

TECHNICAL MEMORANDUM

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Date: March 24, 2026

Subject: Study 13: Potential Water Savings from Low-Input Turf Grasses

Executive Summary

The Metropolitan Council Environmental Services (MCES), in coordination with 14 communities hydrologically connected to White Bear Lake, is evaluating strategies to ensure sustainable drinking water supplies while supporting long-term municipal growth. As part of this effort, Study 13 assesses the potential for reducing groundwater use through the conversion of conventional turf grass, primarily Kentucky Bluegrass (KBG), to alternative low-input turf grasses. It is common knowledge that the irrigation needs for KBG play a major role in the peak summertime water demands that occur in the White Bear Lake area. Reducing these demands could significantly reduce groundwater pumping from the aquifer and result in less impact on the surface water elevations in White Bear Lake.

This study evaluates how changes in landscape practices can reduce irrigation demand across residential, commercial, institutional, and public lands. Using a combination of community-provided land use data, Metropolitan Council datasets, and national datasets (NLCD and NWI), a GIS-based analysis was performed to estimate areas of irrigated turf and identify locations suitable for conversion. The analysis considered both existing developed areas and future growth areas, applying representative irrigation rates and land use assumptions to estimate potential reductions in groundwater pumping.

Results indicate that transitioning to low-input turf grasses, such as fine fescue and tall fescue, can significantly reduce irrigation demand. At the parcel level, these grasses require substantially less water than KBG, particularly under established conditions. Across the study area, the analysis shows that irrigation use can be reduced by approximately 50 to 75 percent, corresponding to potential savings of approximately 298,700 to 325,500 gallons per acre per year when rainfall is not accounted for and up to 66,300 gallons per acre when rainfall is accounted for. While water savings during turf establishment are modest, the majority of benefits are realized over the long term through reduced irrigation requirements.

At the community scale, total water savings vary based on existing land use patterns and future development potential. Communities with larger areas of irrigated pervious surfaces and planned growth present the greatest opportunity for reduction in groundwater demand. Even under moderate implementation scenarios (e.g., 30% conversion), the cumulative impact across the region represents a meaningful contribution toward long-term water sustainability goals.

From a cost perspective, installation costs for low-input turf grasses are comparable to traditional turf. However, long-term maintenance costs are generally lower, particularly for fine fescue, due to reduced mowing frequency, lower nutrient requirements, and decreased irrigation demand. As a result, the primary benefits of low-input turf grasses are associated with lifecycle cost savings and water conservation rather than initial construction cost differences.

Successful implementation depends on aligning turf selection with site conditions and adjusting maintenance practices. Fine fescues are best suited for low-traffic and shaded areas, while tall fescues are more appropriate for higher-use areas. Importantly, irrigation practices must be modified to reflect reduced water needs; maintaining conventional KBG irrigation schedules will limit achievable savings and may negatively impact turf health.

Overall, this study demonstrates that landscape-level changes, when implemented at scale, can provide a practical and cost-effective strategy for reducing irrigation-related groundwater use. Incorporating low-input turf grasses into new development, redevelopment, and public landscapes offers a scalable pathway to support the long-term sustainability objectives of the White Bear Lake Area Comprehensive Plan.

Purpose and Scope

Purpose of the Study

The Minnesota legislature has funded the Metropolitan Council of Environmental Services (MCES) to work with 14 communities that are hydrologically connected to White Bear Lake to identify strategies that ensure sufficient and sustainable drinking water supplies to support long-term municipal growth and protect regional water resources for future generations.

As part of this broader effort, Study 13 evaluates one of the “other methods for reducing groundwater use” identified by the Work Group—specifically, the potential for reducing irrigation demand through the use of alternative low-input turf grasses. This study focuses on identifying how the implementation, installation, and conversion of existing Kentucky Bluegrass to low-input turf grass would affect water use across the 14 identified communities. The study will evaluate the conversion of 20%, 30%, 40% and 50% of the existing and future grass cover to low-input turf grass to identify potential water savings compared to Kentucky Bluegrass.

Scope of the Study

The Scope of this study includes the following key tasks:

- Land Use and Parcel-Level Evaluation
 - Identify and evaluate land use patterns across each community to determine areas suitable for low-input turf grass implementation. This includes:
 - Review of impervious and pervious land cover to identify irrigated and potentially irrigated areas
 - Assessment of current and future (ultimate) land use conditions across the 14 White Bear Lake area communities
 - Identification of candidate areas across residential, commercial, institutional, and public lands where conversion or integration is feasible.
- Irrigation Demand and Turfgrass Assessment
 - Evaluate and compare the irrigation requirements of traditional Kentucky Bluegrass and alternative low-input turf grass using available research, including data from the University of Minnesota Turfgrass Science Program. This task supports the development of representative irrigation rates used in estimating water savings.
- Water Savings Analysis
 - Estimate potential reductions in groundwater use for irrigation based on varying levels of low-input turf adoption. The analysis considers multiple implementation scenarios to reflect a range of realistic adoption levels across communities.
- Cost and Implementation Considerations
 - Develop planning-level estimates of construction (installation) costs and annual operation and maintenance (O&M) costs associated with low-input turf grass implementation. Costs are evaluated at a unit level and scaled for community-wide applications.
- GIS Mapping and Visualization
 - Develop GIS Basemaps and supporting figures to illustrate land use conditions, impervious/pervious surfaces, and potential areas for low-input turf implementation across the study area.

Work Performed

To evaluate the general costs and savings associated with implementing low-input turf grass, the evaluation must be conducted in two stages: the evaluation of the potential area that can be constructed with low-input turf grass and the per-acre costs of implementing turf grass. Additionally, irrigation requirements for both KBG and low input turf grasses must be fully understood.

DATA COLLECTION AND REVIEW

Land Use Data

Land use datasets from MCES and individual datasets provided by the 14 communities were used for this analysis. Where available, city-provided current and future land use data were utilized; otherwise,

Met Council (2020) land use data and/or community comprehensive plans were referenced to maintain consistency. Table 1 summarizes the sources of land use data by community.

To support identification of pervious areas that would allow for the installation of Low-input Turf Grass, including existing turf grass surfaces, 2023 fractional impervious surface data and tree cover from the National Land Cover Database (NLCD) were incorporated. Wetland data from the National Wetlands Inventory (NWI) were also applied consistently across all communities.

Table 1 Land Use Data Source

Cities	County	Current Land Use	Future Land Use
Stillwater	Washington	Provided by City	Provided by City
Mahtomedi	Washington	Provided by City	Provided by City
Hugo	Washington	Met Council 2020	Provided by City
Lake Elmo	Washington	Provided by City	Provided by City
Lino Lakes	Anoka	Provided by City	Provided by City
North St. Paul	Ramsey	Met Council 2020	City's Comprehensive Plan
Oakdale	Washington	Provided by City	Provided by City
Vadnais Heights	Ramsey	Provided by City	Provided by City
Shoreview	Ramsey	Met Council 2020	City's Comprehensive Plan
Woodbury	Washington	Met Council 2020	City's Comprehensive Plan
New Brighton	Ramsey	Provided by City	Provided by City
White Bear Lake	Ramsey	Provided by City	Provided by City
White Bear Township	Ramsey	Met Council 2020	City's Comprehensive Plan
North Oaks	Ramsey	Met Council 2020	City's Comprehensive Plan

Grass Research

To accurately and effectively evaluate the various grass requirements, Kimley-Horn worked closely with the University of Minnesota Turf Grass Program (<https://turf.umn.edu/>). Research has evaluated the typical growth rates, seeding requirements, watering requirements, and establishment requirements for both low-input turf grass and Kentucky Bluegrass.

Turfgrass Water Use Comparison and Implications

Baseline Condition: Kentucky Bluegrass (KBG)

Kentucky Bluegrass (KBG) is the predominant turfgrass used across residential landscapes, athletic fields, and public spaces in the White Bear Lake area due to its aesthetic appeal and durability. However, maintaining KBG requires relatively high irrigation inputs, along with ongoing fertilizer application and maintenance. These characteristics contribute to higher water demand, particularly during peak irrigation months and during the establishment of new turf areas.

Alternative Approach: Low-Input Turf Grasses

Low-input turf grasses, including Fine Fescue and Tall Fescue, provide a viable alternative to KBG by requiring significantly less water, reduced nutrient inputs, and lower mowing frequency. These grasses are adaptable to a range of site conditions:

- Fine Fescue performs well in low-traffic areas and shaded environments with minimal maintenance requirements.
- Tall Fescue offers improved drought tolerance and is better suited for moderate- to high-traffic areas.

As a result, these turf types present an opportunity to significantly reduce irrigation demand while maintaining functional and aesthetically acceptable landscapes.

Irrigation Requirements During Establishment

Water demand during turf establishment represents a critical short-term consideration. As shown in **Table 2**, both KBG and low-input turf grass require consistent irrigation immediately following seeding; however, total water use during establishment is generally lower for low-input turf grasses.

For example:

- On sandy soils, KBG requires approximately 190,000 gallons per acre during establishment, compared to approximately 165,000 gallons per acre for low-input turf grasses.
- On clay soil, the difference is similarly notable, with KBG requiring approximately 114,000 gallons per acre, compared to approximately 103,000 gallons per acre for low-input turf grasses.

While the difference during establishment is moderate, it represents an early opportunity for water savings, particularly when implemented at scale across new developments.

Long-Term Irrigation Requirements (Established Lawns)

The most significant water savings occur over the long term once turf is established. As summarized in **Table 3**, KBG requires substantially more irrigation to maintain healthy conditions compared to low-input turf grasses.

- KBG typically requires 0.8 to 1 inch of water per week, resulting in annual irrigation demands of approximately 474,900 to 597,400 gallons per acre annually (excluding rainfall).
- In contrast, low-input turf grass requires only 0.25 to 0.5 inches per week, corresponding to approximately 149,400 to 298,700 gallons per acre annually (excluding rainfall).

- Average MN rainfall between May and September is approximately 26,500 gallons per acre per week and approximately 531,000 gallons per acre per irrigation season, May -September. This rainfall can supplement grass needs throughout the irrigation season.

This reduction translates to potential water savings up to approximately 66,300 gallons per acre per year, depending on site conditions and irrigation practices.

