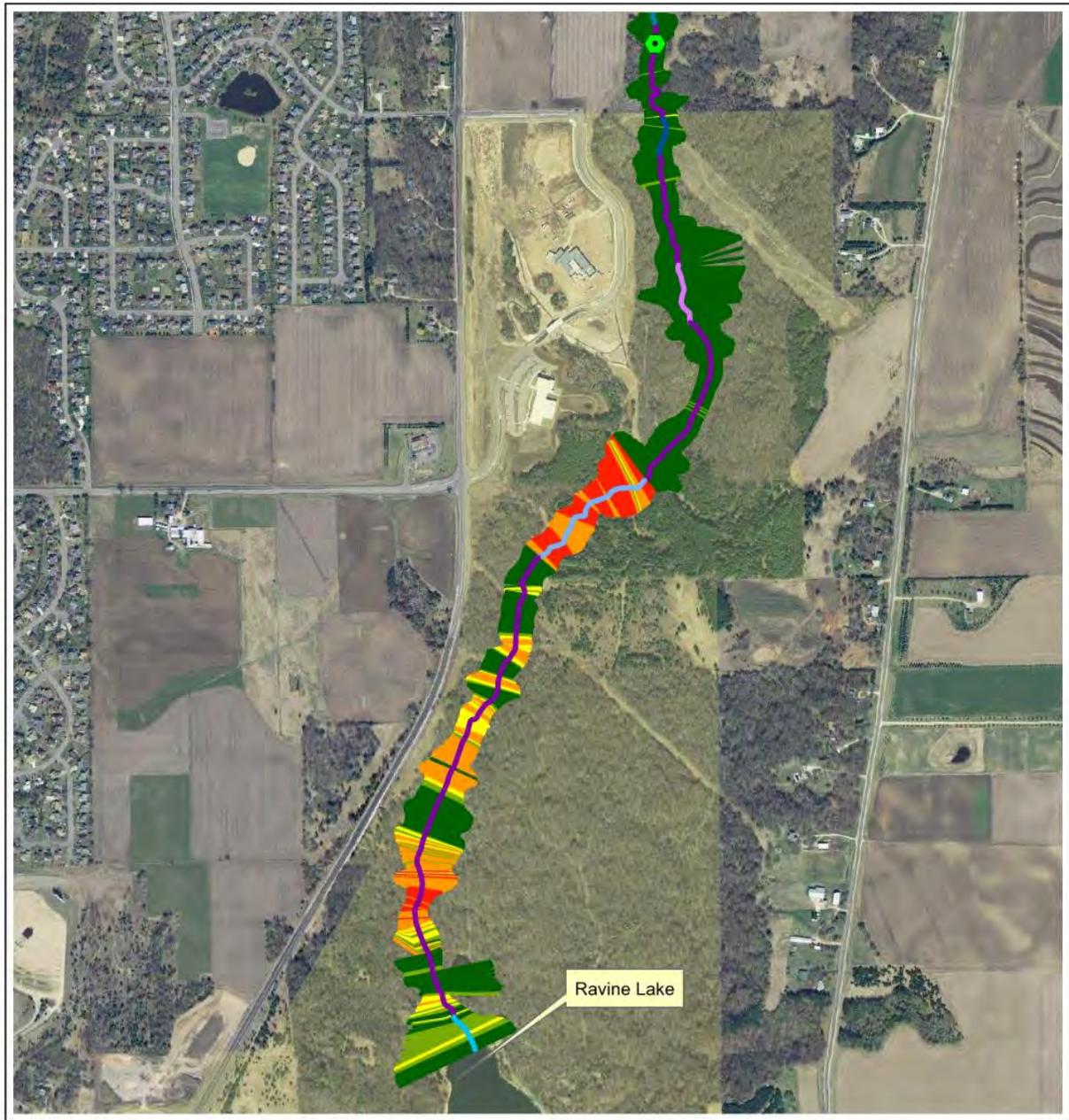
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Figure E1: Shear Plots (Existing Condition)



Legend

Outlet Location
 Outlet Location

Velocity Code

- Low
- Medium
- High
- Excessive
- Very Excessive

Existing Channel Vegetation Type

- High Grass
- Pasture
- Pine Plantation
- Power Line Corridor
- Weedy Area
- Wooded Forest

South Washington
WATERSHED
 District

0 0.075 0.15 0.3 Miles

Sources: SWWD, TLG, MN DOT
 Aerial: 2013 Washington County, MN

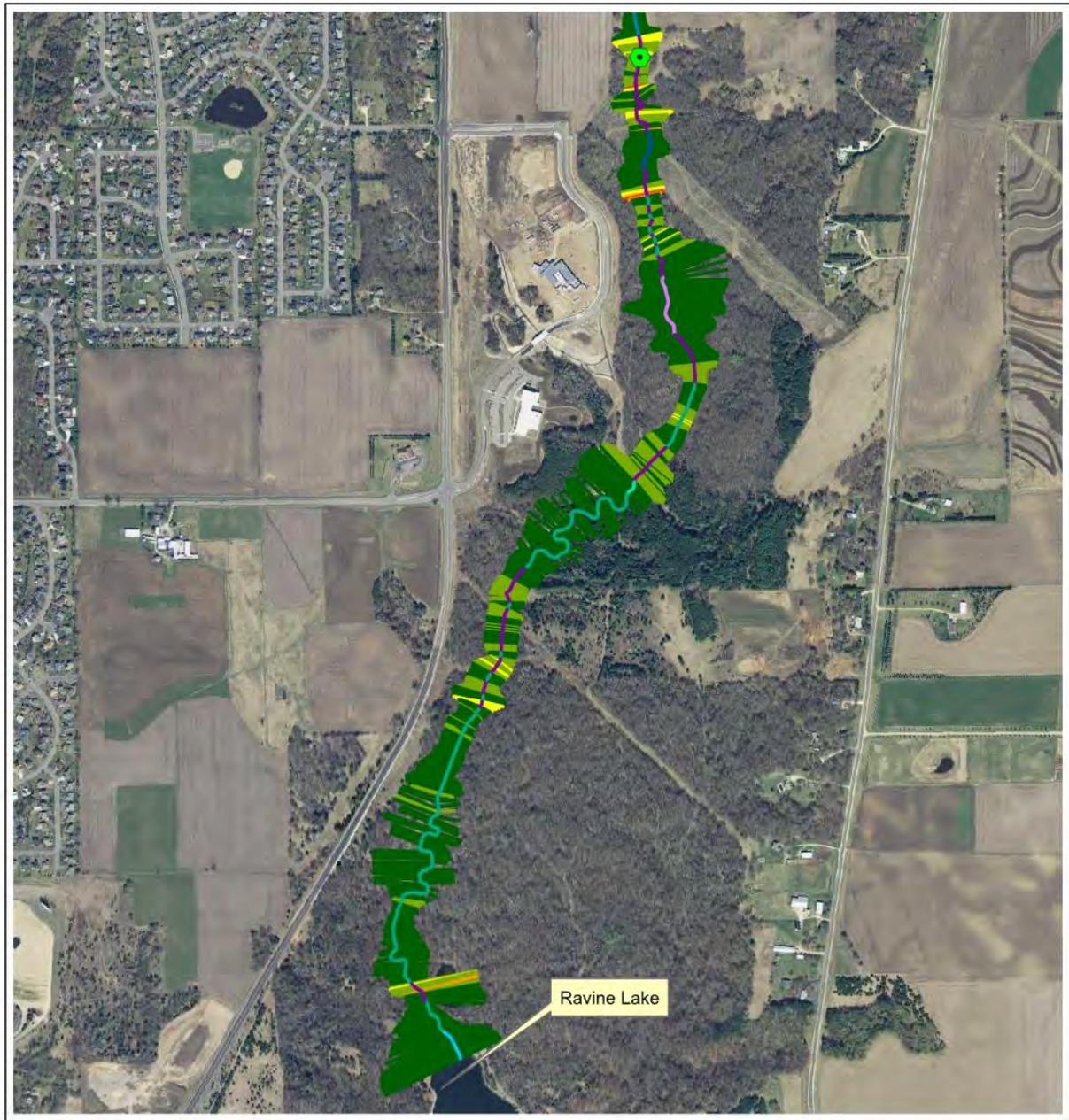
**Ravine Park Stabilization
 Velocity Classification (by model cross section)
 Existing Condition**

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Figure E2: Velocity Plots (Existing Condition)



Legend

Outlet Location
 Outlet Location

Shear Code

- Low
- Medium
- High
- Excessive
- Very Excessive

Proposed Channel Vegetation Type

- Long Native Grasses
- Permanent Erosion Control
- High Grass
- Pasture
- Power Line Corridor
- Weedy Area
- Wooded Forest

South Washington
WATERSHED
 District

Ramsey County
 Dakota County
 Washington County

0 0.075 0.15 0.3 Miles

Sources: SWWD, TLG, MN DOT
 Aerial: 2013 Washington County, MN

Ravine Park Stabilization
Shear Classification (by model cross section)
Proposed Condition

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Figure E3: Shear Plots (Proposed Condition)



Legend

Outlet Location
Velocity Code
 Low
 Medium
 High
 Excessive

Proposed Channel Vegetation Type
 Long Native Grasses
 Permanent Erosion Control
 High Grass
 Pasture
 Power Line Corridor
 Weedy Area
 Wooded Forest

South Washington
WATERSHED
District

Ramsey County
Washington County
Dakota County

0 0.075 0.15 0.3 Miles

Sources: SWWD, TLG, MN DOT
Aerial: 2013 Washington County, MN

**Ravine Park Stabilization
Velocity Classification (by model cross section)
Proposed Condition**

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Figure E4: Velocity Plots (Proposed Condition)

APPENDIX F: EROSION ANALYSIS TABLES

	River Station	Vegetative Cover	Shear to Use	Velocity to Use	Shear Source	Velocity Source	Shear Threshold Minimum	Shear Threshold Average	Shear Threshold Maximum	Velocity Threshold Minimum	Velocity Threshold Average	Velocity Threshold Maximum	Shear Category	Velocity Category
Existing Condition	22516	Pasture	0.465	5.475	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22506	Pasture	0.74	6.825	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22496	Pasture	0.795	7.11	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	22486	Pasture	0.78	6.945	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22476	Pasture	0.84	7.125	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	22466	Pasture	0.885	7.08	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	22456	Pasture	0.765	6.795	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22446	Pasture	0.84	6.825	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22436	Pasture	0.54	5.655	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22426	Pasture	0.825	6.54	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22416	Pasture	0.57	5.55	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22406	Pasture	0.465	5.04	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22396	Pasture	0.315	4.29	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22384	Pasture	0.72	6.165	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22370	Pasture	0.585	5.46	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22366	Pasture	0.375	4.5	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22363	Pasture	0.285	4.05	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22347	Pasture	0.615	5.88	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22336	Pasture	0.69	6.15	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22326	Pasture	0.75	6.27	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22315	Pasture	0.765	6.57	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22306	Pasture	0.54	5.745	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22297	Pasture	0.33	4.41	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22286	Pasture	0.18	3.345	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22276	Pasture	0.12	2.76	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22270	Pasture	0.135	2.94	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22257	Pasture	0.12	2.91	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22246	Pasture	0.21	3.66	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22237	Pasture	0.3	4.275	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22227	Pasture	0.615	6	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22216	Pasture	0.435	5.265	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22207	Pasture	0.705	6.54	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22197	Pasture	0.735	6.57	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22186	Pasture	0.78	6.705	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22177	Pasture	0.855	7.005	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	22167	Pasture	0.72	6.33	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22156	Pasture	0.765	6.555	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22146	Pasture	0.795	6.645	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22136	Pasture	0.78	6.735	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22126	Pasture	0.885	7.095	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High

Existing Condition	22116	Pasture	0.555	5.7	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22106	Pasture	0.42	5.085	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22096	Pasture	0.79	6.525	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22086	Pasture	0.9	7.05	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	22076	Pasture	0.99	7.26	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	22066	Pasture	0.92	7.035	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	22056	Pasture	0.795	7.005	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	22046	Pasture	0.75	6.675	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	22036	Pasture	0.465	5.325	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22026	Pasture	0.525	5.82	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	22015	Pasture	0.9	7.305	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	22006	Pasture	0.825	7.095	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21997	Pasture	0.885	7.305	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21987	Pasture	0.93	7.41	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21976	Pasture	0.72	6.66	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	21967	Pasture	0.915	7.44	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21956	Pasture	0.945	7.575	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21946	Pasture	0.93	7.44	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21936	Pasture	0.81	7.02	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21926	Pasture	0.885	7.44	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21916	Pasture	0.98	7.86	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21906	Pasture	0.82	7.08	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21896	Pasture	0.74	6.9	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	21886	Pasture	0.82	7.095	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21876	Pasture	0.83	7.215	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21866	Pasture	0.93	7.575	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21856	Pasture	0.96	7.665	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21846	Pasture	0.99	7.77	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21836	Pasture	1.125	8.43	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Existing Condition	21826	Pasture	1.035	8.145	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Existing Condition	21816	Pasture	1.02	8.1	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Existing Condition	21806	Pasture	1.185	8.7	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Existing Condition	21796	Pasture	1.005	8.1	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Existing Condition	21786	Pasture	1.035	8.055	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Existing Condition	21776	Pasture	1.05	8.16	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Existing Condition	21766	Pasture	1.005	7.98	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21756	Pasture	0.975	7.92	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21746	Pasture	1.035	7.965	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21736	Pasture	0.915	7.755	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21726	Pasture	0.93	7.635	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21716	Pasture	0.975	7.815	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21706	Pasture	0.75	6.93	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	21696	Pasture	0.85	7.275	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21686	Pasture	1.08	8.295	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Existing Condition	21676	Pasture	1.005	7.92	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High

Existing Condition	21667	Pasture	0.87	7.425	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21656	Pasture	1.125	8.46	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Existing Condition	21646	Pasture	1.11	8.16	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Existing Condition	21636	Pasture	0.93	7.56	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Existing Condition	21626	Pasture	0.72	6.39	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	21616	Pasture	0.68	6.45	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	21606	Pasture	0.73	6.375	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	21596	Pasture	0.68	6.57	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	21586	Pasture	0.645	6.09	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	21576	Pasture	0.3	4.335	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	21565	Pasture	0.225	3.84	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	21556	Pasture	0.135	3.015	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	21546	Pasture	0.105	2.64	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	21536	Pasture	0.105	2.76	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	21526	Pasture	0.09	2.625	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	21516	Pasture	0.105	2.61	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	21506	Wooded forest.	0.165	2.88	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	21496	Wooded forest.	2.415	2.76	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21486	Wooded forest.	3.18	3.24	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21476	Wooded forest.	3.495	3.36	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21466	Wooded forest.	2.28	2.835	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21456	Wooded forest.	3.49	3.27	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21446	Wooded forest.	2.47	2.505	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21436	Wooded forest.	2.95	2.73	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21426	Wooded forest.	2.58	2.625	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21416	Wooded forest.	2.45	2.685	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21406	Wooded forest.	2.39	2.67	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21397	Wooded forest.	2.72	2.865	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21387	Wooded forest.	3.13	3.075	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21376	Wooded forest.	2.44	2.85	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21366	Wooded forest.	1.68	2.52	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21356	Wooded forest.	2.48	2.895	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21346	Wooded forest.	2.51	2.91	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21336	Wooded forest.	2.71	2.94	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21326	Wooded forest.	2.57	2.895	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21316	Wooded forest.	2.62	2.955	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21306	Wooded forest.	2.5	2.805	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21296	Wooded forest.	2.16	2.64	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21286	Wooded forest.	1.875	2.535	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21276	Wooded forest.	2.25	2.745	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21266	Wooded forest.	1.875	2.535	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21256	Wooded forest.	1.74	2.43	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21246	Wooded forest.	1.695	2.355	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21236	Wooded forest.	1.575	2.28	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21226	Wooded forest.	1.59	2.205	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low

Existing Condition	21217	Wooded forest.	1.71	2.22	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21206	Wooded forest.	1.35	2.055	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	21196	Wooded forest.	1.19	1.92	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	21186	Wooded forest.	1.45	2.085	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	21176	Wooded forest.	2.11	2.445	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21166	Wooded forest.	3.55	3.015	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21156	Wooded forest.	3.43	3.105	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21146	Wooded forest.	4.1	3.36	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	21136	Wooded forest.	6.84	4.05	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Medium
Existing Condition	21126	Wooded forest.	4.16	3.165	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	21116	Wooded forest.	5.25	3.31	chan	chan	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	21106	Wooded forest.	3.96	2.94	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	21096	Wooded forest.	2.86	2.625	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21085	Wooded forest.	2.21	2.46	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21079	Wooded forest.	1.69	2.235	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21069	Wooded forest.	2.64	2.715	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21057	Wooded forest.	2.57	2.835	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21046	Wooded forest.	3.27	3.15	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21042	Wooded forest.	3.07	2.94	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	21036	Wooded forest.	1.65	2.37	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	21008	Wooded forest.	4.29	2.97	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	20974	Wooded forest.	0.57	1.2	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	20930	Wooded forest.	0.765	1.38	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	20915	Wooded forest.	1.005	1.56	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	20904	Wooded forest.	1.305	1.77	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	20893	Wooded forest.	3.06	2.835	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	20886	Wooded forest.	3.4	2.715	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	20876	Wooded forest.	3.32	2.73	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	20866	Wooded forest.	3.45	2.73	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	20855	Wooded forest.	2.26	2.445	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20839	Wooded forest.	2.09	2.505	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20820	Wooded forest.	4.26	3.345	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	20788	Wooded forest.	3.66	3.9	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	20774	Wooded forest.	3.12	3.9	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	20760	Wooded forest.	2.805	3.87	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	20743	Wooded forest.	1.98	3.375	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20738	Wooded forest.	2.23	3.48	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20727	Wooded forest.	1.7	3.81	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20716	Wooded forest.	3.4	5.565	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	High
Existing Condition	20706	Power line corridor	0.885	4.155	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20695	Power line corridor	0.69	4.035	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20686	Power line corridor	0.495	4.005	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20675	Power line corridor	0.45	4.275	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20665	Power line corridor	0.345	4.14	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20656	Power line corridor	0.51	5.265	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low