Key Takeaways for Water Use Reduction

- **Short-term (establishment):** Low-input turf grass provides modest but meaningful reductions in irrigation demand.
- **Long-term (established conditions):** The majority of water savings are realized, with reductions of up to ~60–70% compared to KBG.
- **Scalability:** When applied across residential, commercial, and public lands, these per-acre savings translate into substantial reductions in municipal groundwater demand.

Overall, transitioning from Kentucky bluegrass to low-input turf grass represents a practical and scalable strategy to reduce irrigation-related water use while maintaining functional landscape performance.

Table 2 Watering Requirements for New Grass Installations Per Acre

Low-Input Turf Grass										
		First 8 Days after Seeding				Next 7 Days				Total Water During Establishment (Gal)
Soil Type	Grass Type	Inches per Day	Acres	Water Per Day (Gal)	Total Water (Gal)	Inches per day	Acres	Water Per Day (Gal)	Total Water (Gal)	
Sandy Soil	Tall Fescue	0.5	1	13,576	108,610	0.3	1	8,146	57,020	165,630
	Fine Fescue	0.5	1	13,576	108,610	0.3	1	8,146	57,020	165,630
Clay Soil	Tall Fescue	0.3	1	8,146	65,166	0.2	1	5,430	38,013	103,179
	Fine Fescue	0.3	1	8,146	65,166	0.2	1	5,430	38,013	103,179
Kentucky Bluegrass										
First Two Weeks After Seeding										
Soil Type	Grass Type	Inches Per Day	Acres	Water Per Day (Gal)					Total Water During Establishment (Gal)	
Sandy Soil	Kentucky Bluegrass	0.5	1	13,576					190,067	
Clay Soil	Kentucky Bluegrass	0.3	1	8,146					114,040	

Table 3 Watering Requirements for Established Lawns Per Acre

Grass Type	Inches Per Week	Acres	Water Per Week (Gal)	Irrigation required Excluding Rainfall Per Week ² (Gal)	Average Weekly Rainfall ¹ (Gal)	Average Annual Rainfall ¹	Reduction in water per acre with the implementation of low-input turf grass ² (Gal)
Low Input Turf Grass- (Tall Fescue)	0.25-0.5	1	6,788 -13,576	149,400-298,700	26,500	531,100	0-66,300
Low Input Turf Grass- (Fine Fescue)	0.25-0.5	1	6,788 -13,576	149,400-298,700	26,500	531,100	0-66,300
Kentucky Bluegrass	0.8-1	1	21,722-27,152	477,900-597,400	26,500	531,100	--

¹Based on average MN rainfall in MN between May and September (22 Weeks)

²Based on irrigation between May and September (22 Weeks)

Attachment A outlines the various types of general maintenance requirements and benefits associated with Fine Fescue and Tall Fescue.

POTENTIAL LOW-INPUT TURF GRASS AREAS ANALYSIS

Current Land Use Analysis

To estimate the potential areas available for low-input turf grass implementation, community-wide turf grass coverage was evaluated using the datasets summarized in Table 4. Land cover within each city was first classified by land use category to establish a consistent framework for analysis.

A GIS-based approach was then applied to identify areas that are likely to be irrigated and therefore suitable for turf grass conversion. This process incorporated impervious surface data and systematically excluded areas that would not be irrigated or are not appropriate for turf grass, including open water, wetlands, and canopy-covered (wooded) areas.

Table 4 Land-use Calculation Layers

Layer	Rationale
Current Land Use	To Classify Impervious Surface by Land Use
2023 NLCD Fractional Impervious Land Cover	To Identify Total Impervious Coverage
NWI Wetland Coverage	To remove pervious coverage that would not be irrigated and would not be modified
Canopy Coverage	To remove pervious coverage that would not be irrigated and wooded areas

The potential turf grass area was calculated using Equation 1, which combines fractional impervious-surface data with land-use area and excludes non-irrigated or non-convertible surfaces. This approach provides an estimate of the developable and maintained landscape areas where turf grass, and therefore irrigation demand, would be expected.

Equation 1 Impervious Data Coverage.

*(Fractional Pervious Percentage * Area by Land Use Category) – Open Water Area – Wetlands Area – Canopy Coverage Area = Area of potential impervious surface by land use*

This methodology is intended to provide a planning-level estimate of irrigated turf areas and does not account for parcel-level irrigation practices or site-specific landscaping variations.

Future Land Use Analysis

For future development areas, detailed impervious surface data are not available. Therefore, the percent impervious values by land use category developed as part of the current land use analysis (Equation 1) were applied to future land use classifications to estimate potential turf grass areas.

Future land use datasets for each community were used to identify developable areas and categorize them by land use type. The corresponding percent impervious assumptions were then applied to estimate pervious areas likely to be landscaped and irrigated. As with the current land use analysis, areas not expected to be irrigated, such as open water, wetlands, and canopy-covered areas, were excluded.

To avoid double-counting, areas already accounted for in the current land use analysis were removed, ensuring that the results represent only incremental future turf grass installation potential. This approach provides a planning-level estimate and reflects typical development patterns by land use category rather than site-specific design conditions.

When GIS data was not available, future land use areas were estimated using the city's respective 2040 Comprehensive Plan as noted in Table 1. All GIS figures created using this methodology cannot visually define future land use; future land use maps will only be able to show wetlands, but can't discern other land uses geographically, as seen in Figures 14, 16, 20, 26, and 28.

Attachment D presents the results of both the current and future land use analysis.

Findings and Implications

Cost Estimation

While working closely with the UMN Turf Classifications, costs for both establishment and annual maintenance associated with KBG, Fine Fescue, and Tall Fescue were estimated per acre and are shown in Table 5. These costs account for the use of erosion blankets, fertilizers, and maintenance. A detailed overview of the costs associated with each grass is outlined in Attachment C.

Table 5 Opinion of Probable Costs Per Acre

Type of Grass	Establishment Per Acre	General Annual O&M Cost Per Acre
Kentucky Bluegrass	\$4,255	\$6,954
Tall Fescue	\$4,527	\$6,851
Fine Fescue	\$4,379	\$3,453

Potential Water Savings

Based on the current and future impervious cover identified in Attachment D, the total land uses are split into public and private entities, excluding utilities, railroads, and preserves. Based on the final land use calculation, potential impervious and water savings by the city are outlined in Table 6.

Table 6 Potential Water Savings Per Year with the Implementation 20-50% Turf Grass

Community	Land Use Classification	Existing Water Savings ¹ (MGY)	Ultimate Future Water Savings ¹ (MGY)
Lake Elmo	Private	27-67	55-138
	Public	24-61	39-98
Lino Lakes	Private	39-98	11-29
	Public	12-29	18-45
New Brighton	Private	14-35	2-6
	Public	2-4	3-7
North Oaks	Private	10-25	2-5
	Public	3-7	0.2 - 0.6
Oakdale	Private	24-60	NA ²
	Public	5-12	3-7
Vadnais Heights	Private	9-22	2-4
	Public	3-6	0.7-1.8
White Bear Lake	Private	15-38	4-9
	Public	4-9	NA ²
Mahtomedi	Private	6-14	0.3-0.8
	Public	2-4	0.2-0.6
Stillwater	Private	8-20	1-3
	Public	7-18	0.1-0.2
Hugo	Private	25-63	31-78
	Public	10-24	NA ²
North Saint Paul	Private	6-14	0.1
	Public	2-4	NA
Shoreview	Private	19-46	NA ²
	Public	7-18	NA ²
Woodbury	Private	49-124	29-73
	Public	22-55	3-9
White Bear Township	Private	11-28	NA ²
	Public	8-19	NA ²

¹Water savings are based on recommended irrigation needs by grass type and does not represent savings based on individual irrigation practices

²Future land use classifications and their respective areas are less than current land classifications. Calculations of water savings in these cases is not feasible.

Conclusions

Transitioning from Kentucky bluegrass (KBG) to low-input turf grasses could significantly reduce irrigation demand across residential and other irrigated pervious areas across the entire White Bear Lake area. The irrigation needs for KGB account for the majority of the peak summertime water demands that occur in the White Bear Lake area. Reducing these demands could significantly reduce groundwater pumping from the aquifer and result in less impact to the surface water elevations in White Bear Lake. Based on the analysis, irrigation needs can be reduced by approximately 50 to 75 percent, corresponding to annual savings of approximately 61,000 gallons per acre based on water rainfall.

Construction (installation) costs for the turf types evaluated are generally comparable, with differences within approximately 10 percent. However, long-term maintenance costs vary more significantly. Fine fescue has lower annual maintenance costs (approximately \$3,500 per acre) compared to KBG and tall fescue (approximately \$7,000 per acre), primarily due to reduced mowing frequency and lower input requirements.

Overall, the greatest benefits of low-input turf grass are realized through long-term reductions in irrigation demand and maintenance effort, rather than initial construction cost savings.

Recommendations

Successful implementation of low-input turf grasses depends on appropriate application, design, and maintenance practices:

- Modify existing city policies- Consider modifying existing city policies to promote the use of low-input turf grasses for existing development and require it for proposed future development through adoption of a city ordinance.
- Match turf type to application - Fine fescues are best suited for low-traffic areas and/or shaded conditions, while tall fescues are more appropriate for moderate- to high-traffic areas but require maintenance practices more similar to KBG.
- Adjust irrigation practices - Irrigation schedules should be modified to reflect the lower water needs of low-input turf grass. Continuing KBG-style irrigation practices may reduce the effectiveness of these grasses and limit achievable water savings.
- Use seed mixtures where appropriate - Blended seed mixes that include low-input turf grasses with a portion of KBG can improve turf resilience and establishment success while still reducing overall water demand.
- Incorporate into future development and retrofits - Given their cost-effectiveness and lower maintenance requirements, low-input turf grasses should be considered in new development, redevelopment, and public landscaping projects.
- Promote long-term performance through maintenance practices - Over-irrigation and conventional KBG maintenance approaches can lead to shallow root systems and reduced turf health. Proper maintenance practices are essential to achieve the intended water savings and durability benefits.

- Visit the UMN Turf Grass Trial Site – Further understanding, visualization, and education for the community may be beneficial to provide successful application practices as well as maintenance practices for new developments and/or replacement of existing grasses.
- The University of Minnesota has four seed mixture trial sites with low-input turf grasses in four areas of the Metro Region, with the closest one located in Lake Elmo (see addresses on the last page). These spaces are open to the public and show how the turf grasses appear with very minimal to no irrigation.

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Attachments

- Attachment A. General Grass Information
- Attachment B. Water Use Estimator
- Attachment C. Opinion of Probable Costs
- Attachment D. Land Use Calculations
- Attachment E. Low-Input Turf Grass Calculations
- Attachment F. UMN Low-Input Turf Grass Trial Sites Information

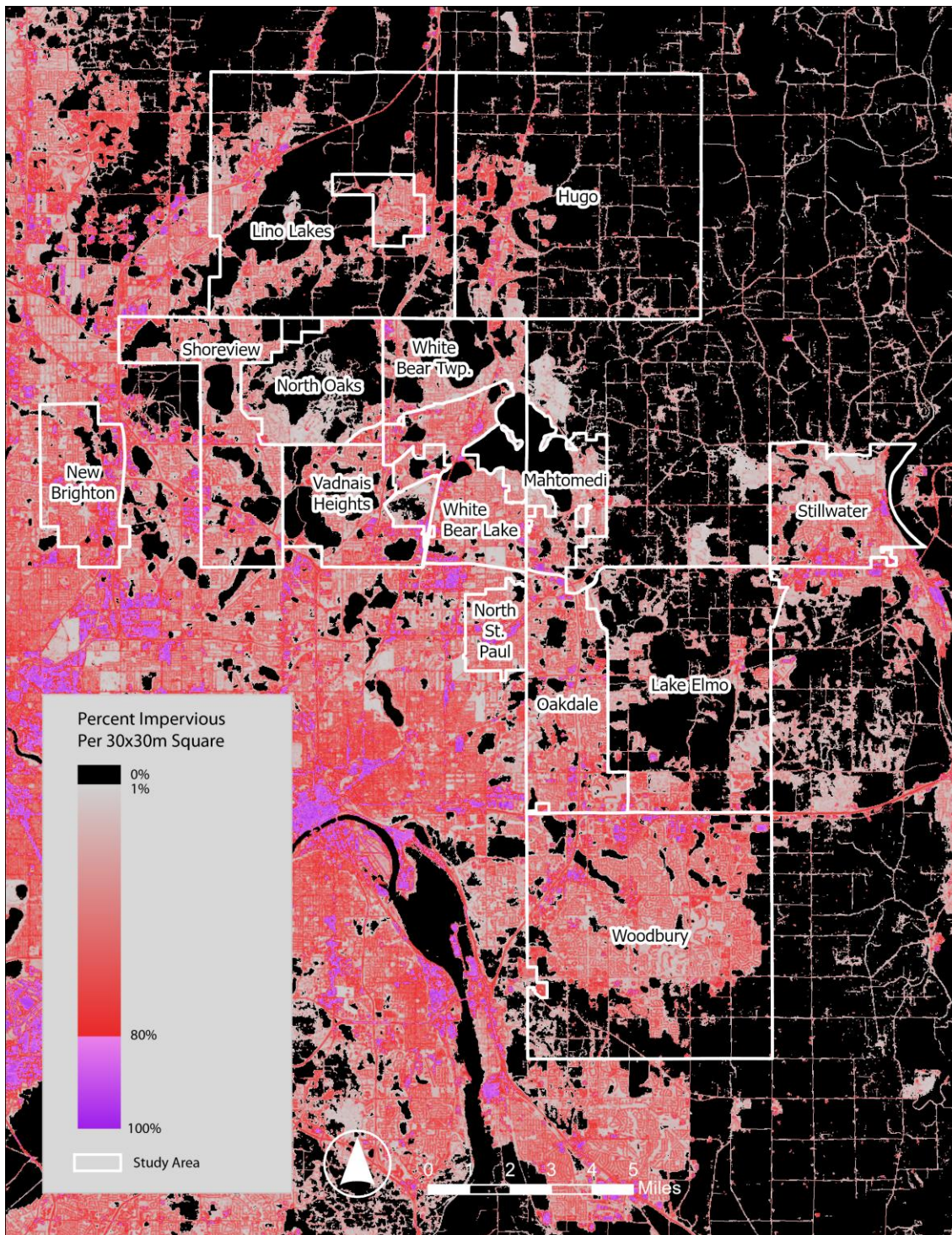


Figure 1 Fractional % Impervious Land Cover Map

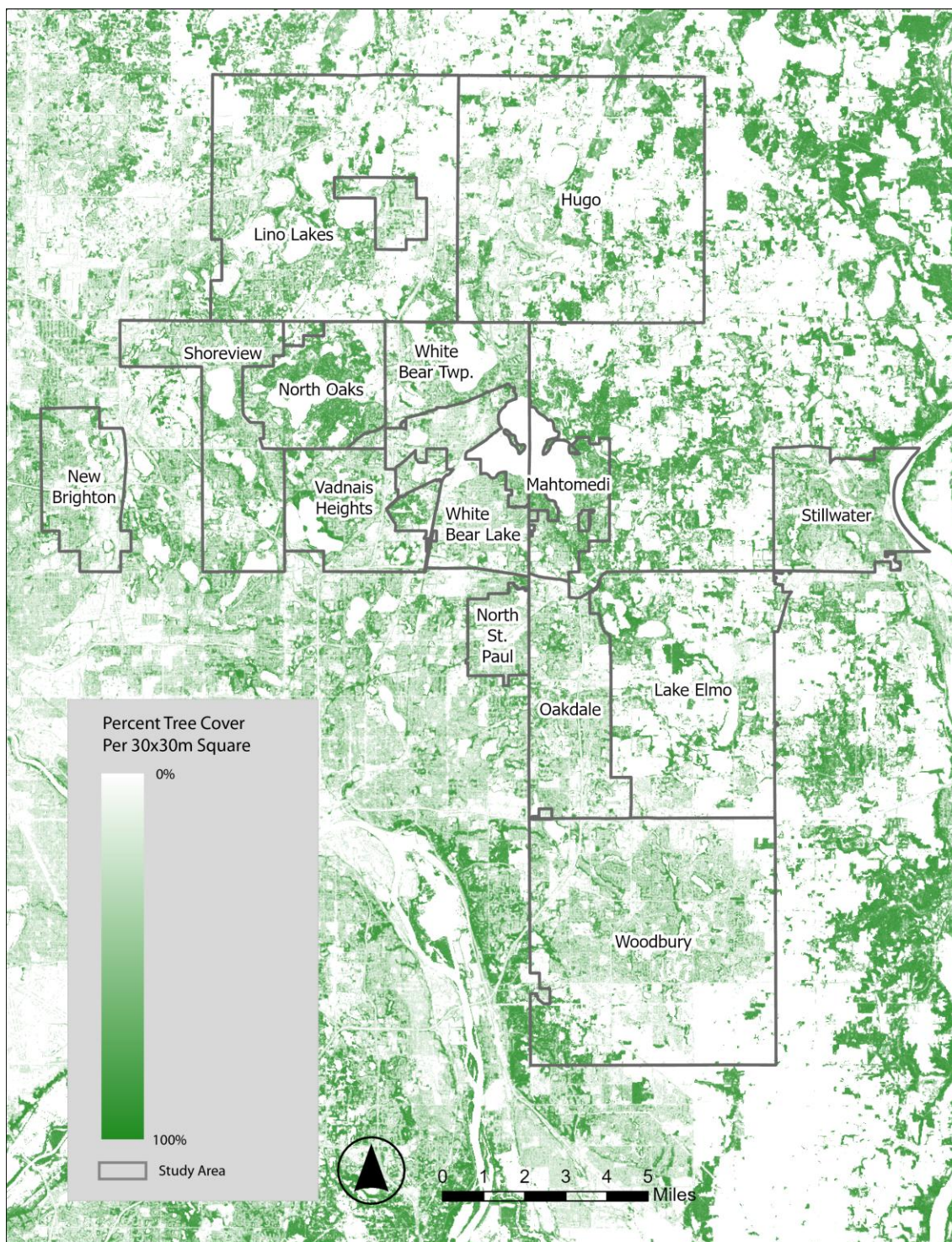


Figure 2 Fractional % Tree Cover Map

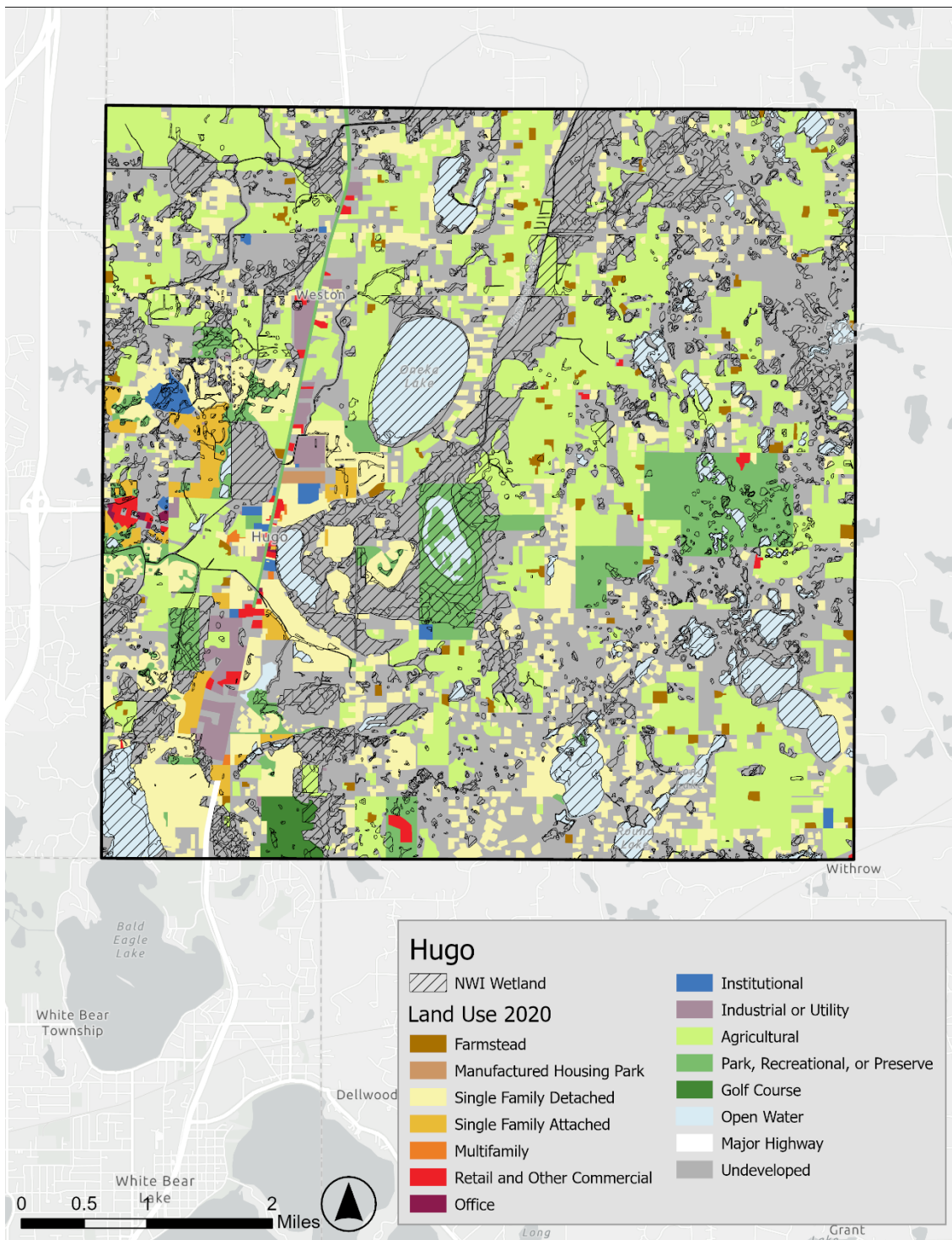