Existing Condition	20644	Power line corridor	0.435	5.085	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20634	Power line corridor	0.49	5.34	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20626	Power line corridor	0.64	6.03	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Existing Condition	20616	Power line corridor	0.55	5.76	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20606	Power line corridor	0.61	5.925	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20596	Power line corridor	0.555	5.79	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20586	Power line corridor	0.435	5.115	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20576	Power line corridor	0.435	5.115	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20566	Power line corridor	0.555	5.34	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20558	Power line corridor	0.33	4.35	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20549	Power line corridor	0.255	4.14	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20536	Power line corridor	0.345	4.38	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20526	Power line corridor	0.225	3.93	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20516	Power line corridor	0.33	4.32	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20506	Power line corridor	0.255	3.825	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20497	Power line corridor	0.15	3.33	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20487	Power line corridor	0.135	3.06	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20476	Power line corridor	0.105	2.67	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20466	Power line corridor	0.075	2.325	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20456	Power line corridor	0.06	2.04	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20446	Power line corridor	0.06	2.04	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20435	Power line corridor	0.045	1.92	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20425	Power line corridor	0.05	1.695	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Existing Condition	20416	Wooded forest.	0.045	1.57	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	20406	Wooded forest.	0.045	1.49	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	20396	Wooded forest.	0.045	1.24	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	20386	Wooded forest.	0.045	1.08	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	20375	Wooded forest.	0.06	0.975	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	20365	Wooded forest.	0.075	0.975	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	20356	Wooded forest.	0.105	0.9	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	20349	Wooded forest.	0.165	0.915	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	20338	Wooded forest.	0.225	0.96	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	20326	Wooded forest.	0.285	1.02	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	20317	Wooded forest.	0.36	1.17	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	20306	Wooded forest.	0.42	1.26	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	20296	Wooded forest.	0.555	1.44	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	20286	Wooded forest.	0.84	1.725	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	20276	Wooded forest.	1.365	2.13	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	20266	Wooded forest.	2.025	2.58	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20256	Wooded forest.	2.79	2.955	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	20246	Wooded forest.	4.09	3.36	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	20236	Wooded forest.	6.93	4.215	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Medium
Existing Condition	20226	Wooded forest.	5.71	4.095	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Medium
Existing Condition	20216	Wooded forest.	4.74	3.84	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	20206	Wooded forest.	4.245	3.645	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low

Existing Condition	20196	Wooded forest.	4.11	3.645	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Very Excessive	Low
Existing Condition	20185	Wooded forest.	3.87	3.465	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Very Excessive	Low
Existing Condition	20176	Wooded forest.	2.88	2.985	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	20167	Wooded forest.	2.31	2.76	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20157	Wooded forest.	2.265	2.775	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20146	Wooded forest.	2.34	2.82	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20136	Wooded forest.	2.325	2.805	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20126	Wooded forest.	2.715	2.985	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	20116	Wooded forest.	2.475	2.865	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20105	Wooded forest.	2.535	2.895	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	20095	Wooded forest.	2.025	2.685	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20086	Wooded forest.	2.13	2.655	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20076	Wooded forest.	1.935	2.565	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20066	Wooded forest.	1.755	2.46	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20056	Wooded forest.	1.83	2.505	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20046	Wooded forest.	1.875	2.535	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20036	Wooded forest.	1.725	2.475	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20026	Wooded forest.	1.71	2.445	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20016	Wooded forest.	1.83	2.535	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	20006	Wooded forest.	1.98	2.655	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	19996	Wooded forest.	2.07	2.7	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	19986	Wooded forest.	2.175	2.76	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	19976	Wooded forest.	2.715	3.03	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	19966	Wooded forest.	2.67	3.045	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	19956	Wooded forest.	2.52	3	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	19946	Wooded forest.	2.415	2.925	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	19936	Wooded forest.	2.325	2.865	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	19926	Wooded forest.	2.925	3.18	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	19916	Wooded forest.	3.405	3.315	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	19906	Wooded forest.	3.67	3.45	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	19895	Wooded forest.	3.61	3.375	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	19884	Wooded forest.	3.255	3.3	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	19876	Wooded forest.	3.09	3.225	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	19866	Wooded forest.	3.495	3.42	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	19856	Wooded forest.	4.39	3.63	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Very Excessive	Low
Existing Condition	19846	Wooded forest.	3.6	3.405	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	19837	Wooded forest.	4.27	3.495	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Very Excessive	Low
Existing Condition	19826	Wooded forest.	3.225	3.165	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	19816	Wooded forest.	2.685	2.835	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	19807	Wooded forest.	2.22	2.625	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	19797	Wooded forest.	1.74	2.34	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	19786	Wooded forest.	1.485	2.13	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	19776	Wooded forest.	1.275	1.935	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	19766	Wooded forest.	0.87	1.635	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	19756	Wooded forest.	0.8	1.56	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low

Existing Condition	18846	Wooded forest.	1.01	1.905	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18836	Wooded forest.	1.1	1.935	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18826	Wooded forest.	1.33	2.055	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18816	Wooded forest.	1.48	2.19	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	18806	Wooded forest.	1.45	2.1	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18796	Wooded forest.	1.4	2.13	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18786	Wooded forest.	1.47	2.145	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	18776	Wooded forest.	1.57	2.16	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	18766	Wooded forest.	1.39	2.07	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18756	Wooded forest.	1.21	1.95	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18746	Wooded forest.	1.13	1.92	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18736	Wooded forest.	1.19	1.965	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18726	Wooded forest.	1.51	2.16	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	18716	Wooded forest.	1.7	2.295	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	18706	Wooded forest.	2.29	2.655	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	18696	Wooded forest.	2.79	2.88	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	18686	Wooded forest.	3.48	3.105	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	18676	Wooded forest.	3.1	3.075	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	18666	Wooded forest.	3.15	3.09	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	18656	Wooded forest.	2.68	2.895	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	18646	Wooded forest.	2.73	2.955	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	18636	Wooded forest.	2.76	3	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	18626	Wooded forest.	2.83	3.09	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	18616	Wooded forest.	3.92	3.465	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18606	Wooded forest.	4.55	3.81	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18596	Wooded forest.	4.51	3.69	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18586	Wooded forest.	3.98	3.645	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18576	Wooded forest.	4.09	3.765	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18566	Wooded forest.	4.73	3.9	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18556	Wooded forest.	4.29	3.87	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18546	Wooded forest.	4.05	3.765	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18536	Wooded forest.	4.4	3.765	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18526	Wooded forest.	4.25	3.72	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18516	Wooded forest.	5	3.975	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18506	Wooded forest.	5.37	3.9	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18496	Wooded forest.	6.07	4.035	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Medium
Existing Condition	18486	Wooded forest.	4.28	3.705	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18476	Wooded forest.	7.45	4.395	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Medium
Existing Condition	18466	Wooded forest.	5.17	3.96	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18456	Wooded forest.	5.03	3.945	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18446	Wooded forest.	5.39	4.035	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Medium
Existing Condition	18436	Wooded forest.	5.77	3.885	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18426	Wooded forest.	5.19	3.87	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18416	Wooded forest.	4.33	3.585	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low
Existing Condition	18406	Wooded forest.	3.86	3.375	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Low

Existing Condition	18396	Wooded forest.	4.53	3.51	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Very Excessive	Low
Existing Condition	18386	Wooded forest.	3.69	3.3	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	18376	Wooded forest.	3.57	3.285	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	18366	Wooded forest.	2.97	2.94	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	18356	Wooded forest.	2.565	2.73	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	18346	Wooded forest.	2.61	2.7	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Existing Condition	18336	Wooded forest.	2.49	2.67	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	18326	Wooded forest.	2.16	2.46	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	18316	Wooded forest.	2.025	2.385	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	18306	Wooded forest.	1.905	2.325	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	18296	Wooded forest.	1.77	2.22	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	18286	Wooded forest.	1.38	1.98	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18276	Wooded forest.	1.155	1.845	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18266	Wooded forest.	1.02	1.74	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18256	Wooded forest.	0.87	1.605	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18246	Wooded forest.	0.735	1.5	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18236	Wooded forest.	0.615	1.38	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18226	Wooded forest.	0.495	1.26	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18216	Wooded forest.	0.525	1.275	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18206	Wooded forest.	0.48	1.215	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18196	Wooded forest.	0.42	1.17	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	18186	Wooded forest.	0.375	1.14	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	18176	Wooded forest.	0.42	1.215	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	18166	Wooded forest.	0.45	1.305	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18158	Wooded forest.	0.48	1.32	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18146	Wooded forest.	0.54	1.335	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18136	Wooded forest.	0.49	1.26	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18126	Wooded forest.	0.48	1.26	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18116	Wooded forest.	0.51	1.305	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18106	Wooded forest.	0.46	1.26	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18096	Wooded forest.	0.465	1.275	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18086	Wooded forest.	0.435	1.23	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18076	Wooded forest.	0.45	1.245	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18067	Wooded forest.	0.51	1.245	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18057	Wooded forest.	0.405	1.125	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	18046	Wooded forest.	0.435	1.14	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18036	Wooded forest.	0.48	1.185	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18026	Wooded forest.	0.5	1.185	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	18016	Wooded forest.	0.42	1.11	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	18006	Wooded forest.	0.5	1.155	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	17996	Wooded forest.	0.7	1.29	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	17986	Wooded forest.	0.74	1.38	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	17976	Wooded forest.	0.76	1.38	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	17966	Wooded forest.	0.79	1.425	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	17956	Wooded forest.	0.94	1.455	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low

Existing Condition	17950	Wooded forest.	0.7	1.41	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	17942	Wooded forest.	0.81	1.485	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	17930	Wooded forest.	0.89	1.545	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	17918	Wooded forest.	1.21	1.785	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	17908	Wooded forest.	1.42	1.92	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	17900	Wooded forest.	1.49	2.01	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	17888	Wooded forest.	1.71	2.07	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	17877	Wooded forest.	1.62	2.07	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	17866	Wooded forest.	1.97	3.015	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	17858	Wooded forest.	1.93	3.54	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	17847	Wooded forest.	1.99	3.84	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	17836	Pine Plantation	1.7	3.81	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Very Excessive	Very Excessive
Existing Condition	17826	Pine Plantation	1.95	4.59	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Very Excessive	Very Excessive
Existing Condition	17816	Pine Plantation	1.2	4.71	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Very Excessive
Existing Condition	17806	Pine Plantation	2.14	5.25	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Very Excessive	Very Excessive
Existing Condition	17794	Pine Plantation	1.94	3.885	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Very Excessive	Very Excessive
Existing Condition	17784	Pine Plantation	2.39	3.165	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Very Excessive	Very Excessive
Existing Condition	17776	Pine Plantation	1.47	2.685	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Excessive
Existing Condition	17767	Pine Plantation	1.1	2.295	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Excessive
Existing Condition	17758	Pine Plantation	0.95	2.13	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	High	Excessive
Existing Condition	17747	Pine Plantation	0.85	2.07	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	High	Excessive
Existing Condition	17736	Pine Plantation	0.81	2.115	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	High	Excessive
Existing Condition	17728	Pine Plantation	0.56	1.905	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Medium	High
Existing Condition	17716	Pine Plantation	0.45	1.845	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Medium	Medium
Existing Condition	17706	Pine Plantation	0.525	2.115	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Medium	Excessive
Existing Condition	17696	Pine Plantation	0.585	2.475	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Medium	Excessive
Existing Condition	17686	Pine Plantation	0.675	3.105	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Medium	Very Excessive
Existing Condition	17677	Pine Plantation	0.72	4.05	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	High	Very Excessive
Existing Condition	17664	Pine Plantation	0.675	4.035	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Medium	Very Excessive
Existing Condition	17656	Pine Plantation	1.23	5.82	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Very Excessive
Existing Condition	17646	Pine Plantation	1.23	5.715	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Very Excessive
Existing Condition	17636	Pine Plantation	1.245	5.07	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Very Excessive
Existing Condition	17626	Pine Plantation	1.575	5.28	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Very Excessive	Very Excessive
Existing Condition	17617	Pine Plantation	1.2	5.055	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Very Excessive
Existing Condition	17607	Pine Plantation	1.17	4.305	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Very Excessive
Existing Condition	17596	Pine Plantation	1.59	4.5	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Very Excessive	Very Excessive
Existing Condition	17586	Pine Plantation	1.515	4.53	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Very Excessive	Very Excessive
Existing Condition	17576	Pine Plantation	2.01	5.25	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Very Excessive	Very Excessive
Existing Condition	17566	Pine Plantation	1.785	4.425	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Very Excessive	Very Excessive
Existing Condition	17556	Pine Plantation	1.99	4.515	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Very Excessive	Very Excessive
Existing Condition	17546	Pine Plantation	1.53	4.305	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Very Excessive	Very Excessive
Existing Condition	17536	Pine Plantation	1.44	4.05	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Very Excessive
Existing Condition	17527	Pine Plantation	1.29	3.45	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Very Excessive
Existing Condition	17516	Pine Plantation	0.98	2.865	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	High	Excessive
Existing Condition	17506	Pine Plantation	1.03	2.94	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Excessive

Existing Condition	17497	Pine Plantation	1.1	3.21	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	17487	Pine Plantation	1.4	3.525	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	17476	Pine Plantation	0.96	3.165	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	High	ery Excessiv
Existing Condition	17466	Pine Plantation	0.76	3.36	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	High	ery Excessiv
Existing Condition	17456	Pine Plantation	0.99	3.48	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	High	ery Excessiv
Existing Condition	17446	Pine Plantation	0.94	3.42	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	High	ery Excessiv
Existing Condition	17436	Pine Plantation	0.96	3.165	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	High	ery Excessiv
Existing Condition	17426	Pine Plantation	1.41	3.255	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	17416	Pine Plantation	1.65	3.39	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	ery Excessiv
Existing Condition	17406	Pine Plantation	1.635	3.21	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	ery Excessiv
Existing Condition	17396	Pine Plantation	1.95	2.76	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	Excessive
Existing Condition	17386	Pine Plantation	2.805	2.985	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	Excessive
Existing Condition	17376	Pine Plantation	2.475	2.805	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	Excessive
Existing Condition	17366	Pine Plantation	3.24	3.165	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	ery Excessiv
Existing Condition	17356	Pine Plantation	3.945	4.515	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	ery Excessiv
Existing Condition	17347	Pine Plantation	2.625	6.36	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	ery Excessiv
Existing Condition	17337	Pine Plantation	1.95	5.58	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	ery Excessiv
Existing Condition	17326	Pine Plantation	1.815	4.905	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	ery Excessiv
Existing Condition	17317	Pine Plantation	2.085	4.995	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	ery Excessiv
Existing Condition	17306	Pine Plantation	1.83	4.215	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	ery Excessiv
Existing Condition	17296	Pine Plantation	1.485	3.51	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	17285	Pine Plantation	1.515	3.57	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	ery Excessiv
Existing Condition	17275	Pine Plantation	1.47	3.675	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	17266	Pine Plantation	1.425	3.78	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	17257	Pine Plantation	1.53	4.335	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	ery Excessiv
Existing Condition	17247	Pine Plantation	1.77	4.485	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	ery Excessiv
Existing Condition	17236	Pine Plantation	1.545	4.185	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	ery Excessiv
Existing Condition	17224	Pine Plantation	1.905	4.59	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	ery Excessiv
Existing Condition	17214	Pine Plantation	1.29	3.855	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	17206	Pine Plantation	0.75	3.195	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	High	ery Excessiv
Existing Condition	17196	Pine Plantation	0.405	2.46	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Medium	Excessive
Existing Condition	17186	Pine Plantation	0.54	2.535	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Medium	Excessive
Existing Condition	17176	Pine Plantation	0.69	2.46	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Medium	Excessive
Existing Condition	17166	Pine Plantation	0.945	2.565	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	High	Excessive
Existing Condition	17156	Pine Plantation	1.245	2.43	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Excessive
Existing Condition	17146	Pine Plantation	1.515	2.475	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	Excessive
Existing Condition	17136	Pine Plantation	1.44	2.355	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Excessive
Existing Condition	17126	Pine Plantation	1.68	2.43	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	Excessive
Existing Condition	17116	Pine Plantation	1.815	2.415	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	Excessive
Existing Condition	17106	Pine Plantation	2.265	2.67	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	Excessive
Existing Condition	17096	Pine Plantation	1.65	2.535	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	Excessive
Existing Condition	17086	Pine Plantation	1.9	2.625	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	Excessive
Existing Condition	17076	Pine Plantation	1.64	2.535	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	Excessive
Existing Condition	17066	Pine Plantation	1.54	2.415	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessiv	Excessive
Existing Condition	17056	Pine Plantation	1.365	2.43	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Excessive

Existing Condition	17046	Pine Plantation	1.35	2.7	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Excessive
Existing Condition	17036	Pine Plantation	1.215	2.775	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	Excessive
Existing Condition	17026	Pine Plantation	0.93	2.895	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	High	Excessive
Existing Condition	17019	Pine Plantation	1.05	3.555	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	17009	Pine Plantation	1.245	4.26	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	16996	Pine Plantation	1.02	4.005	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	16986	Pine Plantation	1.185	4.425	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	16976	Pine Plantation	1.455	4.53	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	16966	Pine Plantation	1.65	4.425	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessive	ery Excessiv
Existing Condition	16955	Pine Plantation	1.68	4.95	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessive	ery Excessiv
Existing Condition	16945	Pine Plantation	1.23	4.605	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	16936	Pine Plantation	0.75	3.99	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	High	ery Excessiv
Existing Condition	16926	Pine Plantation	0.66	4.39	1.5*ave	chan	0.4	0.7	1	1.75	1.875	2	Medium	ery Excessiv
Existing Condition	16915	Pine Plantation	1.16	7.5	chan	chan	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	16906	Pine Plantation	1.27	5.07	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	16896	Pine Plantation	1.545	5.28	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	ery Excessive	ery Excessiv
Existing Condition	16886	Pine Plantation	1.03	4.785	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	16876	Pine Plantation	0.66	3.675	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Medium	ery Excessiv
Existing Condition	16866	Pine Plantation	0.68	3.615	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Medium	ery Excessiv
Existing Condition	16856	Pine Plantation	1.38	3.09	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Excessive	ery Excessiv
Existing Condition	16846	Pine Plantation	0.4	2.49	chan	1.5*ave	0.4	0.7	1	1.75	1.875	2	Medium	Excessive
Existing Condition	16836	Pine Plantation	0.315	2.235	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Low	Excessive
Existing Condition	16826	Pine Plantation	0.225	2.115	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Low	Excessive
Existing Condition	16816	Pine Plantation	0.195	2.115	1.5*ave	1.5*ave	0.4	0.7	1	1.75	1.875	2	Low	Excessive
Existing Condition	16807	Wooded forest.	0.18	2.67	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16797	Wooded forest.	0.21	3.35	chan	chan	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16786	Wooded forest.	0.23	3.23	chan	chan	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16776	Wooded forest.	0.195	2.37	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16766	Wooded forest.	0.26	3.75	chan	chan	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16756	Wooded forest.	0.33	3.53	chan	chan	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16746	Wooded forest.	0.345	3.66	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16736	Wooded forest.	0.405	3.645	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16726	Wooded forest.	0.39	3.51	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16716	Wooded forest.	0.43	3.57	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16706	Wooded forest.	0.405	3.3	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16696	Wooded forest.	0.495	3.195	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16686	Wooded forest.	0.585	3.135	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16676	Wooded forest.	0.675	3.045	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16666	Wooded forest.	0.69	2.79	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16656	Wooded forest.	0.645	2.625	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16646	Wooded forest.	0.645	2.445	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16636	Wooded forest.	0.66	2.46	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16631	Wooded forest.	0.675	2.355	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16626	Wooded forest.	0.675	2.28	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16621	Wooded forest.	0.645	2.19	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low

Existing Condition	16607	Wooded forest.	0.675	2.115	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16592	Wooded forest.	1.05	2.43	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16579	Wooded forest.	1	2.355	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16557	Wooded forest.	1.78	3.54	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	16546	Wooded forest.	2.17	4.47	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	16538	Wooded forest.	2.49	5.235	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	16534	Wooded forest.	2.47	5.28	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	16529	Wooded forest.	2.63	5.775	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	High
Existing Condition	16519	Wooded forest.	1.56	4.995	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	16508	Wooded forest.	1.41	5.085	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	16494	Wooded forest.	0.62	3.765	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16486	Wooded forest.	0.46	3.33	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16476	Wooded forest.	0.42	2.97	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16466	Wooded forest.	0.465	2.79	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16456	Wooded forest.	0.615	2.655	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16446	Wooded forest.	0.705	2.745	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16436	Wooded forest.	0.615	2.655	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16426	Wooded forest.	0.555	2.7	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16416	Wooded forest.	0.51	2.73	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16406	Wooded forest.	0.48	2.88	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16396	Wooded forest.	0.375	2.835	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16386	Wooded forest.	0.315	2.595	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16376	Wooded forest.	0.255	2.55	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16366	Wooded forest.	0.255	2.73	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16356	Wooded forest.	0.255	2.865	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16346	Wooded forest.	0.87	2.85	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16336	Wooded forest.	0.21	2.73	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16326	Wooded forest.	0.795	2.655	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16316	Wooded forest.	0.18	2.49	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16306	Wooded forest.	0.6	2.34	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	16296	Wooded forest.	0.165	2.205	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16286	Wooded forest.	0.15	2.025	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16276	Wooded forest.	0.15	1.98	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16266	Wooded forest.	0.135	1.92	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16256	Wooded forest.	0.15	2.055	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16246	Wooded forest.	0.195	2.205	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16236	Wooded forest.	0.225	2.64	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16226	Wooded forest.	0.32	3.33	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16216	Wooded forest.	0.42	3.825	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	16206	Wooded forest.	0.51	4.29	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	16196	Wooded forest.	0.6	4.74	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	16186	Wooded forest.	0.675	5.145	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	16176	Wooded forest.	0.765	5.475	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	16166	Wooded forest.	1.035	6.345	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	16156	Wooded forest.	1.44	7.74	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive

Existing Condition	16146	Wooded forest.	1.44	8.04	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	16136	Wooded forest.	1.455	7.545	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	16126	Wooded forest.	1.26	5.7	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	16116	Wooded forest.	1.125	5.67	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	16106	Wooded forest.	1.66	7.125	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	16096	Wooded forest.	2.22	8.085	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	16087	Wooded forest.	1.88	8.625	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	16077	Wooded forest.	1.035	8.4	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	16066	Wooded forest.	1	8.25	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	16056	Wooded forest.	0.615	6.75	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	16046	Wooded forest.	1.275	5.61	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	16036	Wooded forest.	2.37	5.04	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	16026	Wooded forest.	2.95	5.16	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	High
Existing Condition	16016	Wooded forest.	3.86	4.92	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Very Excessive	Medium
Existing Condition	16006	Wooded forest.	1.4	3.615	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15997	Wooded forest.	1.17	3.03	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15987	Wooded forest.	0.795	2.505	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15976	Wooded forest.	0.555	2.025	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15966	Wooded forest.	0.465	1.785	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15956	Wooded forest.	0.435	1.74	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15946	Wooded forest.	0.435	1.77	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15936	Wooded forest.	0.435	1.815	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15926	Wooded forest.	0.45	1.86	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15916	Wooded forest.	0.45	1.92	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15906	Wooded forest.	0.495	2.175	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15896	Wooded forest.	0.525	2.55	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15886	Wooded forest.	0.48	2.745	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15876	Wooded forest.	0.64	4.32	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	15866	Wooded forest.	0.69	5.31	chan	chan	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15856	Wooded forest.	1.36	8.1	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15845	Wooded forest.	1.13	8.58	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15834	Wooded forest.	1.16	8.745	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15826	Wooded forest.	1.11	8.115	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15816	Wooded forest.	0.98	6.525	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15806	Wooded forest.	0.84	5.31	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15796	Wooded forest.	0.975	5.085	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15786	Wooded forest.	0.915	4.53	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	15776	Wooded forest.	0.705	3.87	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15766	Wooded forest.	0.675	3.735	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15757	Wooded forest.	0.645	3.51	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15747	Wooded forest.	0.6	3.555	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15736	Wooded forest.	0.585	3.33	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15726	Wooded forest.	0.615	3.36	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15716	Wooded forest.	0.63	3.195	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15706	Wooded forest.	0.57	2.88	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low

Existing Condition	15696	Wooded forest.	0.6	2.985	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15686	Wooded forest.	0.645	3.045	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15676	Wooded forest.	0.74	3.54	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15666	Wooded forest.	0.94	4.2	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	15656	Wooded forest.	0.97	4.575	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	15646	Wooded forest.	1.41	5.955	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15637	Wooded forest.	1.605	6.39	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	15627	Wooded forest.	1.455	6.105	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15616	Wooded forest.	1.605	6.315	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	15606	Wooded forest.	1.38	5.82	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15596	Wooded forest.	3.15	8.25	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Excessive
Existing Condition	15586	Wooded forest.	1.38	5.475	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15576	Wooded forest.	1.65	5.97	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	15566	Wooded forest.	2.61	7.08	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Excessive
Existing Condition	15556	Wooded forest.	2.265	6.285	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	15546	Wooded forest.	2.79	6.675	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Excessive
Existing Condition	15536	Wooded forest.	3.045	6.855	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Excessive
Existing Condition	15526	Wooded forest.	1.695	5.34	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	15513	Wooded forest.	1.77	5.235	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	15508	Wooded forest.	1.935	5.235	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	15500	Wooded forest.	1.905	5.805	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	15486	Wooded forest.	1.47	5.22	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	15476	Wooded forest.	1.35	5.145	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15466	Wooded forest.	1.455	5.475	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15456	Wooded forest.	1.395	5.385	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15446	Wooded forest.	1.275	5.685	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15436	Wooded forest.	1.11	5.505	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15426	Wooded forest.	1.065	5.475	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15416	Wooded forest.	0.96	5.49	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15406	Wooded forest.	0.945	5.88	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15396	Wooded forest.	1.125	6.3	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15386	Wooded forest.	1.695	8.175	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	15376	Wooded forest.	1.725	7.875	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	15366	Wooded forest.	1.515	7.5	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	15356	Wooded forest.	1.29	6.9	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15346	Wooded forest.	1.08	5.97	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	15336	Wooded forest.	0.855	4.935	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	15326	Wooded forest.	0.795	4.905	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	15316	Wooded forest.	1.26	7.55	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15306	Wooded forest.	1.26	6.91	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15296	Wooded forest.	0.86	6.51	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15286	Wooded forest.	1.34	8	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15276	Wooded forest.	1.35	8.07	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15266	Wooded forest.	1.45	8.32	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15256	Wooded forest.	1.43	8.17	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive

Existing Condition	15246	Wooded forest.	1.41	8.16	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15236	Wooded forest.	1.31	7.83	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15226	Wooded forest.	1.38	8.03	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15216	Wooded forest.	1.51	8.41	chan	chan	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	15206	Wooded forest.	1.37	8.07	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15196	Wooded forest.	1.47	8.36	chan	chan	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	15186	Wooded forest.	1.35	7.96	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15176	Wooded forest.	1.22	7.51	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15166	Wooded forest.	1.21	7.45	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15156	Wooded forest.	1.16	7.33	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15146	Wooded forest.	1.11	7.16	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15136	Wooded forest.	1.26	7.64	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15126	Wooded forest.	1.25	7.6	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15116	Wooded forest.	0.735	3.915	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15106	Wooded forest.	0.56	3.52	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	15096	Wooded forest.	1.18	7.46	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15086	Wooded forest.	1.33	7.99	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15076	Wooded forest.	1.13	7.33	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15066	Wooded forest.	1.1	7.22	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15056	Wooded forest.	1.12	7.19	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15046	Wooded forest.	1.35	7.92	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15036	Wooded forest.	1.27	7.69	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15026	Wooded forest.	1.07	7.08	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15016	Wooded forest.	1.13	7.41	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	15006	Wooded forest.	1.29	7.73	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14996	Wooded forest.	1.23	7.53	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14986	Wooded forest.	2.08	6.045	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	14976	Wooded forest.	1.95	5.73	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	14966	Wooded forest.	1.69	5.085	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	14956	Wooded forest.	1.98	5.25	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	14946	Wooded forest.	1.6	4.68	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	14936	Wooded forest.	1.635	4.395	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	14926	Wooded forest.	1.635	4.38	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	14916	Wooded forest.	1.695	4.455	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	14906	Wooded forest.	1.515	3.855	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14896	Wooded forest.	1.74	3.84	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14886	Wooded forest.	1.695	3.78	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14876	Wooded forest.	1.71	3.72	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14866	Wooded forest.	1.68	3.48	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14856	Wooded forest.	1.515	3.27	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14846	Wooded forest.	1.5	3.21	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14836	Wooded forest.	2.01	3.525	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14826	Wooded forest.	1.875	3.255	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14816	Wooded forest.	1.8	3.09	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14806	Wooded forest.	2.04	3.195	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low

Existing Condition	14796	Wooded forest.	1.8	3.09	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14786	Wooded forest.	1.545	2.895	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14776	Wooded forest.	1.485	2.895	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14766	Wooded forest.	1.695	3.06	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14756	Wooded forest.	1.35	2.82	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	14746	Wooded forest.	1.44	2.805	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	14736	Wooded forest.	1.455	3	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	14726	Wooded forest.	1.62	3.15	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14716	Wooded forest.	1.62	3.135	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14706	Wooded forest.	1.62	3.135	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14696	Wooded forest.	1.485	3.015	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14686	Wooded forest.	1.515	2.985	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14676	Wooded forest.	1.455	3.015	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	14666	Wooded forest.	1.575	3.24	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14656	Wooded forest.	1.575	3.075	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14646	Wooded forest.	1.605	3.06	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14636	Wooded forest.	1.365	3.03	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	14626	Wooded forest.	1.5	3.15	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	14616	Wooded forest.	1.215	3.045	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	14606	Wooded forest.	1.05	2.895	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	14596	Wooded forest.	1.07	4.37	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	14586	Wooded forest.	1.37	5.02	chan	chan	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	14576	Wooded forest.	1.14	5	chan	chan	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	14566	Wooded forest.	0.89	4.7	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	14556	Wooded forest.	0.83	5.41	chan	chan	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	14546	Wooded forest.	1.29	6.82	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14536	Wooded forest.	1.44	7.14	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14526	Wooded forest.	1.31	5.57	chan	chan	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	14516	Wooded forest.	1.48	6.04	chan	chan	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	14506	Wooded forest.	1.07	4.65	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	14496	Wooded forest.	1.7	6.5	chan	chan	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	14486	Wooded forest.	1.13	4.99	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	14476	Wooded forest.	1.12	6.29	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14466	Wooded forest.	0.78	4.67	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	14456	Wooded forest.	1.18	7.14	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14446	Wooded forest.	1.2	7.81	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14438	Wooded forest.	1.13	7.53	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14428	Wooded forest.	1.25	7.85	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14416	Wooded forest.	1.15	7.55	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14407	Wooded forest.	0.78	4.635	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	14397	Wooded forest.	0.98	6.89	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14386	Wooded forest.	1.45	8.57	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14376	Wooded forest.	1.25	8.04	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14366	Wooded forest.	1.27	8.09	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14356	Wooded forest.	1.31	7.38	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive

Existing Condition	14346	Wooded forest.	1.32	7.4	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14333	Wooded forest.	1.54	8.93	chan	chan	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	14326	Wooded forest.	1.85	9.54	chan	chan	0.43	1.465	2.5	4	5	6	High	ery Excessiv
Existing Condition	14316	Wooded forest.	0.83	5.31	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Existing Condition	14306	Wooded forest.	1.62	9.22	chan	chan	0.43	1.465	2.5	4	5	6	High	ery Excessiv
Existing Condition	14296	Wooded forest.	1.425	8.37	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14286	Wooded forest.	1.64	9.21	chan	chan	0.43	1.465	2.5	4	5	6	High	ery Excessiv
Existing Condition	14276	Wooded forest.	1.5	8.89	chan	chan	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	14266	Wooded forest.	0.94	7.17	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14257	Wooded forest.	0.91	7.06	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14247	Wooded forest.	0.88	7.02	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14236	Wooded forest.	0.93	7.68	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14226	Wooded forest.	0.89	8.01	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14216	Wooded forest.	0.92	8.445	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14206	Wooded forest.	1.45	11.085	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	ery Excessiv
Existing Condition	14196	Wooded forest.	1.23	10.17	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	ery Excessiv
Existing Condition	14186	Wooded forest.	1.24	10.2	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	ery Excessiv
Existing Condition	14176	Wooded forest.	1.21	9.525	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	ery Excessiv
Existing Condition	14166	Wooded forest.	1.095	9.48	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	ery Excessiv
Existing Condition	14156	Wooded forest.	1.05	9.36	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	ery Excessiv
Existing Condition	14146	Wooded forest.	1.755	12.24	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	ery Excessiv
Existing Condition	14136	Wooded forest.	1.26	10.455	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	ery Excessiv
Existing Condition	14126	Wooded forest.	1.23	10.185	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	ery Excessiv
Existing Condition	14116	Wooded forest.	0.945	8.97	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14106	Wooded forest.	1.425	11.07	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	ery Excessiv
Existing Condition	14096	Wooded forest.	1.56	11.235	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	ery Excessiv
Existing Condition	14086	Wooded forest.	1.44	10.755	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	ery Excessiv
Existing Condition	14076	Wooded forest.	1.425	10.41	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	ery Excessiv
Existing Condition	14066	Wooded forest.	1.095	8.655	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14056	Wooded forest.	1.42	10.17	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	ery Excessiv
Existing Condition	14045	Wooded forest.	1.515	10.065	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	ery Excessiv
Existing Condition	14035	Wooded forest.	1.395	8.97	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14026	Wooded forest.	1.455	8.55	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14016	Wooded forest.	1.395	7.2	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	14006	Wooded forest.	1.71	8.205	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	13996	Wooded forest.	1.875	8.82	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	13986	Wooded forest.	1.68	9.15	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	ery Excessiv
Existing Condition	13976	Wooded forest.	1.065	7.68	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Existing Condition	13966	Wooded forest.	2.19	7.11	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	13955	Wooded forest.	3	7.485	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Excessive
Existing Condition	13945	Wooded forest.	2.36	6.345	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Existing Condition	13936	Wooded forest.	2.73	6.375	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Excessive
Existing Condition	13926	Wooded forest.	2.61	5.925	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	High
Existing Condition	13916	Wooded forest.	2.08	5.535	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	13906	Wooded forest.	3.56	6.525	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Excessive

Existing Condition	13896	Wooded forest.	2.76	5.895	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	High
Existing Condition	13886	Wooded forest.	2.32	5.205	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	13876	Wooded forest.	1.97	4.965	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	13866	Wooded forest.	1.65	4.86	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	13856	Wooded forest.	1.94	5.085	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	13846	Wooded forest.	2.19	5.25	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	13836	Wooded forest.	2.15	5.145	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	13826	Wooded forest.	1.83	5.19	chan	chan	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	13816	Wooded forest.	1.55	4.26	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	13806	Wooded forest.	1.82	4.35	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	13796	Wooded forest.	1.14	3.795	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	13786	Wooded forest.	2.57	6.82	chan	chan	0.43	1.465	2.5	4	5	6	Excessive	Excessive
Existing Condition	13776	Wooded forest.	1.8	5.6	chan	chan	0.43	1.465	2.5	4	5	6	High	High
Existing Condition	13765	Wooded forest.	1.96	4.725	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	13756	Wooded forest.	1.93	4.455	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	13746	Wooded forest.	2.49	4.98	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	13736	Wooded forest.	6.13	7.155	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Very Excessive	Excessive
Existing Condition	13726	Wooded forest.	2.38	3.27	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	13715	Wooded forest.	2.11	3.225	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	13706	Wooded forest.	2.01	3.06	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	13696	Wooded forest.	1.84	3.18	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	13684	Wooded forest.	2.02	3.405	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	13674	Wooded forest.	1.86	3.36	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	13666	Wooded forest.	2.28	3.765	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	13656	Wooded forest.	2.16	3.81	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	13646	Wooded forest.	1.81	3.87	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	13636	Wooded forest.	1.73	3.825	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	13626	Wooded forest.	1.44	3.765	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	13616	Wooded forest.	1.37	4.005	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	13606	Wooded forest.	1.51	4.17	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	13596	Wooded forest.	1.3	4.035	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	13586	Wooded forest.	0.88	3.06	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	13576	Wooded forest.	0.87	3.345	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	13566	Wooded forest.	0.795	2.52	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	13556	Wooded forest.	0.42	1.14	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	13546	Wooded forest.	0.255	1.05	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	13538	Wooded forest.	0.21	0.975	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	13530	Wooded forest.	0.15	0.81	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	13521	Wooded forest.	0.15	0.795	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	13510	Wooded forest.	0.15	0.765	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	13497	Wooded forest.	0.12	0.705	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	13486	Wooded forest.	0.135	0.72	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	13474	Wooded forest.	0.075	0.54	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	13461	Wooded forest.	0.195	0.885	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Existing Condition	13447	Wooded forest.	0.51	1.17	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low