Figure 3 Hugo Current Land Use

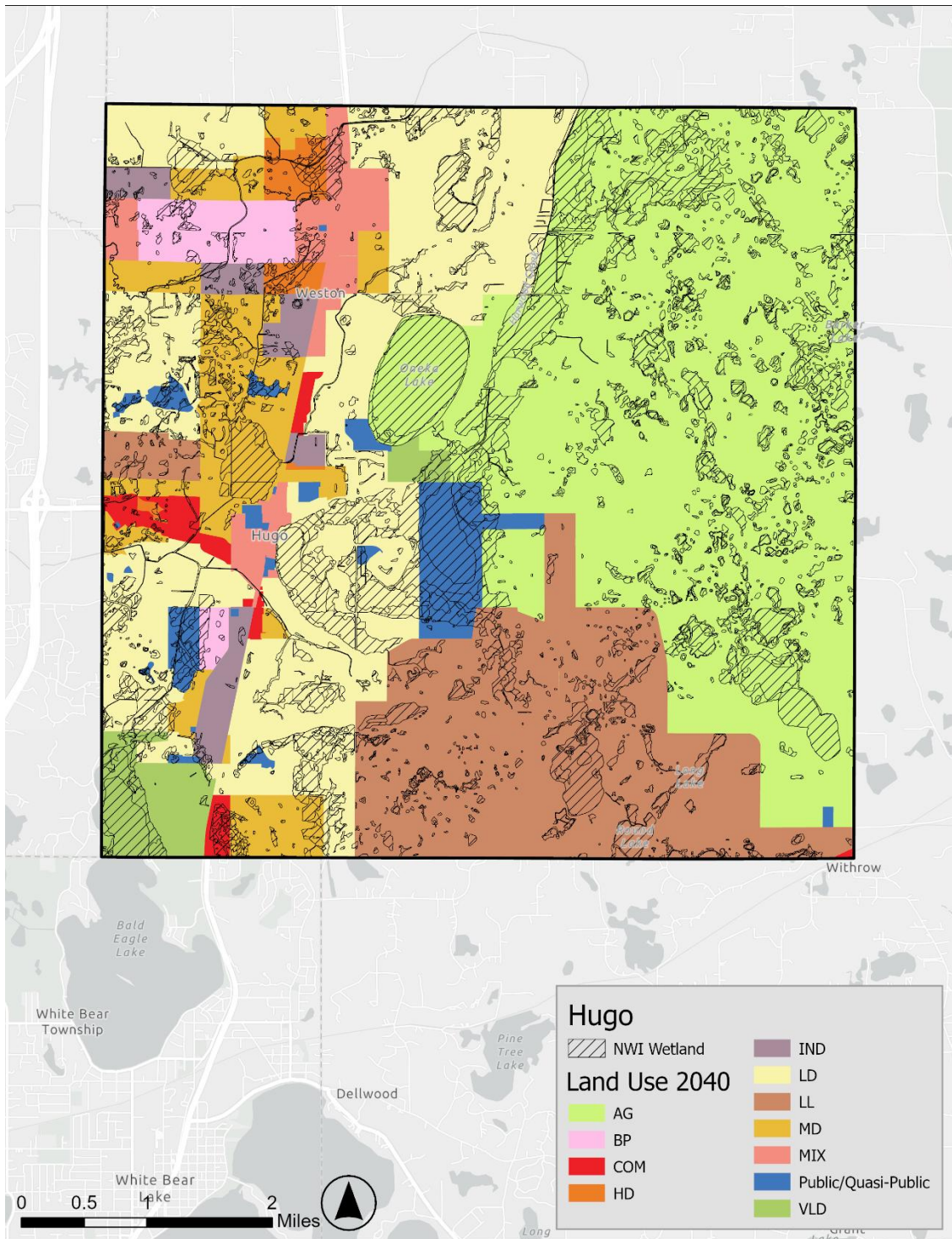


Figure 4 Hugo Future Land Use

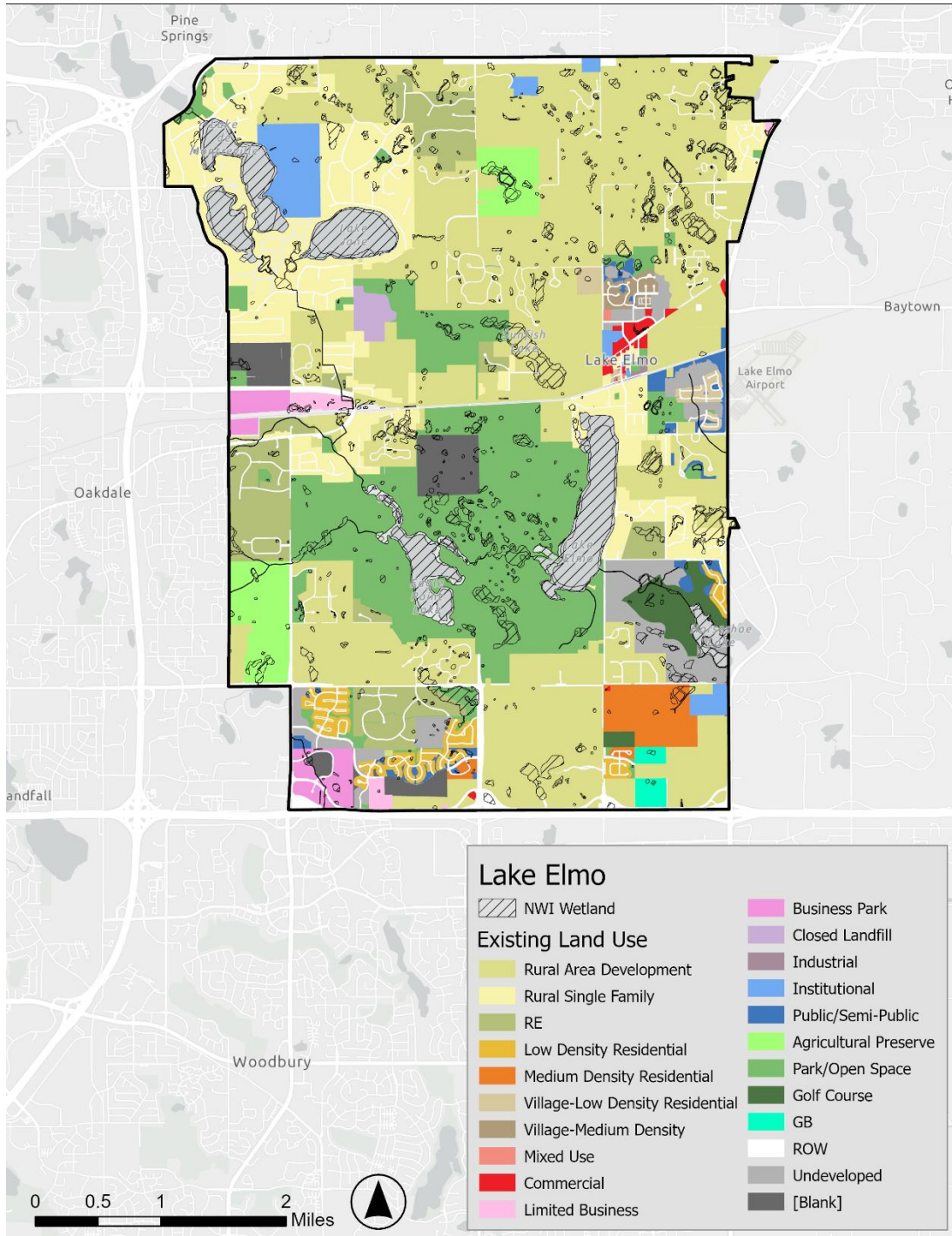


Figure 5 Lake Elmo Current Land Use

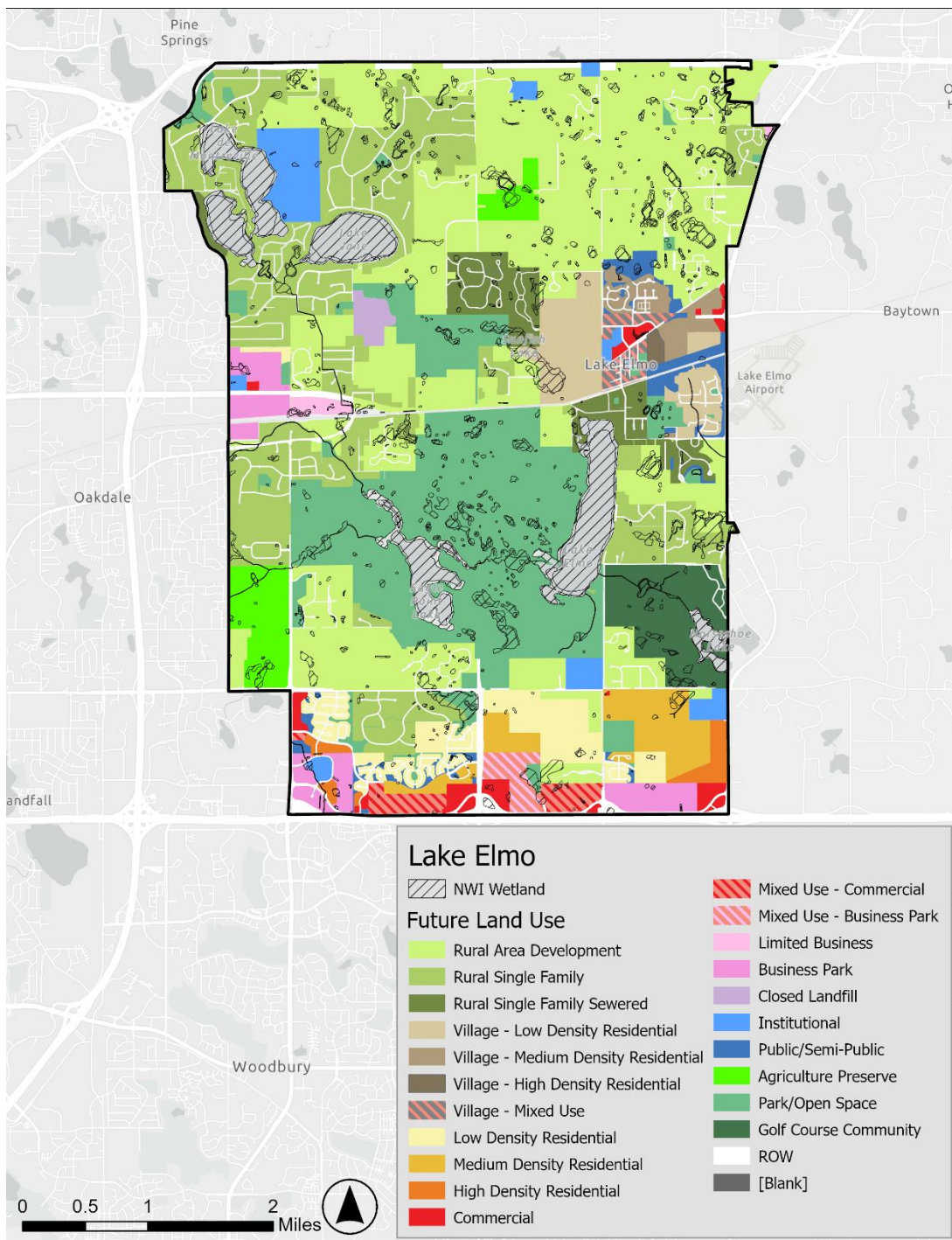


Figure 6 Lake Elmo Future Land Use