Existing Condition	13430	Wooded forest.	2.07	3.27	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Existing Condition	13420	Wooded forest.	2.79	4.38	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Medium
Existing Condition	13412	Wooded forest.	3.21	4.65	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Medium
Existing Condition	13402	Wooded forest.	3.47	5.28	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	High
Existing Condition	13391	Wooded forest.	3.79	5.64	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	High
Existing Condition	13382	Wooded forest.	4.01	5.505	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	High
Existing Condition	13369	Wooded forest.	5.24	6.48	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	Excessive
Existing Condition	13358	Wooded forest.	3.79	5.355	chan	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	High
Existing Condition	13345	Wooded forest.	3.21	5.04	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	High
Existing Condition	13328	Wooded forest.	2.37	4.5	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Existing Condition	13312	Wooded forest.	2.79	5.13	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	High
Existing Condition	13296	Wooded forest.	1.455	4.065	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Existing Condition	13275	Wooded forest.	1.44	3.42	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	13261	Wooded forest.	1.275	3.225	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	13248	Wooded forest.	1.29	3.21	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Existing Condition	13235	Wooded forest.	4.695	5.475	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	ery Excessiv	High
Existing Condition	13225	High Grass. Wetland	1.545	3.495	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Existing Condition	13217	High Grass. Wetland	0.48	2.205	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low
Existing Condition	13202	High Grass. Wetland	1.185	2.985	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low
Existing Condition	13187	High Grass. Wetland	0.975	2.745	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low
Existing Condition	13174	High Grass. Wetland	1.77	3.51	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Existing Condition	13170	High Grass. Wetland	1.995	3.495	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Existing Condition	13155	High Grass. Wetland	1.695	4.11	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Existing Condition	13140	High Grass. Wetland	0.945	3.87	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Existing Condition	13129	High Grass. Wetland	1.41	4.875	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Existing Condition	13111	High Grass. Wetland	0.975	4.995	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Existing Condition	13098	High Grass. Wetland	0.645	5.37	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Existing Condition	13082	High Grass. Wetland	0.435	4.365	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Existing Condition	13069	High Grass. Wetland	0.84	6.57	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	High
Existing Condition	13057	High Grass. Wetland	0.795	6.72	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	High
Existing Condition	13044	High Grass. Wetland	0.705	5.565	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Existing Condition	13028	High Grass. Wetland	0.315	3.855	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Existing Condition	13012	High Grass. Wetland	0.015	0.735	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low
Existing Condition	13000	High Grass. Wetland	0	0.54	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low
Existing Condition	12983	High Grass. Wetland	0	0.375	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low
Existing Condition	12969	High Grass. Wetland	0	0.3	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low
Existing Condition	12958	High Grass. Wetland	0	0.255	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low
Existing Condition	12945	High Grass. Wetland	0	0.24	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low

	River Station	Vegetative Cover	Shear to Use	Velocity to Use	Shear Source	Velocity Source	Shear Threshold Minimum	Shear Threshold Average	Shear Threshold Maximum	Velocity Threshold Minimum	Velocity Threshold Average	Velocity Threshold Maximum	Shear Category	Velocity Category
Proposed Condition	23488	Pasture	0.465	5.475	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23478	Pasture	0.74	6.825	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23468	Pasture	0.795	7.11	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	23458	Pasture	0.78	6.945	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23448	Pasture	0.84	7.125	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	23438	Pasture	0.885	7.08	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	23428	Pasture	0.765	6.795	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23418	Pasture	0.84	6.825	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23408	Pasture	0.54	5.655	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23398	Pasture	0.825	6.54	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23388	Pasture	0.57	5.55	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23378	Pasture	0.465	5.04	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23368	Pasture	0.315	4.29	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23356	Pasture	0.72	6.165	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23342	Pasture	0.585	5.46	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23338	Pasture	0.375	4.5	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23335	Pasture	0.285	4.05	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23320	Pasture	0.615	5.88	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23308	Pasture	0.69	6.15	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23298	Pasture	0.75	6.27	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23287	Pasture	0.765	6.57	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23278	Pasture	0.54	5.745	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23269	Pasture	0.33	4.41	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23259	Pasture	0.18	3.345	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23248	Pasture	0.12	2.76	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23242	Pasture	0.135	2.94	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23229	Pasture	0.12	2.91	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23218	Pasture	0.21	3.66	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23209	Pasture	0.3	4.275	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23199	Pasture	0.615	6	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23188	Pasture	0.435	5.265	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23179	Pasture	0.705	6.54	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23169	Pasture	0.735	6.57	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23158	Pasture	0.78	6.705	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23149	Pasture	0.855	7.005	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	23139	Pasture	0.72	6.33	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23128	Pasture	0.765	6.555	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23119	Pasture	0.795	6.645	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23109	Pasture	0.78	6.735	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23098	Pasture	0.885	7.095	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	23088	Pasture	0.555	5.7	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23078	Pasture	0.42	5.085	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	23068	Pasture	0.79	6.525	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23058	Pasture	0.9	7.05	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	23048	Pasture	0.99	7.26	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	23038	Pasture	0.92	7.035	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	23029	Pasture	0.795	7.005	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	23019	Pasture	0.75	6.675	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	23008	Pasture	0.465	5.325	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	22998	Pasture	0.525	5.82	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	22987	Pasture	0.9	7.305	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22978	Pasture	0.825	7.095	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22969	Pasture	0.885	7.305	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22959	Pasture	0.93	7.41	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22948	Pasture	0.72	6.66	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	22939	Pasture	0.915	7.44	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High

Proposed Condition	22928	Pasture	0.945	7.575	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22918	Pasture	0.93	7.44	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22909	Pasture	0.81	7.02	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22898	Pasture	0.885	7.44	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22888	Pasture	0.98	7.86	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22878	Pasture	0.82	7.08	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22868	Pasture	0.74	6.9	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	22858	Pasture	0.82	7.095	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22849	Pasture	0.83	7.215	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22838	Pasture	0.93	7.575	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22828	Pasture	0.96	7.665	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22818	Pasture	0.99	7.77	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22808	Pasture	1.125	8.43	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Proposed Condition	22798	Pasture	1.035	8.145	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Proposed Condition	22788	Pasture	1.02	8.1	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Proposed Condition	22778	Pasture	1.185	8.7	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Proposed Condition	22768	Pasture	1.005	8.1	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Proposed Condition	22758	Pasture	1.035	8.055	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Proposed Condition	22748	Pasture	1.05	8.16	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Proposed Condition	22738	Pasture	1.005	7.98	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22728	Pasture	0.975	7.92	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22718	Pasture	1.035	7.965	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22708	Pasture	0.915	7.755	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22698	Pasture	0.93	7.635	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22688	Pasture	0.975	7.815	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22678	Pasture	0.75	6.93	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	22668	Pasture	0.85	7.275	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22658	Pasture	1.08	8.295	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Proposed Condition	22648	Pasture	1.005	7.92	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22639	Pasture	0.87	7.425	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22629	Pasture	1.125	8.46	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Proposed Condition	22618	Pasture	1.11	8.16	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Excessive
Proposed Condition	22608	Pasture	0.93	7.56	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	High
Proposed Condition	22598	Pasture	0.72	6.39	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	22588	Pasture	0.68	6.435	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	22578	Pasture	0.74	6.42	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	22568	Pasture	0.62	6.24	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Medium
Proposed Condition	22558	Pasture	0.36	4.71	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	22548	Pasture	0.195	3.615	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	22538	Pasture	0.15	3.225	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	22528	Pasture	0.105	2.625	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	22518	Pasture	0.075	2.355	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	22508	Pasture	0.075	2.43	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	22498	Pasture	0.075	2.34	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	22488	Pasture	0.09	2.34	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	22478	Wooded forest.	0.135	2.61	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	22468	Wooded forest.	1.905	2.475	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	22458	Wooded forest.	2.37	2.79	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	22448	Wooded forest.	2.33	2.775	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	22438	Wooded forest.	1.47	2.175	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	22429	Wooded forest.	1.81	2.19	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	22419	Wooded forest.	1.06	1.695	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22408	Wooded forest.	1.13	1.74	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22398	Wooded forest.	0.92	1.68	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22396	Wooded forest.	0	0	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	22388	Wooded forest.	1.45	2.07	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22378	Wooded forest.	1.33	2.025	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22369	Wooded forest.	1.36	2.1	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22360	Wooded forest.	1.53	2.145	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low

Proposed Condition	22348	Wooded forest.	1.11	1.965	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22338	Wooded forest.	0.84	1.755	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22328	Wooded forest.	1.05	1.875	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22326	Wooded forest.	0	0	1.5*ave	1.5*ave	0.43	1.465	2.5*ave	4	5	6	Low	Low
Proposed Condition	22318	Wooded forest.	1.38	2.205	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22308	Wooded forest.	1.44	2.16	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22298	Wooded forest.	1.25	2.04	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22288	Wooded forest.	1.17	1.965	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22278	Wooded forest.	0.97	1.8	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22268	Wooded forest.	0.81	1.665	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22258	Wooded forest.	0.67	1.56	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22256	Wooded forest.	0	0	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	22248	Wooded forest.	0.87	1.755	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22238	Wooded forest.	0.705	1.62	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22228	Wooded forest.	0.6	1.485	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22218	Wooded forest.	0.54	1.395	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22208	Wooded forest.	0.48	1.32	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22198	Wooded forest.	0.42	1.215	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	22189	Wooded forest.	0.405	1.185	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	22186	Wooded forest.	0	0	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	22178	Wooded forest.	0.75	1.56	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22168	Wooded forest.	0.645	1.44	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22159	Wooded forest.	0.675	1.485	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22148	Wooded forest.	0.66	1.56	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22138	Wooded forest.	0.85	1.65	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22129	Wooded forest.	0.83	1.65	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22119	Wooded forest.	0.9	1.635	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22116	Wooded forest.	0	0	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	22108	Wooded forest.	4.9	3.405	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Very Excessive	Low
Proposed Condition	22098	Wooded forest.	2.39	2.4	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	22088	Wooded forest.	1.95	2.09	chan	chan	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	22078	Wooded forest.	0.9	1.5	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22068	Wooded forest.	0.38	1.14	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	22057	Wooded forest.	0.2	0.96	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	22051	Wooded forest.	0.13	0.855	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	22041	Wooded forest.	0.105	0.81	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	22029	Wooded forest.	0.075	0.72	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	22021	Wooded forest.	0	0	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	22018	Wooded forest.	1.14	2.1	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22015	Wooded forest.	0.7	1.68	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	22008	Wooded forest.	0.3	1.26	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21980	Wooded forest.	0.13	0.84	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21946	Wooded forest.	0.075	0.495	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21902	Wooded forest.	0.075	0.51	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21900	Wooded forest.	0	0	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21888	Wooded forest.	0.915	1.5	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21876	Wooded forest.	1.125	1.65	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21865	Wooded forest.	2.28	2.505	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	21858	Wooded forest.	2.3	2.34	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	21848	Wooded forest.	1.92	2.205	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	21838	Wooded forest.	1.68	2.07	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	21827	Wooded forest.	1.13	1.815	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21811	Wooded forest.	0.81	1.74	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21792	Wooded forest.	0.76	1.815	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21791	Wooded forest.	0	0	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21760	Wooded forest.	1.125	2.475	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21746	Wooded forest.	0.555	2.025	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21733	Wooded forest.	0.33	1.71	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21715	Wooded forest.	0.18	1.395	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low

Proposed Condition	21710	Wooded forest.	0.15	1.32	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21699	Wooded forest.	0.09	1.26	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21690	Wooded forest.	0	0	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21688	Power line corridor	3.4	5.565	chan	1.5*ave	1.5	2	2.5	6	7	8	Excessive	Low
Proposed Condition	21678	Power line corridor	0.885	4.155	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21667	Power line corridor	0.69	4.035	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21658	Power line corridor	0.495	4.005	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21647	Power line corridor	0.45	4.26	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21637	Power line corridor	0.345	4.14	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21628	Power line corridor	0.51	5.235	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21616	Power line corridor	0.435	5.055	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21606	Power line corridor	0.48	5.295	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21598	Power line corridor	0.64	5.895	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21588	Power line corridor	0.55	5.61	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21578	Power line corridor	0.61	5.91	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21568	Power line corridor	0.525	5.655	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21558	Power line corridor	0.42	4.935	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21548	Power line corridor	0.42	4.92	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21538	Power line corridor	0.525	5.16	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21531	Power line corridor	0.315	4.185	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21521	Power line corridor	0.24	3.99	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21508	Power line corridor	0.3	4.185	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21498	Power line corridor	0.195	3.78	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21488	Power line corridor	0.28	4.05	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21478	Power line corridor	0.21	3.645	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21469	Power line corridor	0.135	3.21	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21459	Power line corridor	0.12	2.94	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21448	Power line corridor	0.09	2.58	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21438	Power line corridor	0.075	2.235	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21428	Power line corridor	0.05	1.965	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21418	Power line corridor	0.05	1.98	chan	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21407	Power line corridor	0.045	1.86	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21397	Power line corridor	0.045	1.635	1.5*ave	1.5*ave	1.5	2	2.5	6	7	8	Low	Low
Proposed Condition	21388	Wooded forest.	0.04	1.53	chan	chan	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21378	Wooded forest.	0.04	1.45	chan	chan	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21368	Wooded forest.	0.045	1.21	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21358	Wooded forest.	0.045	1.06	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21348	Wooded forest.	0.045	0.96	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21337	Wooded forest.	0.06	0.945	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21328	Wooded forest.	0.105	0.885	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21321	Wooded forest.	0.165	0.9	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21310	Wooded forest.	0.21	0.93	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21298	Wooded forest.	0.27	1.005	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21289	Wooded forest.	0.345	1.155	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21278	Wooded forest.	0.405	1.245	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	21268	Wooded forest.	0.525	1.41	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21258	Wooded forest.	0.795	1.68	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21248	Wooded forest.	1.275	2.055	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21238	Wooded forest.	1.83	2.46	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	21228	Wooded forest.	2.46	2.775	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	21218	Wooded forest.	3.19	3.03	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Proposed Condition	21208	Wooded forest.	4.32	3.375	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Very Excessive	Low
Proposed Condition	21198	Wooded forest.	2.81	2.91	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Excessive	Low
Proposed Condition	21188	Perm RECP	1.89	2.52	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	21178	Perm RECP	1.425	2.205	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	21168	Perm RECP	1.125	2.01	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	21157	Perm RECP	0.915	1.8	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	21148	Perm RECP	0.66	1.53	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	21146	Perm RECP	0	0	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low

Proposed Condition	21139	Perm RECP	1.47	2.25	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	21129	Perm RECP	1.38	2.22	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	21118	Wooded forest.	1.38	2.205	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21109	Wooded forest.	1.32	2.175	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21099	Wooded forest.	1.365	2.205	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21088	Wooded forest.	1.215	2.085	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21077	Wooded forest.	1.125	2.01	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21067	Wooded forest.	0.885	1.86	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21058	Perm RECP	0.885	1.785	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	21049	Perm RECP	0.78	1.71	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	21046	Perm RECP	0	0	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	21039	Perm RECP	1.245	2.115	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	21028	Perm RECP	1.26	2.13	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	21019	Wooded forest.	1.29	2.13	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	21008	Wooded forest.	1.17	2.07	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	20998	Wooded forest.	1.14	2.025	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	20988	Wooded forest.	1.17	2.07	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	20978	Wooded forest.	1.2	2.115	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	20968	Wooded forest.	1.2	2.115	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	20959	Perm RECP	1.215	2.115	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20949	Perm RECP	1.38	2.22	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20940	Perm RECP	0	0	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20938	Perm RECP	1.725	2.49	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20928	Perm RECP	1.59	2.415	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20918	Perm RECP	1.395	2.28	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20908	Wooded forest.	1.29	2.205	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	20898	Wooded forest.	1.44	2.325	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	20888	Wooded forest.	1.515	2.295	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	20878	Perm RECP	1.46	2.25	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20867	Perm RECP	1.25	2.1	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20856	Perm RECP	1.065	1.98	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20855	Perm RECP	0	0	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20848	Perm RECP	1.68	2.43	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20838	Perm RECP	1.635	2.415	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20828	Wooded forest.	1.59	2.31	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Low
Proposed Condition	20818	Wooded forest.	1.155	2.01	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	20809	Perm RECP	1.1	1.86	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20798	Perm RECP	0.705	1.575	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20788	Perm RECP	0.525	1.365	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20786	Perm RECP	0	0	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20779	Perm RECP	2.16	2.595	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20769	Perm RECP	1.68	2.31	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	20758	Wooded forest.	1.425	2.085	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	20749	Wooded forest.	1.2	1.905	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	20738	Wooded forest.	0.84	1.605	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	20728	Wooded forest.	0.75	1.53	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	20718	Wooded forest.	0.57	1.335	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	20708	Wooded forest.	0.405	1.155	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	20698	Wooded forest.	0.315	1.02	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	20685	Wooded forest.	0.255	0.93	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	20673	Wooded forest.	0.195	0.84	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	20668	Wooded forest.	0.11	0.6	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	20659	Wooded forest.	0.045	0.42	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	20649	Wooded forest.	0.03	0.3	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	20638	Wooded forest.	0.015	0.24	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	20628	Wooded forest.	0.015	0.21	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	20617	Wooded forest.	0.015	0.195	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	20608	Wooded forest.	0.015	0.18	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	20599	Wooded forest.	0	0.165	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low

Proposed Condition	19998	Wooded forest.	0.03	0.345	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19988	Wooded forest.	0.03	0.39	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19978	Wooded forest.	0.045	0.45	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19968	Wooded forest.	0.06	0.54	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19958	Wooded forest.	0.09	0.63	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19948	Wooded forest.	0.12	0.75	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19937	Wooded forest.	0.165	0.87	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19927	Wooded forest.	0.21	0.975	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19918	Wooded forest.	0.24	1.02	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19908	Wooded forest.	0.285	1.11	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19898	Wooded forest.	0.3	1.14	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19888	Wooded forest.	0.285	1.125	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19879	Wooded forest.	0.31	1.155	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19869	Wooded forest.	0.48	1.35	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19858	Wooded forest.	0.7	1.59	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19848	Wooded forest.	0.91	1.755	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19838	Wooded forest.	0.93	1.755	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19828	Wooded forest.	0.99	1.83	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19818	Wooded forest.	0.96	1.86	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19808	Wooded forest.	1.04	1.89	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19798	Wooded forest.	1.24	2.01	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19788	Wooded forest.	1.39	2.115	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19778	Wooded forest.	1.36	2.025	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19768	Wooded forest.	1.32	2.055	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19758	Wooded forest.	1.35	2.055	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19748	Wooded forest.	1.41	2.07	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19738	Wooded forest.	1.26	1.98	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19728	Perm RECP	1.11	1.86	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19718	Perm RECP	1.01	1.83	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19708	Perm RECP	1.08	1.875	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19700	Perm RECP	0	0	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19698	Perm RECP	1.36	2.055	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19688	Perm RECP	1.49	2.16	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19678	Perm RECP	2.01	2.475	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19668	Perm RECP	2.35	2.67	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19658	Perm RECP	2.84	2.835	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19648	Perm RECP	2.59	2.775	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19638	Perm RECP	2.45	2.745	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19628	Perm RECP	2.09	2.55	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19618	Perm RECP	2.01	2.565	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19608	Perm RECP	2.1	2.58	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19598	Perm RECP	2.07	2.61	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19588	Perm RECP	2.61	2.82	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19578	Perm RECP	2.77	2.955	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19568	Perm RECP	2.35	2.73	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19561	Perm RECP	0	0	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19558	Perm RECP	3.98	3.645	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19548	Perm RECP	4.09	3.765	chan	1.5*ave	4	6	8	7.5	12.75	18	Medium	Low
Proposed Condition	19538	Perm RECP	4.73	3.9	chan	1.5*ave	4	6	8	7.5	12.75	18	Medium	Low
Proposed Condition	19528	Perm RECP	4.29	3.87	chan	1.5*ave	4	6	8	7.5	12.75	18	Medium	Low
Proposed Condition	19518	Perm RECP	4.05	3.765	chan	1.5*ave	4	6	8	7.5	12.75	18	Medium	Low
Proposed Condition	19508	Perm RECP	4.4	3.765	chan	1.5*ave	4	6	8	7.5	12.75	18	Medium	Low
Proposed Condition	19498	Perm RECP	4.24	3.72	chan	1.5*ave	4	6	8	7.5	12.75	18	Medium	Low
Proposed Condition	19488	Perm RECP	5	3.975	chan	1.5*ave	4	6	8	7.5	12.75	18	Medium	Low
Proposed Condition	19478	Perm RECP	5.37	3.9	chan	1.5*ave	4	6	8	7.5	12.75	18	Medium	Low
Proposed Condition	19468	Perm RECP	6.06	4.035	chan	1.5*ave	4	6	8	7.5	12.75	18	High	Low
Proposed Condition	19458	Perm RECP	4.27	3.705	chan	1.5*ave	4	6	8	7.5	12.75	18	Medium	Low
Proposed Condition	19448	Perm RECP	7.41	4.38	chan	1.5*ave	4	6	8	7.5	12.75	18	High	Low
Proposed Condition	19438	Perm RECP	5.13	3.945	chan	1.5*ave	4	6	8	7.5	12.75	18	Medium	Low

Proposed Condition	19428	Perm RECP	4.97	3.915	chan	1.5*ave	4	6	8	7.5	12.75	18	Medium	Low
Proposed Condition	19418	Perm RECP	5.28	3.99	chan	1.5*ave	4	6	8	7.5	12.75	18	Medium	Low
Proposed Condition	19408	Perm RECP	5.56	3.81	chan	1.5*ave	4	6	8	7.5	12.75	18	Medium	Low
Proposed Condition	19398	Perm RECP	4.83	3.75	chan	1.5*ave	4	6	8	7.5	12.75	18	Medium	Low
Proposed Condition	19388	Perm RECP	3.84	3.405	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19378	Perm RECP	3.17	3.105	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19368	Perm RECP	3.13	2.985	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19358	Perm RECP	2.205	2.61	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19348	Perm RECP	1.725	2.355	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19338	Perm RECP	1.11	1.905	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19328	Perm RECP	0.78	1.62	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19318	Perm RECP	0.645	1.47	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19308	Perm RECP	0.51	1.32	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19298	Perm RECP	0.39	1.17	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19288	Perm RECP	0.315	1.05	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19278	Perm RECP	0.27	0.975	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19268	Perm RECP	0.225	0.915	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19260	Perm RECP	0	0	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19258	Perm RECP	1.365	1.965	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19248	Perm RECP	1.14	1.83	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19238	Perm RECP	1.005	1.725	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	19228	Wooded forest.	0.855	1.605	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19218	Wooded forest.	0.72	1.485	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19208	Wooded forest.	0.6	1.365	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19198	Wooded forest.	0.48	1.245	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19188	Wooded forest.	0.51	1.26	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19178	Wooded forest.	0.465	1.215	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19168	Wooded forest.	0.405	1.17	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19158	Wooded forest.	0.375	1.125	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19148	Wooded forest.	0.41	1.2	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19138	Wooded forest.	0.44	1.275	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19130	Wooded forest.	0.46	1.305	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19119	Wooded forest.	0.53	1.305	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19108	Wooded forest.	0.48	1.245	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19099	Wooded forest.	0.46	1.245	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19089	Wooded forest.	0.49	1.29	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19078	Wooded forest.	0.44	1.245	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19068	Wooded forest.	0.45	1.245	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19058	Wooded forest.	0.42	1.215	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19048	Wooded forest.	0.435	1.215	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19039	Wooded forest.	0.495	1.215	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	19029	Wooded forest.	0.39	1.095	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19018	Wooded forest.	0.405	1.11	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	19008	Wooded forest.	0.45	1.14	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	18998	Wooded forest.	0.46	1.14	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	18988	Wooded forest.	0.39	1.08	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	18978	Wooded forest.	0.45	1.11	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	18968	Wooded forest.	0.62	1.215	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	18958	Wooded forest.	0.67	1.29	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	18948	Wooded forest.	0.65	1.275	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	18938	Wooded forest.	0.73	1.32	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	18928	Wooded forest.	0.73	1.32	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	18923	Wooded forest.	0.56	1.275	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	18915	Wooded forest.	0.63	1.32	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	18895	Perm RECP	0.93	1.395	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	18874	Perm RECP	1.08	1.62	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	18850	Perm RECP	1.26	1.785	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	18841	Perm RECP	1.485	2.055	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	18819	Perm RECP	3.23	8.59	chan	chan	4	6	8	7.5	12.75	18	Low	Medium

Proposed Condition	18802	Perm RECP	3.195	9.39	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18786	Perm RECP	2.295	8.655	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18769	Perm RECP	2.13	8.46	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18738	Perm RECP	1.29	6.435	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	18713	Perm RECP	1.17	6.51	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	18661	Perm RECP	1.35	6.435	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	18612	Perm RECP	1.89	7.965	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18571	Perm RECP	1.83	7.89	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18528	Perm RECP	2.01	8.235	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18488	Perm RECP	2.13	8.475	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18448	Perm RECP	1.935	8.1	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18408	Perm RECP	2.13	8.46	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18373	Perm RECP	1.74	7.71	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18331	Perm RECP	2.31	8.775	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18283	Perm RECP	1.755	7.695	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18225	Perm RECP	1.95	8.13	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18198	Perm RECP	2.025	8.28	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18151	Perm RECP	1.695	8.07	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	18097	Perm RECP	1.35	6.855	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	18052	Perm RECP	1.335	6.84	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	18020	Perm RECP	1.02	6.045	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17993	Perm RECP	0.615	4.965	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17959	Perm RECP	0.435	4.41	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17931	Perm RECP	0.735	5.85	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17904	Perm RECP	0.63	5.25	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17870	Perm RECP	0.58	4.02	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17810	Perm RECP	0.39	3.54	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17792	Perm RECP	0.54	4.155	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17751	Perm RECP	0.65	4.425	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17728	Perm RECP	0.61	4.245	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17703	Perm RECP	0.54	4.065	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17668	Perm RECP	0.63	4.095	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17631	Perm RECP	0.56	3.825	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17582	Perm RECP	0.6	3.8	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17534	Perm RECP	0.87	4.83	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17493	Perm RECP	0.89	5.13	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17471	Perm RECP	1.13	5.955	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17442	Perm RECP	1.14	6.21	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17421	Perm RECP	0.89	5.16	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17401	Perm RECP	0.67	4.38	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17384	Perm RECP	0.31	3.225	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17374	Perm RECP	0.3	3.015	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17363	Perm RECP	0.3	2.69	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17353	Perm RECP	0.19	2.28	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17343	Perm RECP	0.165	2.055	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17332	Perm RECP	0.135	1.935	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17322	Wooded forest.	0.135	1.995	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	17314	Wooded forest.	0.195	2.13	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	17306	Wooded forest.	0.18	2.75	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	17296	Wooded forest.	0.18	2.355	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	17286	Wooded forest.	0.18	2.77	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	17276	Wooded forest.	0.22	3.54	chan	chan	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	17266	Wooded forest.	0.29	3.3	chan	chan	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	17256	Wooded forest.	0.3	3.39	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	17246	Wooded forest.	0.345	3.375	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	17236	Wooded forest.	0.33	3.255	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	17225	Wooded forest.	0.37	3.3	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	17215	Wooded forest.	0.345	3.06	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	17206	Wooded forest.	0.405	2.97	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low

Proposed Condition	17195	Wooded forest.	0.48	2.88	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17185	Wooded forest.	0.54	2.79	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17176	Wooded forest.	0.54	2.55	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17166	Wooded forest.	0.51	2.4	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17156	Wooded forest.	0.51	2.235	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17146	Wooded forest.	0.51	2.22	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17141	Wooded forest.	0.525	2.145	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17136	Wooded forest.	0.525	2.07	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17131	Wooded forest.	0.495	1.98	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17117	Wooded forest.	0.525	1.905	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17101	Wooded forest.	0.72	2.13	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17088	Wooded forest.	0.66	2.04	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17066	Wooded forest.	0.95	2.715	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17056	Wooded forest.	0.97	3.195	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17048	Wooded forest.	0.8	3.33	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17043	Wooded forest.	0.71	3.33	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17039	Wooded forest.	0.66	3.36	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	17029	Wooded forest.	0.38	2.82	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	17017	Perm RECP	0.27	2.61	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17003	Perm RECP	0.17	2.16	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	17001	Perm RECP	0	0	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16996	Perm RECP	0.45	3.3	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16986	Perm RECP	0.42	2.94	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16976	Wooded forest.	0.45	2.76	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16966	Wooded forest.	0.6	2.64	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16956	Wooded forest.	0.69	2.73	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16946	Wooded forest.	0.6	2.64	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16936	Wooded forest.	0.54	2.67	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16925	Wooded forest.	0.495	2.7	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16915	Wooded forest.	0.465	2.85	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16906	Wooded forest.	0.375	2.805	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16896	Wooded forest.	0.315	2.565	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16886	Wooded forest.	0.24	2.535	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16876	Wooded forest.	0.255	2.7	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16866	Wooded forest.	0.255	2.85	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16856	Wooded forest.	0.855	2.82	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16846	Wooded forest.	0.21	2.7	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16836	Wooded forest.	0.78	2.64	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16826	Wooded forest.	0.18	2.46	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16816	Wooded forest.	0.585	2.325	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16806	Wooded forest.	0.165	2.19	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16796	Wooded forest.	0.15	2.01	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16786	Wooded forest.	0.15	1.965	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16776	Wooded forest.	0.135	1.905	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16766	Wooded forest.	0.15	2.04	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16756	Wooded forest.	0.195	2.19	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16746	Wooded forest.	0.225	2.61	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16736	Wooded forest.	0.315	3.285	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16726	Wooded forest.	0.405	3.765	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16716	Wooded forest.	0.48	4.215	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Proposed Condition	16706	Wooded forest.	0.57	4.665	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Proposed Condition	16696	Wooded forest.	0.645	5.04	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Proposed Condition	16686	Wooded forest.	0.735	5.355	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Proposed Condition	16676	Wooded forest.	0.96	6.135	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Proposed Condition	16666	Perm RECP	1.125	7.035	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16656	Perm RECP	0.945	6.525	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16646	Perm RECP	0.93	5.97	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16636	Perm RECP	0.81	4.77	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16626	Wooded forest.	0.705	4.575	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium

Proposed Condition	16616	Wooded forest.	0.705	4.605	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Proposed Condition	16606	Wooded forest.	0.51	4.23	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Proposed Condition	16601	Wooded forest.	0	0	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16597	Wooded forest.	1.88	8.595	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Excessive
Proposed Condition	16587	Wooded forest.	1.02	8.43	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Proposed Condition	16576	Wooded forest.	0.975	8.25	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Proposed Condition	16565	Wooded forest.	0.54	6.285	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Excessive
Proposed Condition	16555	Wooded forest.	1.065	5.235	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Proposed Condition	16546	Wooded forest.	1.76	4.56	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Proposed Condition	16536	Wooded forest.	1.51	4.08	chan	1.5*ave	0.43	1.465	2.5	4	5	6	High	Medium
Proposed Condition	16525	Wooded forest.	1.28	3.57	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16516	Wooded forest.	0.68	2.745	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16507	Wooded forest.	0.54	2.37	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16496	Wooded forest.	0.41	1.95	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16491	Wooded forest.	0	0	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16486	Perm RECP	0.525	1.995	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16475	Perm RECP	0.45	1.755	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16465	Perm RECP	0.405	1.695	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16456	Perm RECP	0.405	1.71	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16446	Wooded forest.	0.405	1.77	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16436	Wooded forest.	0.42	1.815	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16426	Wooded forest.	0.42	1.875	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16415	Wooded forest.	0.465	2.13	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16405	Wooded forest.	0.48	2.475	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16396	Wooded forest.	0.435	2.655	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	16385	Wooded forest.	0.555	4.27	1.5*ave	chan	0.43	1.465	2.5	4	5	6	Medium	Medium
Proposed Condition	16375	Wooded forest.	0.55	4.74	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Medium
Proposed Condition	16366	Wooded forest.	0.66	5.87	chan	chan	0.43	1.465	2.5	4	5	6	Medium	High
Proposed Condition	16354	Wooded forest.	0.49	5.205	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	High
Proposed Condition	16344	Wooded forest.	0.57	4.62	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Proposed Condition	16336	Wooded forest.	0.36	3.75	chan	chan	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	16326	Perm RECP	0.26	3.14	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16316	Perm RECP	0.24	2.7	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16306	Perm RECP	0.27	2.715	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16301	Perm RECP	0	0	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16295	Perm RECP	1.44	5.55	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16285	Perm RECP	1.095	4.755	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16276	Wooded forest.	1.5	5.46	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Proposed Condition	16267	Wooded forest.	1.605	5.34	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Proposed Condition	16257	Wooded forest.	1.515	5.28	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Proposed Condition	16246	Wooded forest.	1.545	5.175	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Proposed Condition	16236	Perm RECP	1.95	5.505	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16226	Perm RECP	1.605	5.475	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16215	Perm RECP	0.975	4.905	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16205	Perm RECP	1.035	5.145	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	16195	Perm RECP	2.04	7.845	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16184	Perm RECP	3.66	10.275	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16175	Perm RECP	4.425	11.85	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Medium	Medium
Proposed Condition	16165	Perm RECP	3.075	10.47	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16156	Perm RECP	2.82	9.675	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16147	Perm RECP	2.595	9.36	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16139	Perm RECP	3.195	11.235	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16130	Perm RECP	3.03	10.995	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16120	Perm RECP	2.985	10.77	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16110	Perm RECP	2.865	10.785	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16100	Perm RECP	3.09	10.83	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16090	Perm RECP	2.91	10.17	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16081	Perm RECP	3.87	11.67	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16072	Perm RECP	4.38	12.225	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Medium	Medium

Proposed Condition	16062	Perm RECP	3.495	10.995	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16052	Perm RECP	3.825	11.475	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16042	Perm RECP	3.84	11.49	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16031	Perm RECP	3.825	11.49	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16021	Perm RECP	3.69	11.28	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16015	Perm RECP	3.66	11.25	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	16002	Perm RECP	4.86	12.765	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Medium	High
Proposed Condition	15996	Perm RECP	4.74	12.51	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Medium	Medium
Proposed Condition	15989	Perm RECP	4.485	12.075	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Medium	Medium
Proposed Condition	15982	Perm RECP	3.66	10.935	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15975	Perm RECP	3.375	10.575	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15969	Perm RECP	3.375	10.59	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15961	Perm RECP	3.345	10.545	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15952	Perm RECP	3.285	10.455	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15944	Perm RECP	3.105	10.185	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15931	Perm RECP	3.435	10.68	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15918	Perm RECP	3.09	10.125	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15904	Perm RECP	3.465	10.71	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15894	Perm RECP	3.51	10.77	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15884	Perm RECP	3.465	10.725	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15874	Perm RECP	3.345	10.56	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15864	Perm RECP	3.255	10.41	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15854	Perm RECP	3.18	10.29	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15844	Perm RECP	2.73	9.57	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15836	Perm RECP	2.43	9.105	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15829	Perm RECP	2.775	9.675	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15822	Perm RECP	2.625	9.42	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15812	Perm RECP	2.385	9.03	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15802	Perm RECP	2.16	8.64	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15792	Perm RECP	1.935	8.205	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15782	Perm RECP	1.725	7.77	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15772	Perm RECP	1.53	7.35	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	15762	Perm RECP	1.86	8.085	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15752	Perm RECP	2.76	9.87	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15742	Perm RECP	2.85	10.035	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15732	Perm RECP	3.03	10.305	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15722	Perm RECP	3.69	11.31	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15711	Perm RECP	3.93	11.625	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15700	Perm RECP	3.96	11.67	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15690	Perm RECP	2.955	10.185	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15680	Perm RECP	3.735	11.295	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15670	Perm RECP	3.675	11.265	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15658	Perm RECP	3.54	11.07	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15647	Perm RECP	3.45	10.935	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15636	Perm RECP	3.285	10.71	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15627	Perm RECP	3.15	10.5	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15618	Perm RECP	2.91	10.095	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15610	Perm RECP	2.295	9.075	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15602	Perm RECP	2.445	9.33	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15593	Perm RECP	2.4	8.94	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15585	Perm RECP	2.34	8.535	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15575	Perm RECP	2.34	8.31	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15565	Perm RECP	3.615	11.355	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15555	Perm RECP	5.34	13.59	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Medium	High
Proposed Condition	15521	Perm RECP	3.615	11.115	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15500	Perm RECP	3.555	11.04	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15459	Perm RECP	2.79	9.87	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15426	Perm RECP	4.89	12.87	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Medium	High
Proposed Condition	15383	Perm RECP	2.25	8.865	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium

Proposed Condition	15348	Perm RECP	2.34	9.105	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15338	Perm RECP	2.655	10.035	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15328	Perm RECP	2.355	9.54	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15318	Perm RECP	1.98	8.28	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15233	Perm RECP	0.93	5.985	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	15205	Perm RECP	1.35	7.485	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	15186	Perm RECP	1.14	6.675	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	15124	Perm RECP	1.515	7.47	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	15085	Perm RECP	1.575	7.92	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15076	Perm RECP	1.605	8.07	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15066	Perm RECP	1.515	7.995	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15056	Perm RECP	1.35	7.77	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15046	Perm RECP	1.44	7.635	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	15035	Perm RECP	1.29	7.035	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	15025	Perm RECP	1.14	6.615	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	14985	Perm RECP	1.365	7.35	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	14906	Perm RECP	1.635	8.22	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14885	Perm RECP	1.71	8.4	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14868	Perm RECP	1.77	8.565	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14839	Perm RECP	1.63	8.745	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14801	Perm RECP	1.57	8.37	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14775	Perm RECP	2.16	7.92	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14726	Perm RECP	1.78	7.38	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	14708	Perm RECP	2.4	9.42	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14693	Perm RECP	1.16	5.745	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	14675	Perm RECP	1.62	7.23	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	14640	Perm RECP	0.61	3.89	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	14608	Perm RECP	0.87	5.28	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	14578	Perm RECP	0.99	5.46	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	14557	Perm RECP	1.335	6.39	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	14520	Perm RECP	3.735	10.545	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14453	Perm RECP	1.43	5.05	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	14432	Perm RECP	0.345	4.31	1.5*ave	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	14409	Perm RECP	0.195	3.075	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	14382	Perm RECP	1.56	7.245	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	14366	Perm RECP	2.085	8.13	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14356	Perm RECP	3.99	11.28	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14346	Perm RECP	4.68	12.48	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Medium	Medium
Proposed Condition	14336	Perm RECP	4.785	12.72	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Medium	Medium
Proposed Condition	14325	Perm RECP	4.77	12.69	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Medium	Medium
Proposed Condition	14319	Perm RECP	4.8	12.75	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Medium	High
Proposed Condition	14312	Perm RECP	2.625	9.66	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14305	Perm RECP	2.625	9.66	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14295	Perm RECP	2.88	10.095	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14285	Perm RECP	2.925	10.17	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14275	Perm RECP	3	10.305	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14266	Perm RECP	3.24	10.65	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14256	Perm RECP	2.94	10.2	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14247	Perm RECP	2.91	10.14	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14233	Perm RECP	2.715	9.81	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14221	Perm RECP	3.27	10.785	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14208	Perm RECP	3.285	10.725	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14192	Perm RECP	2.94	10.23	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14176	Perm RECP	2.595	9.585	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14161	Perm RECP	2.055	9.03	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14154	Perm RECP	2.58	9.54	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14147	Perm RECP	3.135	10.47	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14140	Perm RECP	2.625	9.525	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14129	Perm RECP	2.55	9.435	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium

Proposed Condition	14118	Perm RECP	2.34	8.835	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14107	Perm RECP	2.55	9.375	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14091	Perm RECP	3.6	11.895	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14075	Perm RECP	2.01	8.835	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14060	Perm RECP	2.055	8.94	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14050	Perm RECP	1.995	9.06	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14040	Perm RECP	1.92	8.64	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14030	Perm RECP	1.86	8.415	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14020	Perm RECP	3.3	11.355	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	14010	Perm RECP	2.41	9.93	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	13994	Perm RECP	3.705	11.1	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	13972	Perm RECP	1.275	6.66	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13954	Perm RECP	1.125	6.975	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13930	Perm RECP	1.5	7.905	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	13905	Perm RECP	1.41	7.395	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13873	Perm RECP	2.26	7.21	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13830	Perm RECP	0.97	4.77	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13800	Perm RECP	1.44	5.68	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13784	Perm RECP	1.37	5.54	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13776	Perm RECP	2.42	7.29	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13754	Perm RECP	1.6	5.99	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13734	Perm RECP	1.48	5.78	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13714	Perm RECP	1.22	5.24	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13707	Perm RECP	1.84	6.39	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13697	Perm RECP	1.6	5.95	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13687	Perm RECP	1.38	5.53	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13677	Perm RECP	1.245	5.02	1.5*ave	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13665	Perm RECP	1.035	4.41	1.5*ave	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13654	Perm RECP	1.035	4.44	1.5*ave	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13642	Perm RECP	0.885	4.275	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13630	Perm RECP	0.99	4.08	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13619	Wooded forest.	1.185	4.395	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Medium
Proposed Condition	13607	Wooded forest.	1.77	5.13	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	High	High
Proposed Condition	13595	Wooded forest.	1.11	3.645	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	13581	Wooded forest.	0.89	1.7	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	13567	Wooded forest.	0.78	1.48	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	13556	Wooded forest.	1.34	1.83	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	13544	Wooded forest.	1.36	1.6	chan	chan	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	13533	Wooded forest.	2.9	2.18	chan	chan	0.43	1.465	2.5	4	5	6	Excessive	Low
Proposed Condition	13521	Wooded forest.	0.47	0.915	chan	1.5*ave	0.43	1.465	2.5	4	5	6	Medium	Low
Proposed Condition	13508	Wooded forest.	0.195	0.825	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	13497	Wooded forest.	0.225	0.825	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	13485	Wooded forest.	0.09	0.615	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	13473	Wooded forest.	0.12	0.66	1.5*ave	1.5*ave	0.43	1.465	2.5	4	5	6	Low	Low
Proposed Condition	13458	Perm RECP	0.12	0.675	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13445	Perm RECP	0.135	0.735	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13434	Perm RECP	0.12	1.54	1.5*ave	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13426	Perm RECP	2.7	7.94	1.5*ave	chan	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	13415	Perm RECP	2.94	8.88	1.5*ave	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	13405	Perm RECP	3.29	10.335	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	13395	Perm RECP	2.32	8.43	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	13380	Perm RECP	2.24	8.34	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	13367	Perm RECP	2.65	9.195	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	13355	Perm RECP	2.13	7.695	chan	1.5*ave	4	6	8	7.5	12.75	18	Low	Medium
Proposed Condition	13341	Perm RECP	1.94	6.89	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13329	Perm RECP	1.92	6.75	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13311	Perm RECP	1.65	6.15	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13298	Perm RECP	1.97	6.58	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13285	Perm RECP	2.14	6.76	chan	chan	4	6	8	7.5	12.75	18	Low	Low

Proposed Condition	13272	Perm RECP	0.91	4.43	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13252	Perm RECP	0.93	4.33	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13233	Perm RECP	0.93	4.32	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13221	Perm RECP	0.405	2.7	1.5*ave	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13208	Perm RECP	1.18	4.85	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13193	Perm RECP	0.7	3.66	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13178	Perm RECP	0.96	4.21	chan	chan	4	6	8	7.5	12.75	18	Low	Low
Proposed Condition	13166	High Grass. Wetland	2.07	5.85	chan	chan	2.1	2.6	3.1	3	6.5	10	Low	Medium
Proposed Condition	13155	High Grass. Wetland	1.74	4.44	1.5*ave	chan	2.1	2.6	3.1	3	6.5	10	Low	Medium
Proposed Condition	13140	High Grass. Wetland	0.945	3.87	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Proposed Condition	13129	High Grass. Wetland	1.41	4.875	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Proposed Condition	13111	High Grass. Wetland	0.975	4.995	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Proposed Condition	13098	High Grass. Wetland	0.645	5.37	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Proposed Condition	13082	High Grass. Wetland	0.45	4.11	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Proposed Condition	13069	High Grass. Wetland	0.84	6.57	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	High
Proposed Condition	13057	High Grass. Wetland	0.795	6.72	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	High
Proposed Condition	13044	High Grass. Wetland	0.705	5.565	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Proposed Condition	13028	High Grass. Wetland	0.315	3.855	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Medium
Proposed Condition	13012	High Grass. Wetland	0.015	0.735	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low
Proposed Condition	13000	High Grass. Wetland	0	0	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low
Proposed Condition	12983	High Grass. Wetland	0	0	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low
Proposed Condition	12969	High Grass. Wetland	0	0	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low
Proposed Condition	12958	High Grass. Wetland	0	0	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low
Proposed Condition	12945	High Grass. Wetland	0	0	1.5*ave	1.5*ave	2.1	2.6	3.1	3	6.5	10	Low	Low

Appendix D: 2016 Metropolitan Council Comments on Draft Ravine Park Stabilization and Outlet Concept Design

June 30, 2016

Matt Moore, Administrator
South Washington Watershed District
2302 Tower Drive
Woodbury, MN 55125

RE: Draft Ravine Park Stabilization and Outlet Concept Design

Dear Mr. Moore:

The Metropolitan Council received the South Washington Watershed District's Ravine Park Stabilization and Outlet Concept Design report on April 14, 2016. The report, dated February 4, 2016, addresses the portion of the Central Draw Storage Facility (CDSF) Overflow project within Cottage Grove Ravine Regional Park. The report states that its intent is to develop a concept design to replace the Ravine Lake outlet structure, improve existing erosion conditions, and provide future channel stability in East Ravine from Highway 61 upstream to the Cottage Grove Ravine Regional Park boundary.

Council staff reviewed the report to determine its adequacy and accuracy in addressing regional concerns as well as its potential for environmental impacts on regional facilities. The project concept design needs to be included in Washington County's updated master plan for Cottage Grove Ravine Regional Park, which is subject to the Council's approval based on the *2040 Regional Parks Policy Plan*. Additionally, South Washington Watershed District will need to obtain easements from Washington County in order to proceed with the project. The restrictive covenants between Washington County and the Metropolitan Council that are recorded on several parcels within the regional park require Council approval in order for any easements to be granted.

As detailed in the itemized comments that follow, Council staff has identified areas of concern, the need for additional information, and preliminary recommendations related to the project and its impact on regional facilities.

3.1.1 – Constructed Lined Channel

The report indicates that the existing (western) channel that is proposed to be modified to achieve stability in accommodating future modeled flow events is virtually indistinguishable by sight today. This observation contrasts with the extent of erosion in the nearby eastern ravine within the regional park that has previously, and continues to be altered by rain events, as shown in Figure 3. The Council's review letter on the CDSF Phase II-V Environmental Assessment Worksheet, dated May 28, 2014, recommended that the watershed district revise the project scope to incorporate stabilization of the eastern drainage channel leading into Ravine Lake, either as an additional component of Phase IV or an additional phase of the overall project.

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At a minimum, an erosion analysis should be performed for the east channel. Combining the stabilization of both the western and eastern drainage channels into one project phase could reduce the overall length of time that the regional park would be unavailable for use by the public. Council staff recommends that the updated Cottage Grove Ravine Regional Park master plan also include stabilization of the eastern drainage channel as a proposed project.

The Council's CDSF Phase II-V EAW comment letter also recommended avoidance of potential impact to the rich fen habitat bounding the northern perimeter of Ravine Lake. In order to prevent potential permanent negative vegetation and habitat compaction within the rich fen wetland and wetland buffer areas, Council staff recommends that no easement or project construction access be granted from the southern extent of the planned project via the existing trail through the currently developed portion of the regional park.

3.1.4 – Vegetation Management

Council staff understands that it will be difficult to preserve any existing trees within the clearing limits of the proposed new 145-cfs-design channel due to the need to provide several feet of channel depth below existing ground level (as shown in Figure 4) to accommodate design flows. However, within the vegetation management extent limits, Council staff encourages leaving as many healthy trees as possible, especially the larger diameter trees, instead of removing them all. Council staff also suggests leaving some deadfall and planting new trees in open areas adjacent to the trail, in order to ensure that the view for trail users is as natural as possible, rather than overly sterile and managed.

Following removal of invasives, thinning of the canopy, reseeding of natives, and the recommended addition of new preferred-variety tree plantings within the vegetation management extent zone, there likely will be an increase in the germination and growth of new invasives as a result of increased sunlight on their existing seed bank. Invasive seeds typically remain viable in the soil for at least five years. Council staff recommends that the proposed project include a maintenance contract for the native planting areas within the vegetation management extent zone for a period of not less than five years to give the native forbs and new trees an opportunity to dominate the habitat, reducing the chance that invasives will reestablish in the newly opened areas.

Park woodlands, wetlands, and Ravine Lake meet all criteria to be suitable summer habitat and drinking water source areas for bat species. The northern long-eared bat (NLEB) was recently added to the U.S. Fish and Wildlife Service's (USFWS) Endangered Species Act (ESA) website as a 'threatened' species in this area. In the spring, summer, and fall, NLEB use a wide variety of forested habitats for roosting, foraging, and raising their young. Both live and dead trees are considered suitable roosting habitat in forested areas if they have a diameter at breast height of at least three inches with exfoliating bark, cracks, crevices, and/or other cavities. After hibernation ends in late March or early April, most NLEB migrate to summer roosts. Of particular concern is the potential to disturb the maternity habitat used by juvenile and reproductive females. Disturbance of NLEB summer roosts is to be avoided from April 1 – October 31 per USFWS guidance.

Tree clearing as a result of the proposed project could affect potentially suitable NLEB summer habitat. USFWS's White-Nose Syndrome (WNS) Zone map dated January 6, 2016 includes the regional park within the 150 mile buffer zone of a location where WNS has been detected, putting it



under the protection authority of the ESA's Final 4(d) Rule. For areas within the WNS buffer zone, the incidental take (harm, harassment, or killing of a bat as a side effect of an otherwise lawful action like tree clearing) from tree removal activities is not prohibited unless: 1) it results in removing a known occupied maternity roost tree, 2) if tree removal activities occur within 150 feet of a known occupied maternity roost tree from June 1 through July 31, or 3) tree removal activities occur within 0.25 miles of a hibernaculum at any time.

The Minnesota Department of Natural Resources maintains records of known maternity roost trees and hibernacula within its Natural Heritage Inventory System database. Council staff recommends that the watershed district contact Lisa Joyal, the Minnesota Department of Natural Resource's Endangered Species Environmental Review Coordinator, to determine if NLEB habitat records are available for the project area. Council staff also recommends that tree clearing for the project be confined to the time period *outside* of the NLEB summer roost season – November 1 through March 31—to avoid any NLEB impacts due to the potential presence of undocumented hibernacula and maternity roosts within the regional park.

3.2 – Outlet Structures

The report states that project modeling indicates that "local runoff *excluding* Ravine Lake outlet flow is significant enough to cause flooding upstream of MN Highway 61 during a 100-year, 24-hour event". Council staff strongly disagrees with the decision to potentially drastically increase the bounce in Ravine Lake – at the erosional expense of its entire environmentally stable shoreline—by assuming that modification of the hydraulic structure under East Point Douglas Road and MN Highway 61 is "*not an option*", as stated in Section 3.2.3 of the report.

The 72-inch circular (gravity flow) outlet under the highway is the same size as the planned 72-inch forcemain project outlet. It is clear that future operation of the project would exacerbate an apparent hydraulically undersized structure which might result in local flooding, as well as potentially result in permanent and highly visible environmental damage within the regional park. Failure to evaluate what size of culvert under MN Highway 61 is needed to adequately pass future storm flows that will *include* the project's proposed flows compromises the adequacy of its overall design. Ignoring this flow restriction which will pool water in the roadside ditch for weeks during project operation could compromise the structural integrity of both East Point Douglas Road and MN Highway 61.

MN Highway 61 is a principal arterial as defined in the Council's *2040 Regional Transportation Policy Plan*. The Minnesota Department of Transportation will not allow runoff or the potential for runoff on a road designated as a principal arterial. Additionally, Washington County is studying the Highway 61 corridor as a bus-rapid transit option, so any flooding would also impact the potential transitway.

6.1 – Local Authorities

The report states that the permanent easement boundary is proposed to be defined as "two feet in elevation above the 100-year, 24-hour storm event which is being considered a sufficient buffer within which to construct the project's waterway features and provide future feature and vegetation maintenance." Council staff requests that this specific 'storm event' flow value and storm scenario be identified, as this project waterway will convey both local watershed storm events and time-delayed,

pumped stormwater events. Additionally, please clarify whether it is the watershed district's intent to identify the easement boundary with any type of physical markers at the project site.

Appendix A: Preliminary Placement of Features Maps

In order to demonstrate the impacts and location of tree loss along the project corridor, Council staff requests that a new series of maps be produced that overlays the tree species data depicted in Figure 11 on the eight project segment maps in Appendix A.

Council staff requests clarifications of the following issues on the project segment maps in Appendix A:

- It appears that the clearing limits are located outside of the vegetation management extent zones in some areas.
- There are random scattered red lines on two maps, where the channel diverts east of the existing paved trail and immediately north of an area identified for slope reinforcement.
- It is difficult to determine where the eight project segments are located in the context of the project corridor and the overall regional park without an inset reference map.

As stated earlier, Council approval of an updated master plan for Cottage Grove Ravine Regional Park that includes the project as well as Council approval of specific easements is required in order for Washington County to grant easements throughout much of the project area; therefore, the report must include maps of the proposed permanent and temporary construction easements.

Council staff looks forward to receiving the requested information to supplement the report and would be willing to meet with South Washington Watershed District and Washington County Parks staff to further discuss the project and our comments. If you have any questions or would like to meet, please contact Jan Youngquist at 651-602-1029.