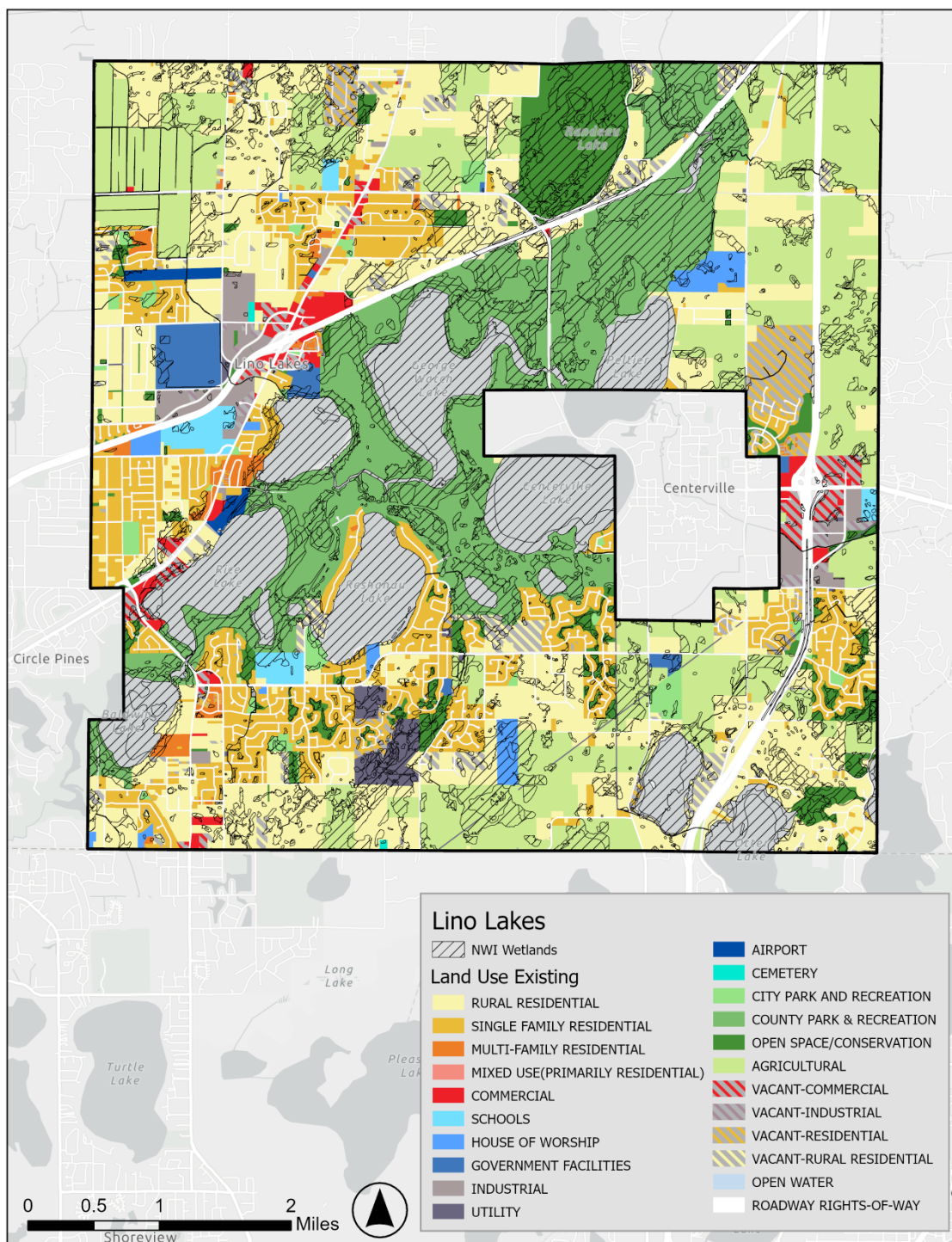


Figure 7 Lino Lakes Current Land Use

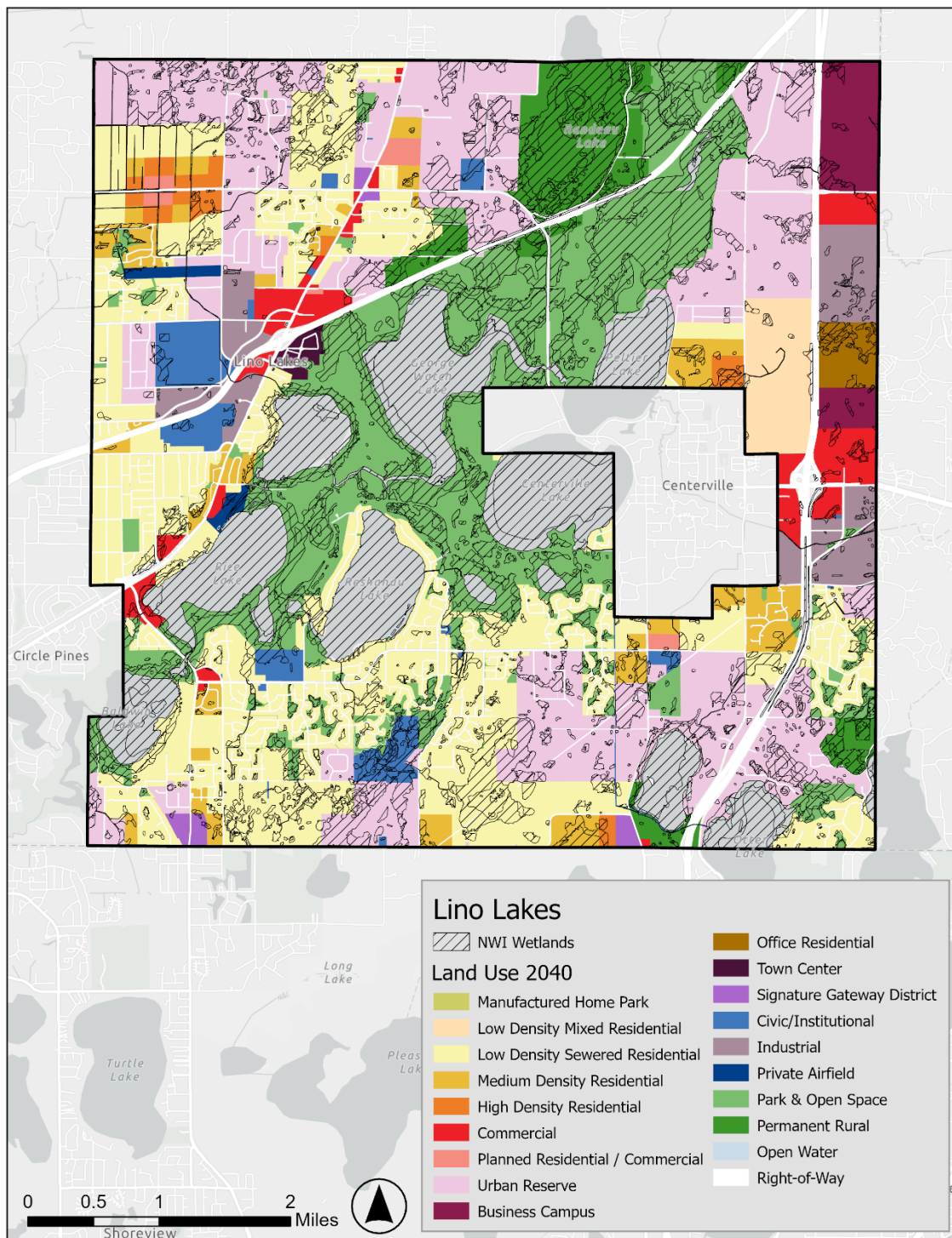


Figure 8 Lino Lakes Future Land Use

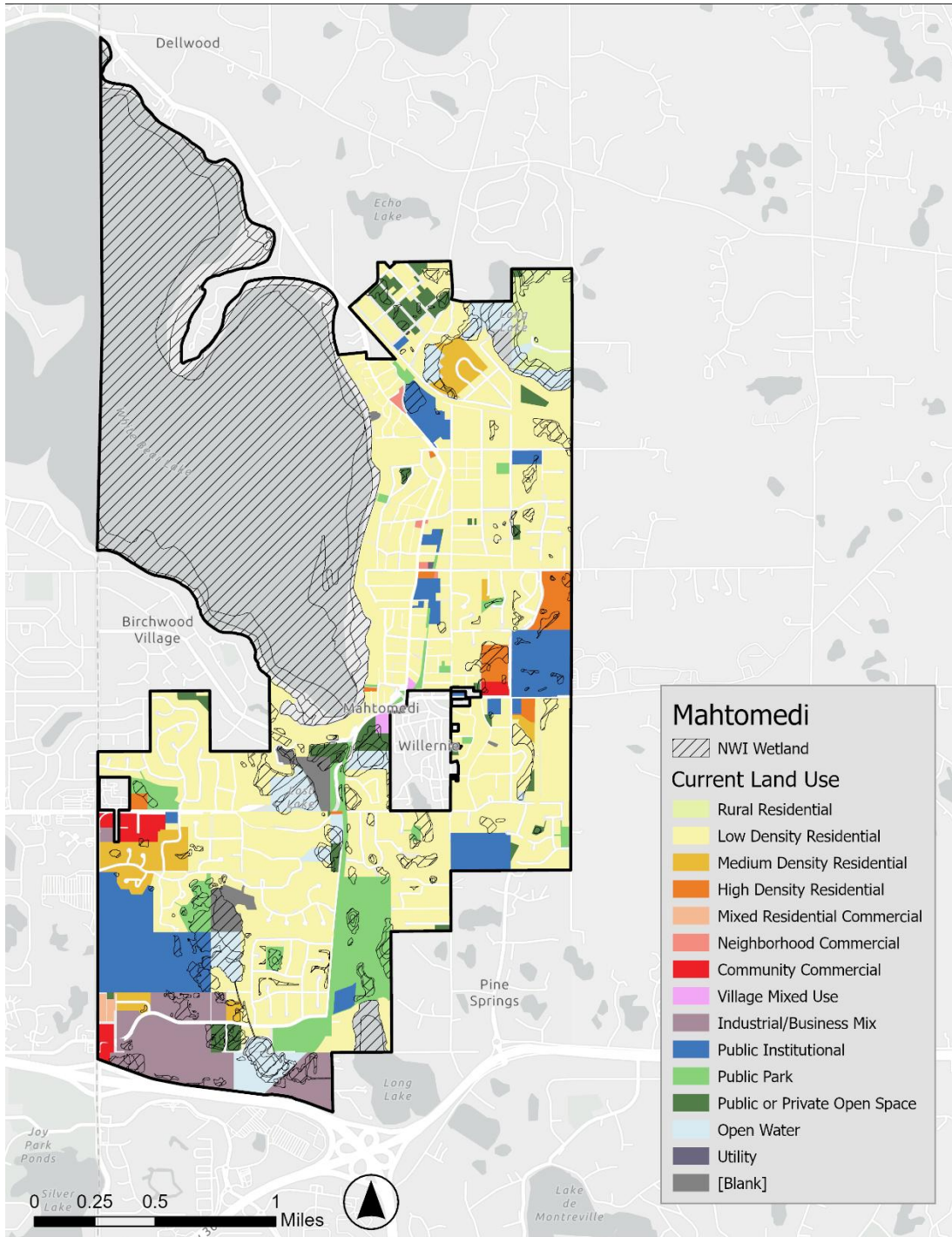


Figure 9 Mahtomedi Existing Land Use

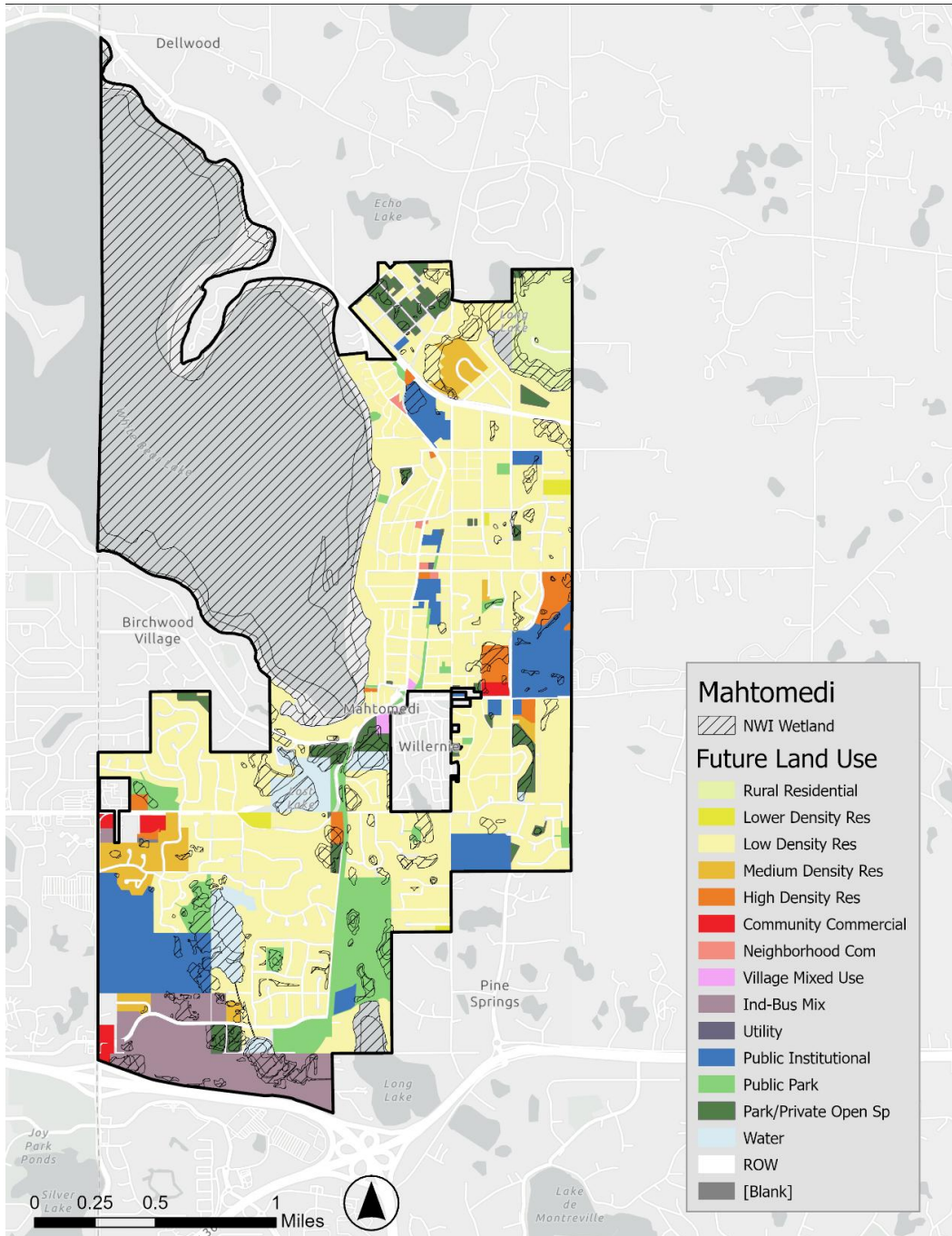


Figure 10 Mahtomedi Future Land Use

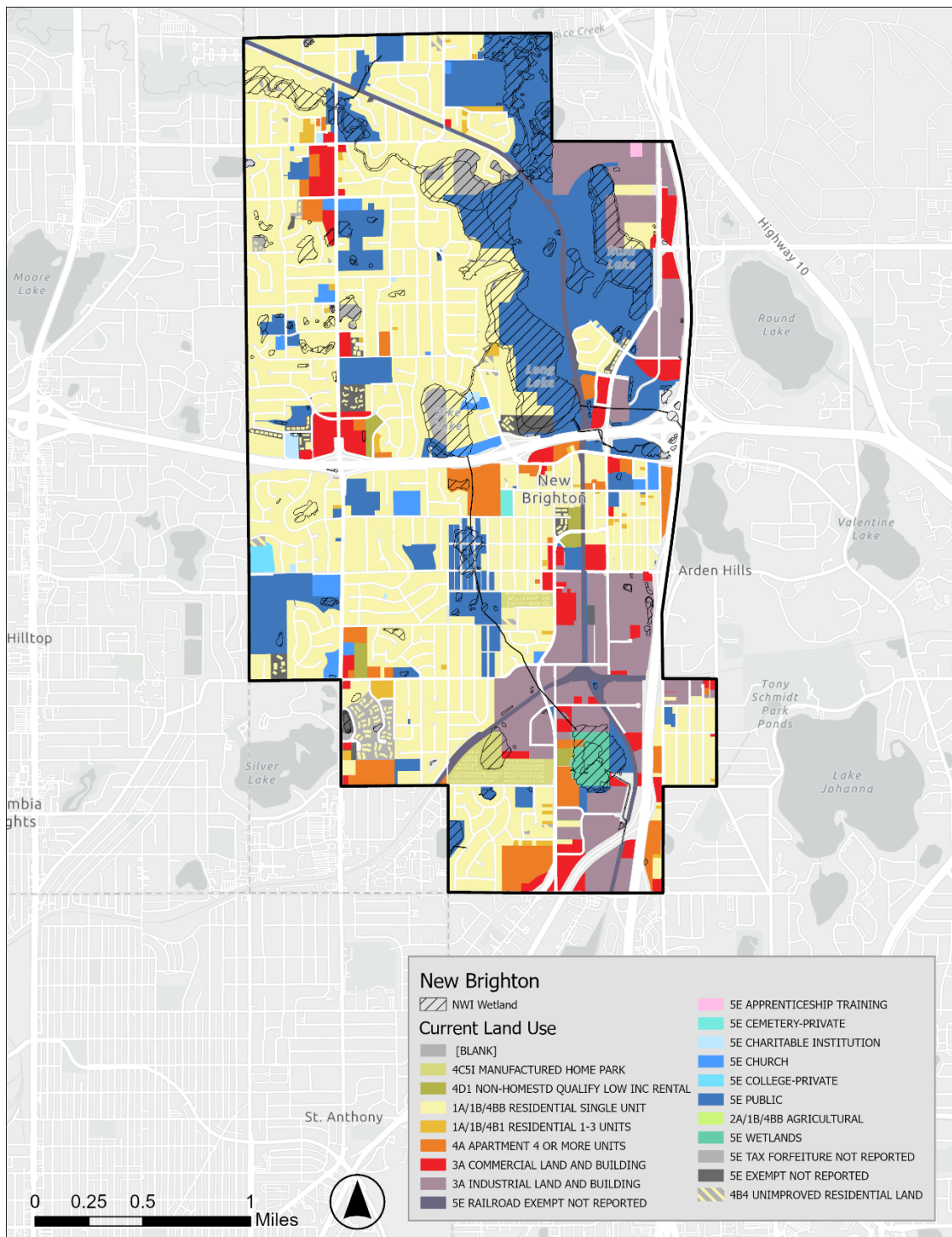


Figure 11 New Brighton Existing Land Use

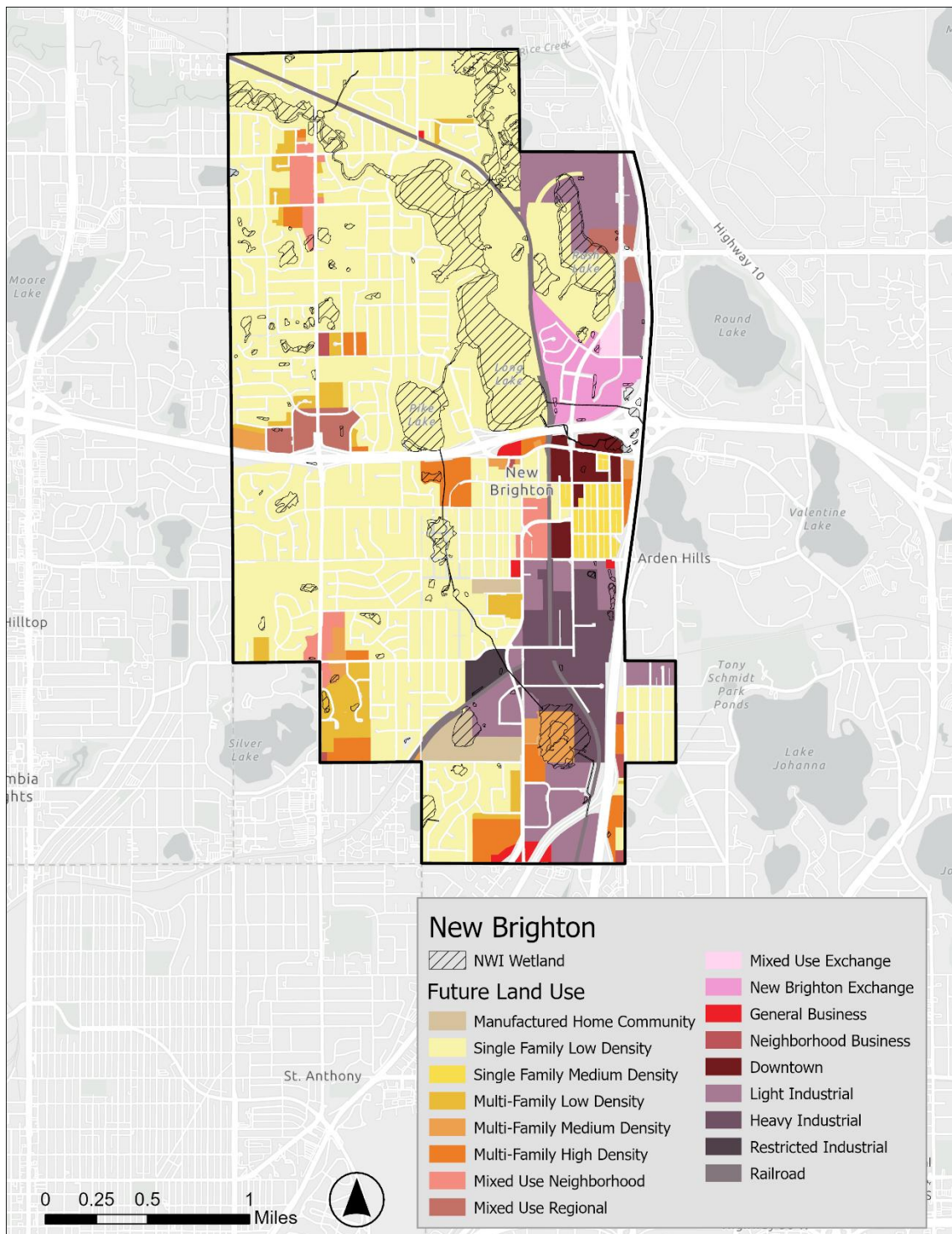


Figure 12 New Brighton Future Land Use

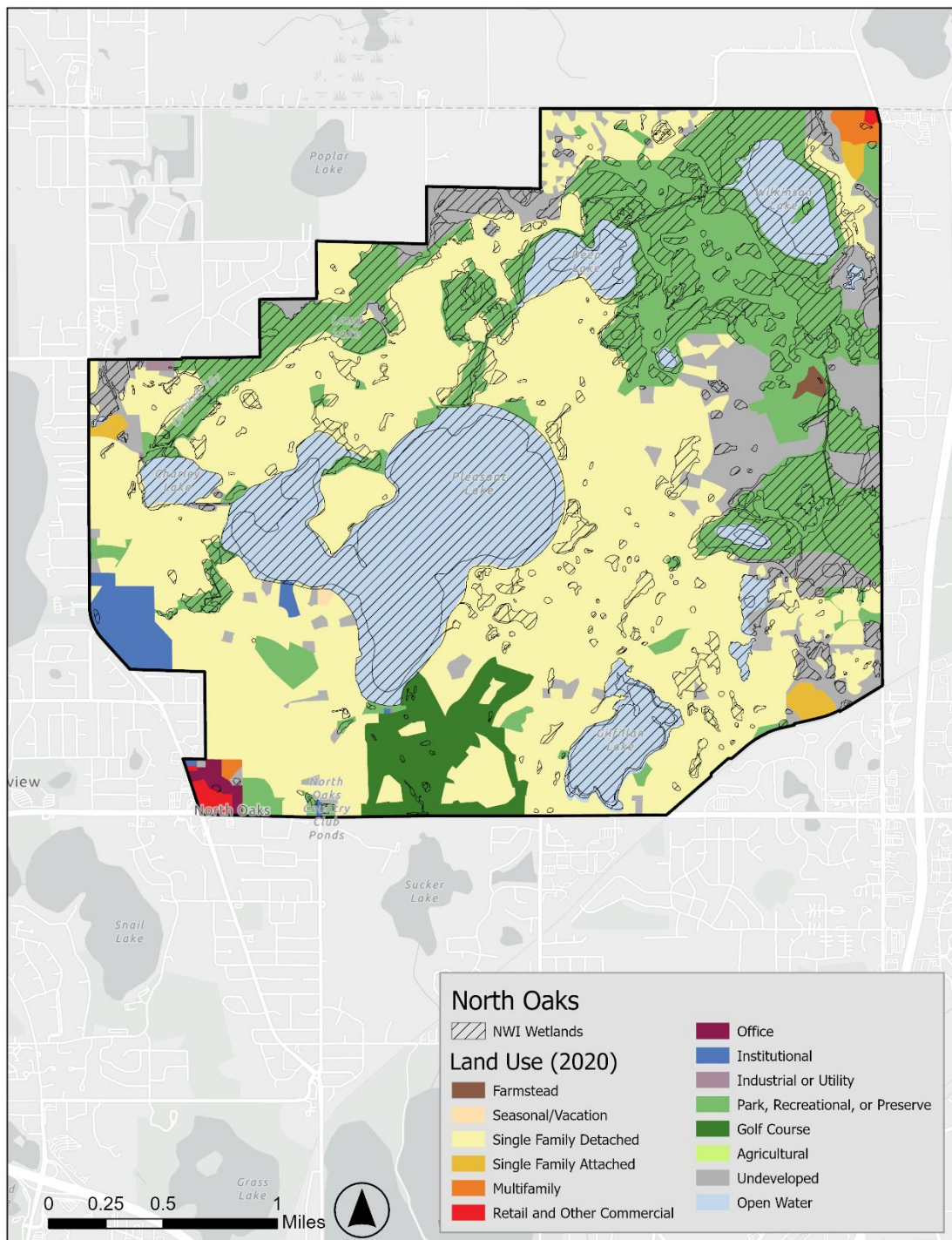


Figure 13 North Oaks Existing Land Use