Sincerely,



LisaBeth Barajas, Manager
Local Planning Assistance

cc: John Elholm, Washington County Parks Director
Melissa Doperalski, MnDNR
Tod Sherman, MnDOT Reviews Coordinator
Harry Melander, Metropolitan Council
Emmett Mullin, Regional Parks and Natural Resources Manager
Jan Youngquist, Planning Analyst
Jim Larsen, Senior Planner

Appendix E: 2014 Metropolitan Council Comments on Central Draw Storage Facility Phase II-V EAW



May 28, 2014

Mr. Matt Moore, Administrator
South Washington Watershed District
2302 Tower Drive
Woodbury, MN 55125

RE: Central Draw Storage Facility Phase II-V Environmental Assessment Worksheet
Metropolitan Council Review File No. 21056-2
Metropolitan Council District 12

Dear Mr. Moore:

The Metropolitan Council (Council) received the South Washington Watershed District's (SWWD) Environmental Assessment Worksheet (EAW) for the Central Draw Storage Facility (CDSF) Phase II-V project located in the City of Cottage Grove on April 23, 2014. The proposed project is a subsequent stage of Phase I of the same name, which the Council reviewed December 23, 2012 (Review File No. 21056-1). CDSF Phase II-V involves the construction of a 72-inch overflow pipe in the City of Cottage Grove continuing south from the depression area and outletting at the north end of Cottage Grove Ravine Regional Park (Regional Park), ravine stabilization activities through the natural west ravine stream channel in the Regional Park, infrastructure improvements to the Ravine Lake Outlet Structure in the south end of the Regional Park, and ravine stabilization activities south of Highway 61 before reaching the Mississippi River.

The Council staff review finds that the EAW is complete with respect to regional concerns, and raises no major issues of consistency with Council policies. The Council finds that an EIS is not necessary for regional purposes.

While the Council respects the validity of the predicted 100-year flood precipitation event data provided as a basis for the South Washington Watershed District's multi-phase CDSF project (Project), we remain concerned with the extent of planned habitat impacts within the Cottage Grove Ravine Regional Park (Regional Park). The planned stabilization of the flow channel to withstand erosive forces of stormwater flow and prolonged periods of inundation will result in significant negative impacts to the Park's natural character.

The following comments are offered concerning specific items in the document.

Item 6.b. – Project Description

The EAW presents clear distinctions between the different future phases of the Project, but has not incorporated projected timing of construction of each of the phases, as was included in the earlier Phase I EAW. The response to comments document should clarify which of the phases will incorporate the construction of the additional box culvert under US Highway 61 – Phase II or Phase III.

Item 7 – Cover Types

The EAW indicates that there will be no change in cover types following construction of the remaining phases of the project along its designated 400-foot wide corridor. We would expect that there would be some degree of loss or conversion to other cover as a component of the project, but acreage impacts of those changes will not be known until the ravine stabilization methods to be used are known. The March 2014 Erosion Analysis document proposed a minimum necessary width of 40 feet for a constructed lined channel, and the EAW text on page 34 in Section 13 indicates that the (maximum) width of tree clearing

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will be an estimated 150 feet for a construction right-of-way in the ravine channel bottom project Phases II and IV.

At this point in time, Council staff assumes that the preferred ravine stabilization methods to be incorporated into Phase IV through the Regional Park will be those that result in the least acreage of wooded vegetation impacts. The 3M pipeline passes under potentially shallow cover in places within the western drainage channel to Ravine Lake through the Park. Based upon the need for a firm access footing on which to bring construction equipment and stabilization materials down to near the north edge of Ravine Lake from the northern reaches of the Park and protection of the 3M pipeline, we recommend stabilizing the western drainage channel with a combination of a constructed lined channel (most probably with riprap), and check dams. Utilization of these two stabilization measures would most likely result in the loss of the least number of healthy trees within the Regional Park, but still allow for the selective removal of dead, diseased, and understory invasive trees and vegetation as per Washington County Park staff's specific guidance.

Council staff requests to be involved in the design selection process when Washington County Parks staff, Watershed staff, and their consultants determine the final design of the stabilization channel so that we may more fully understand its impacts and scope. We encourage the Watershed to begin this process at its earliest convenience to allow sufficient time to incorporate the results into the Regional Park Master Plan (Master Plan) amendment that will need to be prepared and submitted to the Council. The Master Plan must be approved by the Metropolitan Council *in advance of any planned Phase IV construction*.

Item 8 – Permits and Approvals Required

As noted in the text on page 11 of the EAW, the Cottage Grove Ravine Regional Park Master Plan will need to be amended to describe the alterations necessary to the Regional Park to stabilize drainage channels, document easements, and relocate trails. The amendment will need to be reviewed by Council staff, followed by presentation to the Metropolitan Parks and Open Space Commission for consideration, and finally referral to the Metropolitan Council Community Development Committee and the full Council for recommendation for approval. It is not completely clear at this point in the Project (prior to design of Phases II through V) which phase(s) will result in Regional Park alterations that definitely need to be addressed within the Master Plan amendment *in advance* of their progression to the construction phase. The amendment will be necessary before construction of Phase IV, but there could be components within Phase III which might also require revision of the Park Master Plan. Please revise EAW language as needed to reflect the appropriate timing.

The Regional Park Master Plan amendment will need at a minimum to detail the following:

- Planned extent of vegetation impacts within the Park to accommodate specifically located types and methods of stabilization,
- Updated entrance road and lake outlet weir and flow infrastructure,
- Revegetation plans (forbs and trees),
- Details regarding proposed construction equipment access points and construction staging area plans.

In addition to the Master Plan, an easement defining the area of work for the watershed district's project within the Park needs to be approved and recorded. There are restrictive covenants between Washington County and the Metropolitan Council recorded on a portion of the project area through the Park. The restrictive covenants limit the use of the property to regional recreation open space purposes only and state that no easement against the property shall be valid for any purpose unless the written approval of the Metropolitan Council or its successors is duly filed. The Central Draw project is being precipitated by

the need to carry excess stormwater from Woodbury and Cottage Grove to the Mississippi River, which is not a regional recreation open space purpose. Therefore, in order for an easement to be recorded, approval of the easement by the Metropolitan Council is required. This request could be packaged and reviewed concurrently with the required amendment to the Master Plan.

The Minnesota Department of Natural Resources (DNR) will need to review and approve the portion of Phase II that lies within the Mississippi River Corridor Critical Area for consistency with Executive Order 79-19 and Minnesota Statutes 116G.15.

Item 9.b. – Land Use

The EAW states on pages 11 and 12 that the project is compatible and complies with the Mississippi River Corridor Critical Area (MRCCA) guidance. It is not clear from the EAW what the extent of vegetation removal will be from within the drainage channel within the MRCCA to stabilize it adequately to accommodate design flow events. The DNR's MRCCA reviews typically call for the preservation of as much of the native plant community and tree canopy as possible to preserve the natural character and topography of the MRCCA. Council staff requests that the response to comments document provide additional information regarding the extent of vegetation planned for removal and discussion regarding the vegetation restoration plan.

Item 11.b.ii. – Water Resources – Stormwater

The EAW states that specific erosion control and stabilization measures to be implemented within the north and south reaches of the ravine have not been identified at this time. As included in the comments under Item 7, the Council requests to be involved in the design selection process when Washington County Parks staff, Watershed staff, and their consultants determine the design of the stabilization channel to more fully understand its impacts and scope.

Item 13 – Fish, Wildlife, Plant Communities, and Sensitive Ecological Resources (Rare Features)

Tree clearing on both sides of the upper western drainage channel through the Regional Park, if it is 150 feet wide for a proposed necessary stabilization length of 5200 feet would result in an approximate 18 acre void through the forest system. As we have stated earlier in our review, the Council would prefer to see a method of stabilization chosen that minimizes the loss of healthy forest along the drainage channel. The Regional Park is already host to two other utility corridors which leave unsightly and undesirable breaks in the Park's habitat. Should future Project flow inundation events result in the measurable loss of currently healthy trees (in spite of EAW supporting document projections to the contrary), Council staff recommends that the Watershed work with Washington County Parks staff to mitigate for the loss through reforestation in the stabilization corridor with compatible native trees more tolerant of crown inundation over long periods of time.

Native Plant Communities

To the extent possible, the Council recommends that the Project have as little impact to native vegetation and woodlands as possible within the identified native plant communities outcroppings and Sites of Biodiversity Significance as identified by the Minnesota County Biological Survey (MBCS). Specifically within the Regional Park, we recommend complete avoidance of structural stabilization impacts to the areas classified as rich fen habitat bounding the northern perimeter of Ravine Lake.

Item 19 – Cumulative Potential Effects

The same low-probability precipitation events that watershed modeling for this Project predicted would result in flood damage and erosion risks within the western drainage channel that also flows into Ravine Lake within the Regional Park identified similar, but even greater magnitude peak flow events in the eastern drainage channel that flows into the Lake. The Council recommends that the Watershed revise the

Mr. Matt Moore, SWWD Administrator
May 28, 2014
Page 4 of 4

Project scope to incorporate stabilization of the eastern drainage channel leading into Ravine Lake, either as an additional component of Phase IV or an additional Phase of the overall Project. At a minimum, an erosion analysis would need to be performed for the east channel. The record of decision document should address the incorporation of this potential additional project construction component at the same time as Phase IV, or as an additional phase. Combining the stabilization of both the western and eastern drainage channels into one Project phase would reduce the overall length of time that the Regional Park would be unavailable for use by the public. The Council recommends that all proposed Regional Park drainage channel stabilization plans and proposed Park revisions be incorporated into a single Master Plan amendment process.

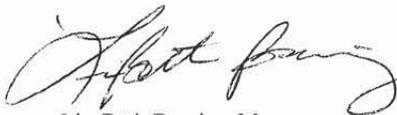
In order to minimize excessive stormwater runoff to the greatest extent possible, the SWWD should work with the Cities of Woodbury and Cottage Grove to implement the use of low impact development techniques and encourage stormwater reuse as each of these cities moves toward full development of the areas that drain to the project.

Appendix B – Lower East Ravine Stabilization Memo

Please clarify the Flow Hydrograph data presented for Figure 2 modeling Points B, C, D, and E as shown on Graphs 4, 5, 6, and 7 presented on pages 7, 8, 10, and 11 respectively, in Appendix B. The peak flow values expressed in the text for each modeling point do not quite match the “With Project” curve peaks in their respective graphical presentations.

This concludes the Council’s review of the EAW. Please contact me at 651-602-1895 or Jim Larsen PE, Principal Reviewer, at 651-602-1159, with any questions.

Sincerely,



LisaBeth Barajas, Manager
Local Planning Assistance

CC: Peter Mott, Washington County Parks
John Elholm, Washington County Parks Director
Jenny Shillcox, DNR, Critical Area
Crystal Shepeck, MHFA
Tod Sherman, Development Reviews Coordinator, MnDOT – Metro Division
Harry Melander, Metropolitan Council District 12
Jim Larsen, Community Development
Judy Sventek, Watershed Coordinator
Raya Esmacili, Reviews Coordinator

Appendix F: South Washington Watershed District Conceptual Overflow Design Letter



SOUTH WASHINGTON
WATERSHED DISTRICT

October 20, 2016

Ms. Jan Youngquist, Parks Planner
Metropolitan Council
390 Robert St. North
St. Paul, MN 55101-1805

RE: Cottage Ravine Regional Park SWWD Conceptual Overflow Design.

Dear Ms. Youngquist:

The South Washington Watershed District (SWWD) would like to thank the Metropolitan Council Staff for your time to meet and discuss our project in the Cottage Grove Ravine Regional Park. The overflow project has been in the planning for nearly 20 years and will provide significant regional infrastructure for a high growth area when completed. In cooperation with Washington County this project will protect the park, restore native vegetation and provide necessary improvements all to enhance the park experience.

The project concept design report can be included in the Ravine Park Master Plan as an Appendix to the plan. Final design is refining the conceptual design in relation to the trail crossings and 3M waterline locations.

The SWWD is working with Washington County and the final design to describe the easement needed for construction and future maintenance of the overflow project. Easement discussion will be added to the Master Plan to provide the framework for Met Council approval. The easement will be included with the final design.

The SWWD and Washington County are aware of the ravine on the east side of the park. As stated during the EAW review if the County wishes to address the eastern ravine the SWWD is willing to assist. Most likely control of the eastern ravine will require work on property outside of the park boundary on private property. The eastern ravine is not part of the current overflow project. The SWWD is currently updating its watershed management plan and has included ravine stabilization as an identified issue in the watershed.

The western ravine in the park is the termination of the buried bedrock valley that dissects the watershed. At the location of the park the ravine is broad and relatively flat. In contrast the eastern ravine is a side channel which drains the upland over the bluff line. The western ravine is experiencing some of the same erosion and deposition as the eastern ravine along the bluff line. Future work with Washington County to restore the park vegetation can include the erosion analysis of the eastern ravine.

L:\CDO\Phase IV\09142016_Conceptual Design Response.docx

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The fen on the northern end of the lake has been avoided by any constructed channel or grade control element of the overflow project. The SWWD will attempt to establish the limits of the fen to ensure avoidance.

Regarding the easement the SWWD will require access to the lower portions of the overflow project from the south. It is the intent of the SWWD to describe an easement that extends to the south including the Ravine Lake outlet. The SWWD will develop a management plan with Washington County to inspect and maintain the project long term this includes the lake outlet structure.

Overflow channel conceptual design established a channel with 8-foot bottom, 25-foot top 3:1 side slopes and a depth of 3-feet. Final design is evaluating a broader, shallower channel within the same overall footprint. Tree impacts from channel construction will be similar to the 3-foot depth under the shallower design. Tree impacts due to channel excavation will be field verified to minimize the impact to larger healthy trees. SWWD and Washington County Staff are planning to verify the location of the channel in relation to trees and the 3M waterline. Potholing the waterline is expected to occur in the next two months. SWWD and Washington County invasive vegetation control has improved the trail experience providing a more natural vegetation environment. Several positive comments were received from the public.

The SWWD includes maintenance contracts with all of its projects. Vegetation management requires continuous monitoring and responsive maintenance as needed. The SWWD will work with Washington County to provide a combined maintenance of all vegetation management within the park.

The SWWD is aware of the Northern Long-Eared bat status as a “threatened” species. The timing of the project allows for tree clearing during non-roosting periods of the year. In addition the project timing for construction will be planned for non-roosting periods and to avoid the potential for spreading oak wilt. MNDNR and USCOE permits will be required for this project.

Local residents have communicated the amount of water that is observed in the area between Ravine Lake and East Point Douglas road from local runoff. Ravine Lake and this area are mapped on the Washington County FEMA map. As part of the final design it has been determined that elevating the park entrance road to contain the 100-year, 24-hour event provides some downstream flood relief to those properties. In consultation with Washington County it was decided that the high water can be managed within the lake with minimal impact to the park. In addition, any FEMA related issues will be addressed through permitting with the City of Cottage Grove.

As part of the final design and in cooperation with Washington County’s CSAH 19 project the SWWD plans to discuss the capacity issues of the 72-inch pipe under Highway 61 with MNDOT. The design of the overflow and the lake outlet will allow the design flow of 146 cfs to adequately pass through the overflow project as well as the 72-inch pipe under Highway 61.

Historically, the industry design standard was 5.9-inch, 24-hour event, this is the design event that was used for municipal infrastructure throughout much of SWWD. The design event for the overflow project is a 6.3-inch, 24-hour event over all of SWWD’s northern watershed, which was the industry standard of care at the time the entire project was planned by the SWWD. That

design event activates the Bailey lift station that fills SWWD's regional infiltration system (~1800 ac-ft). When capacity of the regional system is exceeded, it will overflow via Ravine Park. Rate of discharge from the regional system is capped by the permit for the Bailey lift station. Need for ravine stabilization within the park is driven by local flash flood events. Stabilization features are being designed to withstand rates resulting from a 7.4" 24-hour event (atlas 14) over the immediate watershed, which is the current industry standard. No physical monuments are planned to demarcate easement or flow extents in the park.

The SWWD can provide the tree overlay on the project concept. Final design and field verification will change this information and will attempt to minimize and protect higher quality trees in the corridor. The final plans will also include a tree preservation plan and tree protection for the contractor to follow.

Construction of the overflow project and park improvements are planned for the 2017 construction season. Thank you again for your cooperation on this very important and complex project.

If you have questions or need additional information please contact me at 651.714.3729 or mmoore@ci.woodbury.mn.us.

Sincerely,
South Washington Watershed District



Matt Moore
SWWD Administrator

- c: Mr. Jim Larsen, Metropolitan Council
- Ms. Lisa Barajas, Metropolitan Council
- SWWD Board of Managers
- Mr. Grant Wyffles, Washington County
- Mr. Wayne Sandberg, Washington County

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Appendix G: 2008 Executed Land Exchange Agreement

LAND EXCHANGE AGREEMENT BETWEEN THE METROPOLITAN COUNCIL AND WASHINGTON COUNTY

THIS LAND EXCHANGE AGREEMENT is made and entered into by and between the Metropolitan Council (“the Council”) and Washington County (“the County”).

RECITALS:

1. Washington County desires to amend the terms of the Metropolitan Council’s approval of a land exchange for the Cottage Grove Ravine Regional Park so that the “replacement” property may include all of the inholding properties, parcels 1-13.
2. On December 12, 2007 the Council approved the Cottage Grove Ravine Regional Park Master Plan, which expanded the park boundary to include inholding Parcels 1-10 and approved amending the land exchange approval to make all inholding parcels eligible to be used for land exchange replacement property.
3. The Council is willing to amend the terms of the land exchange subject to the terms of this Agreement.

NOW THEREFORE, the COUNCIL and the COUNTY agree as follows:

1. BACKGROUND

In May 2004, the County submitted a proposal to remove 38.5 acres of land in the northwest portion of Cottage Grove Ravine Regional Park for use as a joint public service center for the County and the City of Cottage Grove. In December 2004, the Council approved the land exchange subject to the County replacing the property on an equal amount of land northeast of the existing park boundary. The land was to be replaced on an acre per acre basis, and the replacement land would be adjacent to the park and have natural characteristics similar to the park. The timeframe for the replacement was January 1, 2006 to December 31, 2015.

Exhibit A shows the land exchange parcels. The properties labeled “A” and “B” depict the 38.5 acres of land to be removed from the park for County/City service center use. The property outlined in yellow depicts the 38.5 acres to be acquired and added to the park for the required land exchange. The 38.5 acres subject to removal from the park boundary was purchased with a Council grant (SG-82-97) in 1988. The grant required the County to place a restrictive covenant on the land, which stipulated that the property would not be used for any purpose except regional recreation open space for public use, unless written approval of the Council was filed and recorded.

In September 2005, the Council released the restrictive covenant on 17.7 acres of land (Parcel A) for development of the County Service Center, which is now open to the public. The acreage for the City facility (Parcel B) is still undeveloped and within the boundary of the park.

The County has updated its master plan for Cottage Grove Ravine Regional Park. The master plan update proposes to expand the boundary at the northern and eastern edge of the park. See **Exhibit B**. (Parcels 1-10). Previous master plans identified three inholding parcels for acquisition, located at the southern boundary of the park (Parcels 11, 12 and 13). The County anticipates acquiring only a portion of Parcels 1-9 and 13; Parcels 10-12 are slated for full acquisition. The master plan update proposes to add approximately 100 acres to the park (Parcels 1-13).

The County desires to amend the land exchange approval to permit the land exchange “replacement” property to include all of the inholding properties—Parcels 1-13. Current the approved land exchange replacement property is limited to portions of Parcels 1, 2 and 7, shown in **Exhibit B**.

2. AGREEMENT

The Council authorizes the land exchange replacement property to include all of the inholdings properties, Parcels 1-13, subject to the County filing a restrictive covenant against the property used as replacement property. The County and the Council agree that each will execute, and the County agrees that it will cause to be recorded at its own expense within one (1) year of execution, an agreement and restrictive covenant, substantially in the form attached to this agreement as **Exhibit C**, for each parcel acquired and for each parcel in which an interest is acquired in whole or in part. The County agrees to subsequently send a photocopy of the recorded restrictive covenant to the Council’s Parks staff. It is the purpose of such agreement and restrictive covenant to limit the right of the County to convey or encumber land or interests in land acquired without the consent of the Council and to ensure that the lands and interests in the lands be devoted exclusively to the purposes for which they were acquired, *i.e.*, regional recreation open space for public use. It is also the purpose of this agreement and restrictive covenant to lower the cost of regional services by allowing the Council, with the County's input, to place regional sewer interceptor facilities on the property if the need arises.

The replacement must be on an acre per acre basis. The Council agrees that the County may acquire Parcel 10 and use that parcel as replacement for 15.8 acres. Since 17.7 acres has been removed from the park, the County proposes to replace the remaining 1.9 acres through the acquisition of next inholding parcel to become available. All replacement property must be acquired by December 31, 2015.

No more than 20.8 acres of land within the regional park may be converted in the future for the City facility. The replacement of this land must be on an acre per acre basis, and all replacement property must be acquired by December 31, 2015.

The County agrees to develop, operate, and maintain the Park in a manner consistent with the Regional Park Policy Plan and the unit's Approved Master Plan, including allowing use of the Park by all persons in the region. The County further agrees that it will not adopt any rules

or restrictions hindering or affecting regional use of the Park without the express written consent of the Council.

IN WITNESS WHEREOF, the parties have caused this agreement to be executed by their duly authorized representatives. The agreement is effective upon final execution by both parties.

Approved as to form



Office of General Counsel

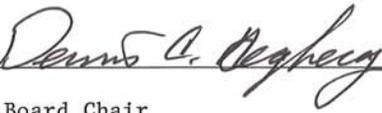
METROPOLITAN COUNCIL

By 

Regional Administrator

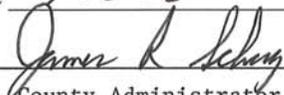
Date 2-1-08

WASHINGTON COUNTY

By 

Its: Board Chair

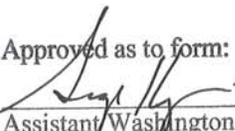
Date 1-15-08

By 

Its: County Administrator

Date 1/15/08

Approved as to form:



Assistant Washington County Attorney

Exhibit A: Location map of Cottage Grove Ravine Regional Park land exchange

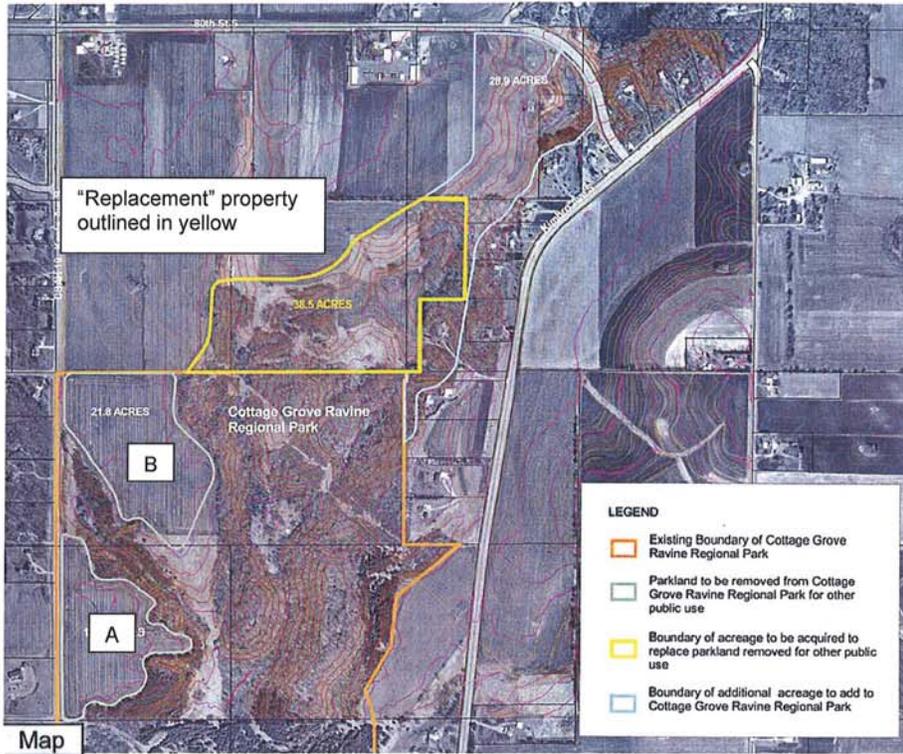


Exhibit B: Park Boundary and Inholding Parcels

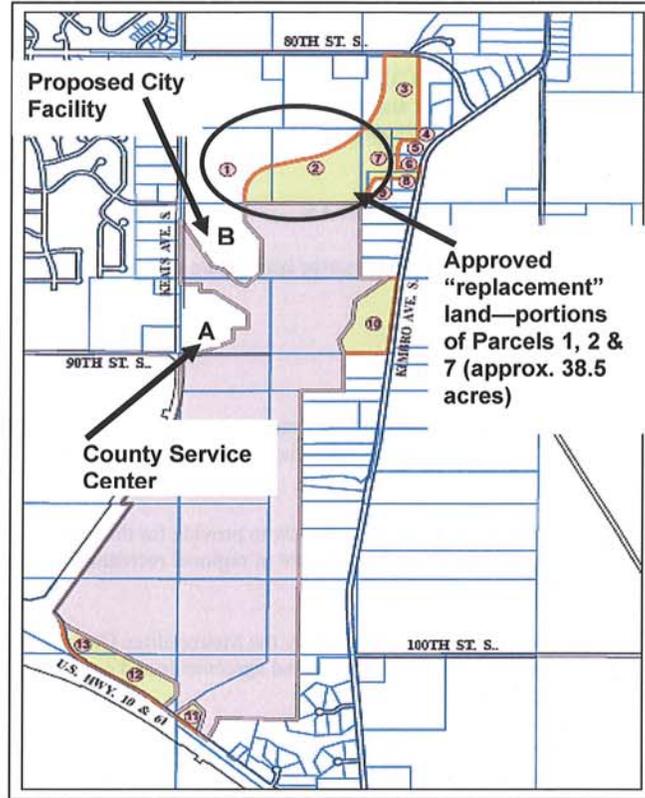


EXHIBIT C
Agreement and Restrictive Covenant

THIS AGREEMENT AND RESTRICTIVE COVENANT is made and entered into this _____ day _____, 20____, by and between _____, a Minnesota (political subdivision, municipal corporation, or county), and the Metropolitan Council, a political subdivision of the State of Minnesota.

RECITALS

1. _____ has acquired (describe here nature of interest) in the following described real property, to-wit:

_____, hereinafter referred to as the "Property."
2. The Metropolitan Council has contributed funds toward the acquisition of the Property pursuant to its grant program and a grant agreement as authorized by Chapter 563, Laws of Minnesota, 1974.
3. The grant program was established pursuant to the law to provide for the acquisition, preservation, protection, development, and betterment of regional recreational open space for public use.

NOW, THEREFORE, in consideration of the grant made by the Metropolitan Council to the _____ and in consideration of the mutual agreements and covenants contained in this agreement, the parties agree as follows:

1. No sale, lease, mortgage, or other conveyance, nor the creation of any easement, restriction, or other encumbrance against the Property shall be valid for any purpose unless the written approval of the Metropolitan Council or its successors is duly filed and recorded at the time of the filing and recording of the instrument to which such approval pertains, nor shall the Property be used for any purpose except regional recreational open space purposes as those purposes are from time to time defined by the Metropolitan Council or its successors, unless the Metropolitan Council or its successors shall consent to the other use or uses by written instrument duly filed and recorded and designating the nature, extent, and duration of the use for which such consent is given.
2. As a condition to this Grant, and provided that conveyance of such easement or easements is consistent with the Approved Master Plan, the Grantee agrees to convey to the Council, its successors or assigns, a permanent easement or easements, hereinafter referred to as "Wastewater Facilities Easement[s]" for future regional wastewater conveyance corridors on the Property. Upon written request by and at no cost to the Council, Grantee will execute and deliver to the Council the Wastewater Facilities Easement[s] substantially in the form of the Easement attached hereto and incorporated herein as Exhibit _____ for the location or locations described by the Council in its written request to Grantee. The Council may exercise this contractual right to the Wastewater Facilities Easement[s] on one or more occasions.

The Council agrees to work cooperatively with Grantee to locate the Wastewater Facilities Easement[s] and the regional wastewater conveyance facilities on the Property in a manner which minimizes the impact on existing and planned park system facilities on the Property and natural resources. As further consideration for the conveyance of the Wastewater Facilities Easement[s], the Council agrees to waive the Sewer Availability Charge for the Property.

As a further condition for this Grant, the Council may, at any time after execution of this Grant, provide to Grantee written notification of the proposed location of a future regional wastewater conveyance corridor on the Property. Grantee agrees not to place or allow to be placed any restrictions, conditions, or encumbrances on the Property within the proposed future regional wastewater conveyance corridor without the written consent of the Council

This Agreement and Restrictive Covenant may be enforced by the Metropolitan Council or its successors or by any citizen residing within the metropolitan area, as then defined, by appropriate action in the courts of the State of Minnesota.

IN WITNESS WHEREOF, the parties have caused this instrument to be executed in their respective names all as of the date first above written.

METROPOLITAN COUNCIL

By _____
Its: Regional Administrator

Dated _____

STATE OF MINNESOTA }
 } ss
COUNTY OF }

The above instrument was acknowledged before me this _____ day of _____, 2005, by _____, the Regional Administrator of the Metropolitan Council, a public corporation and political subdivision of the State of Minnesota on behalf of the subdivision.

Notary Public

[INSERT NAME]

By _____
Its: _____

STATE OF MINNESOTA }
 } ss
COUNTY OF }

The above instrument was acknowledged before me this _____ day of _____, 2005, by _____, the _____ of the _____, a _____ of the State of Minnesota on behalf of said _____.

Notary Public

DRAFTED BY:
Peter A. Hanf
Associate General Counsel
Metropolitan Council
230 East Fifth Street
St. Paul, MN 55101
(651) 602-1749

EXHIBIT ____

EASEMENT

THIS INSTRUMENT, MADE THIS __ day of _____, 2005, by and between _____, of the County of _____, State of Minnesota, Grantor(s), and the Metropolitan Council, a public corporation and political subdivision of the state (successor to the Metropolitan Waste Control Commission), Grantee;

WITNESSETH, that Grantor(s), in consideration of One Dollar and other good and valuable consideration to ____ in hand paid by Grantee, the receipt of which is hereby acknowledged, does hereby grant, bargain, sell, and convey to Grantee, its successors and assigns, the following described easement for sanitary sewer and utility purposes:

[Insert]

Said temporary easement to expire on or before _____.

The above described easement includes the rights of grantee, its contractors, agents and employees to do whatever is necessary for enjoyment of the rights granted herein including the right to enter the easement for purposes of constructing, operating, maintaining, altering, repairing, replacing, and/or removing said sewers and utilities.

Grantor(s), _____ heirs, successors and assigns, will not erect, construct, or create any building, improvement, obstruction or structure of any kind, either above or below the surface, or stockpile soils, construction debris, or construction equipment or change the grade thereof, without the express written permission of the Grantee.

Notwithstanding the aforementioned provision, the following improvements by Grantor(s), heirs, successors, and assigns do not require Grantee's written approval: fences, parking lots, street and/or roadways, landscaping, bushes, shrubs. However, Grantor(s) hereby agree(s) that Grantee will not be

EXHIBIT "A"

(Legal Description)

All that part of the East 313.66 feet of the Southeast Quarter of the Southeast Quarter of Section 25, Township 27 North, Range 22 West of the 4th Principal Meridian, Washington County, Minnesota, lying North of the South 66.00 feet thereof, and lying Southerly and Westerly of the following described Line "A":

Commencing at the Northeast corner of said Southeast Quarter of the Southeast Quarter of Section 25; thence South 00 degrees 18 minutes 39 seconds East, along the East line of said Southeast Quarter of the Southeast Quarter of Section 25, a distance of 622.10 feet, to the point of beginning of Line "A"; thence South 89 degrees 41 minutes 21 seconds West a distance of 213.66 feet; thence North 11 degrees 02 minutes 23 seconds West a distance of 117.62 feet; thence North 17 degrees 54 minutes 54 seconds East a distance of 70.01 feet; thence North 00 degrees 18 minutes 39 seconds West, parallel with said East line of the Southeast Quarter of the Southeast Quarter of Section 25, a distance of 442.49 feet to the North line of said Southeast Quarter of the Southeast Quarter of Section 25, and said Line "A" there terminating.

All that part of the West 165.00 feet of the Southwest Quarter of the Southwest Quarter of Section 30, Township 27 North, Range 21 West, of the 4th Principal Meridian, Washington County, Minnesota, lying North of the South 66.00 feet thereof, and Southerly of the following described Line "B":

Commencing at the Northwest Corner of said Southwest Quarter of the Southwest Quarter of Section 30; thence North 89 degrees 34 minutes 26 seconds East, along the North line of said Southwest Quarter of the Southwest Quarter of Section 30, a distance of 332.00 feet; thence South 21 degrees 16 minutes 56 seconds West a distance of 385.84 feet; thence South 00 degrees 18 minutes 39 seconds East, parallel with the West line of said Southwest Quarter of the Southwest Quarter of Section 30, a distance of 304.00 feet; thence South 89 degrees 41 minutes 21 seconds West a distance of 25.00 feet, to the East line of said West 165.00 feet of the Southwest Quarter of the Southwest Quarter of Section 30, and the point of beginning of Line "B"; thence North 76 degrees 41 minutes 09 seconds West a distance of 169.78 feet to the said West line of the Southwest Quarter of the Southwest Quarter of Section 30, and said Line "B" there terminating.



Appendix H: 2016 Amendment to Land Exchange Agreement

AMENDMENT TO LAND EXCHANGE AGREEMENT BY AND BETWEEN THE METROPOLITAN COUNCIL AND WASHINGTON COUNTY

THIS AMENDMENT is made and entered into by and between the Metropolitan Council (“the Council”) and Washington County (“the County”) effective December 31, 2015.

RECITALS:

1. In May 2004, the County submitted a proposal to remove 38.5 acres of land from the Cottage Grove Ravine Regional Park (the “Park”) for use as a joint public service center for the County and the City of Cottage Grove (the City”). Since Council park bonds were used to acquire the land, the County was required to place a restrictive covenant on said land, which limited its ability to use the property for anything other than regional recreation open space purposes without the Council’s approval. In December 2004, the Council approved the land exchange subject to the County replacing the property on an equal amount of land northeast of the existing park boundary. The land was to be replaced on an acre-per-acre basis, and the replacement land needed to be adjacent to the Park and have natural characteristics similar to the Park.
2. On December 12, 2007, the Council approved an amendment to the Park master plan to expand the boundary of the Park. On February 1, 2008, the Council and the County entered into a Land Exchange Agreement (the “Agreement”) regarding the land replacement at the Park. The Agreement allowed all of the inholding parcels within the Park boundary to be eligible to be used for land replacement property. The Agreement also gave the County until December 31, 2015, to replace the land at the Park. In 2005, the Council released the restrictive covenant on 17.7 acres of Park land for development of the County Service Center, and in 2011, the Council released the restrictive covenant on 20.8 acres of Park land for the City facility.
3. The County purchased 17.7 acres of land adjacent to the Park to replace the land removed from the Park for the County Service Center. The County has replaced 7.44 acres of land removed from the Park for the City facility. The County still needs to replace a total of 13.36 acres of land within the Park boundary for the City facility (the “Remaining Property”).
4. The County is requesting an extension to the timeframe to acquire the Remaining Property. On December 9, 2015, the Council approved an amendment to the Agreement to allow the County to replace the Remaining Property or to effectuate an equally valuable facility exchange (the “Exchange”) and to extend the date by which the County has to meet these requirements.

NOW THEREFORE, the Council and the County agree that the Agreement shall be amended by adding the following:

1. The County agrees to acquire the Remaining Property or effectuate an Exchange that is approved by the Council no later than December 31, 2022. If the County fails to accomplish either by said date, the County agrees that the Council may immediately withhold regional parks funding to it until the Remaining Property is acquired or until the Council has approved an Exchange.

2. The remaining provisions of the Agreement shall remain in full force and effect without change except as amended above.

IN WITNESS WHEREOF, the parties have caused this Amendment to be executed by their duly authorized representatives.

METROPOLITAN COUNCIL

By [Signature]
Regional Administrator

Date 3/17/2016

WASHINGTON COUNTY

By [Signature]
Its: County Board Vice Chair

Date 3-1-16

By [Signature]
Its: County Administrator

Approved as to form:
[Signature]
Assistant County Attorney

Date 2/23/16

Date 3-1-16