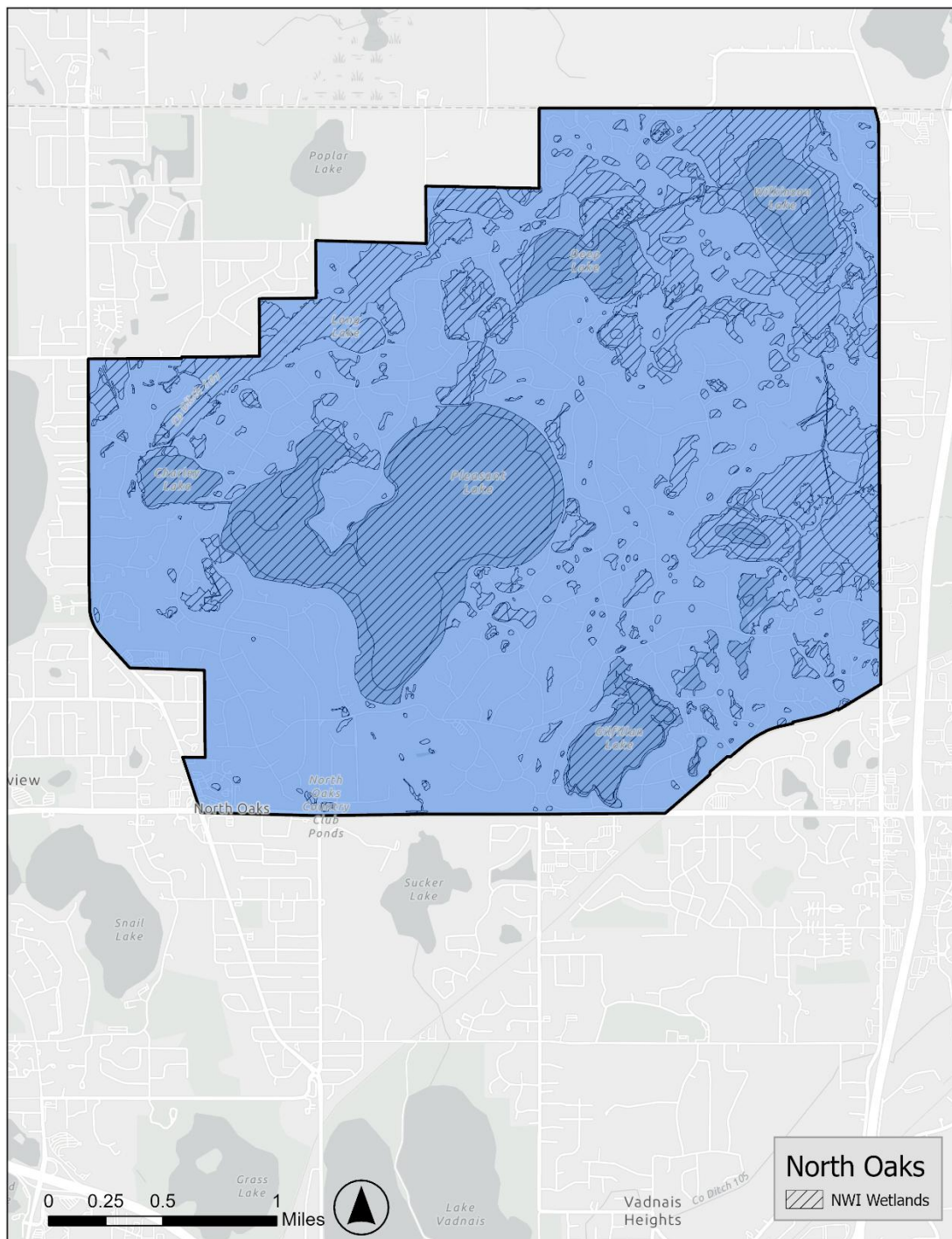


Figure 14 North Oaks Future Land Use

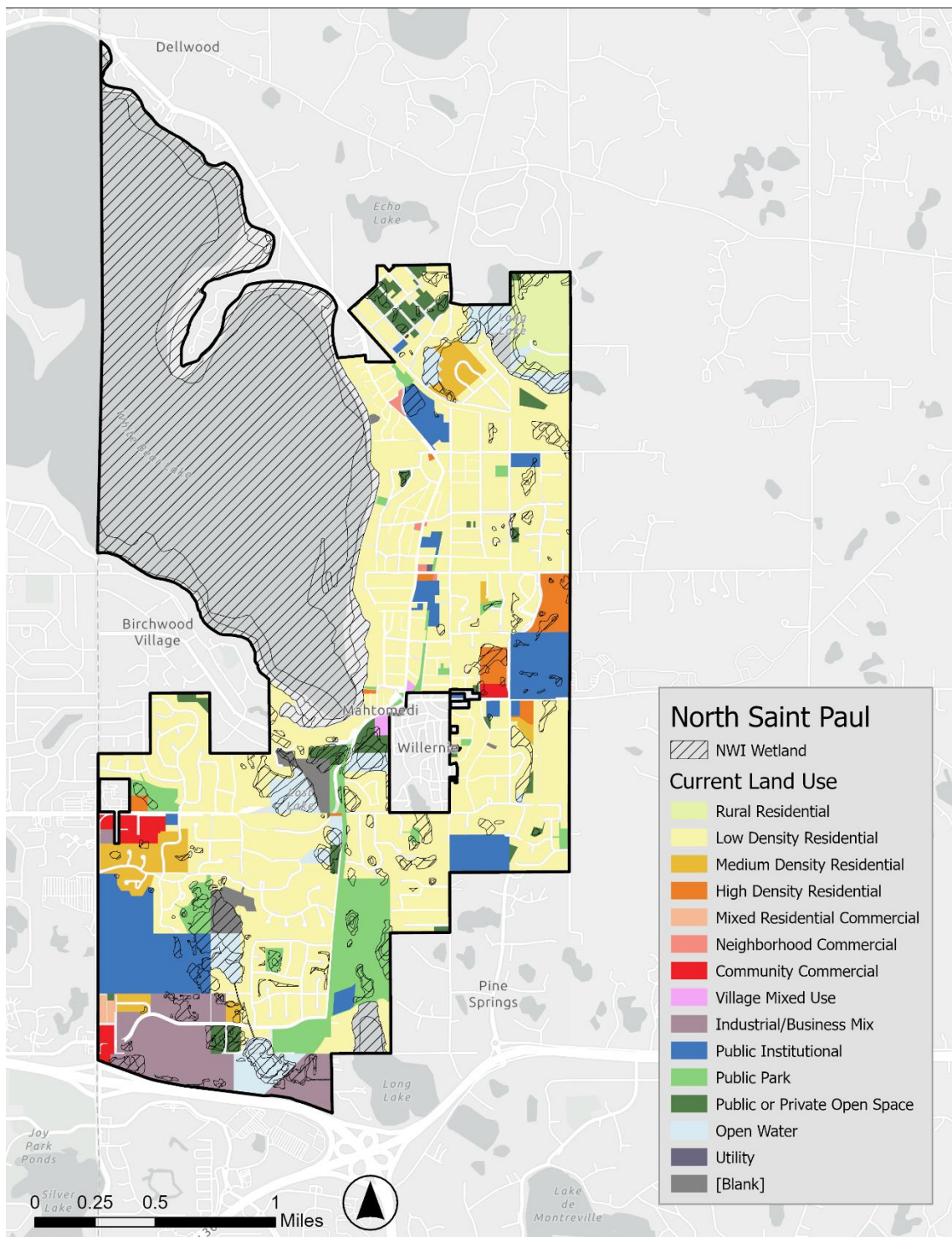


Figure 15 North Saint Paul Current Land Use

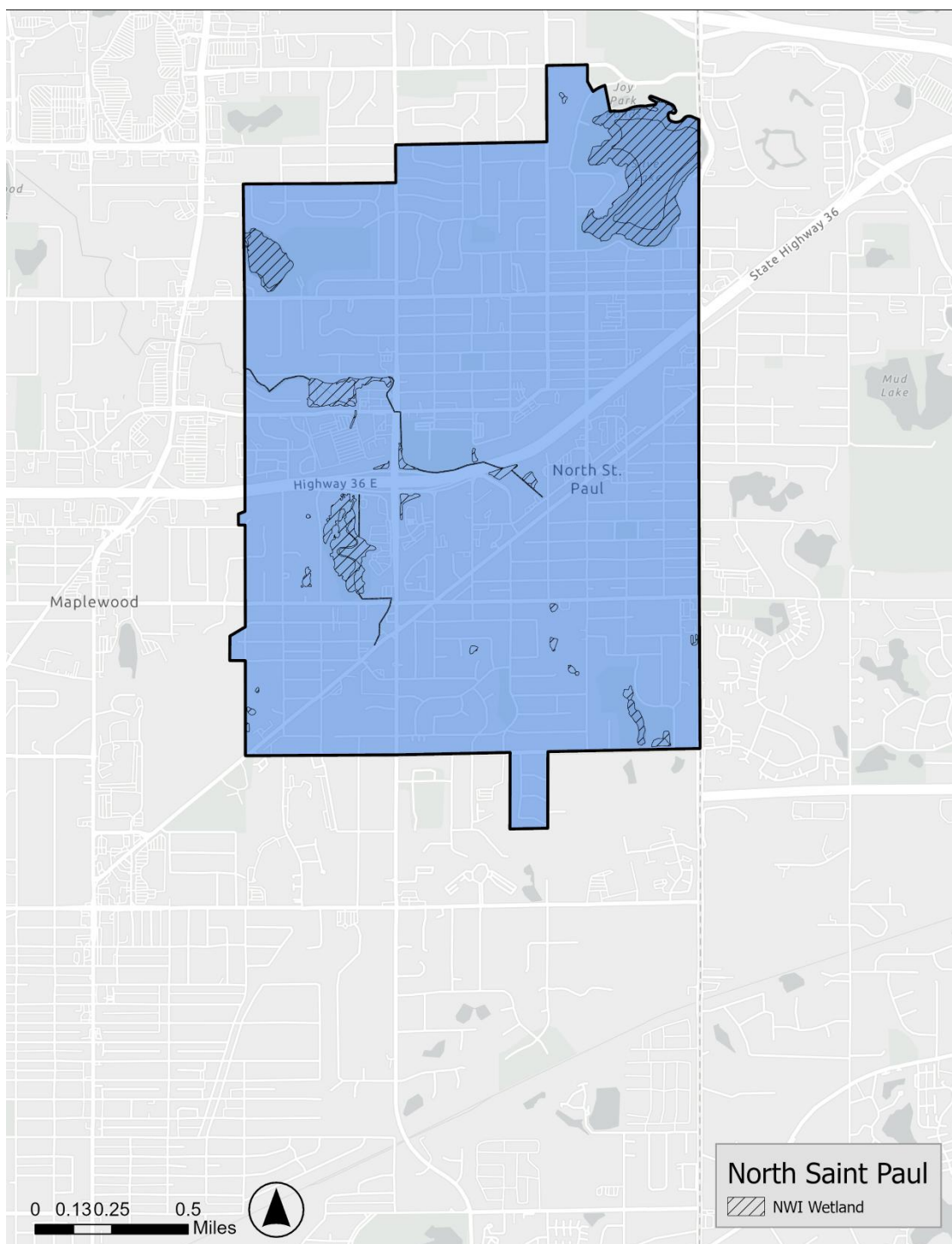


Figure 16 North Saint Paul Future Land Use

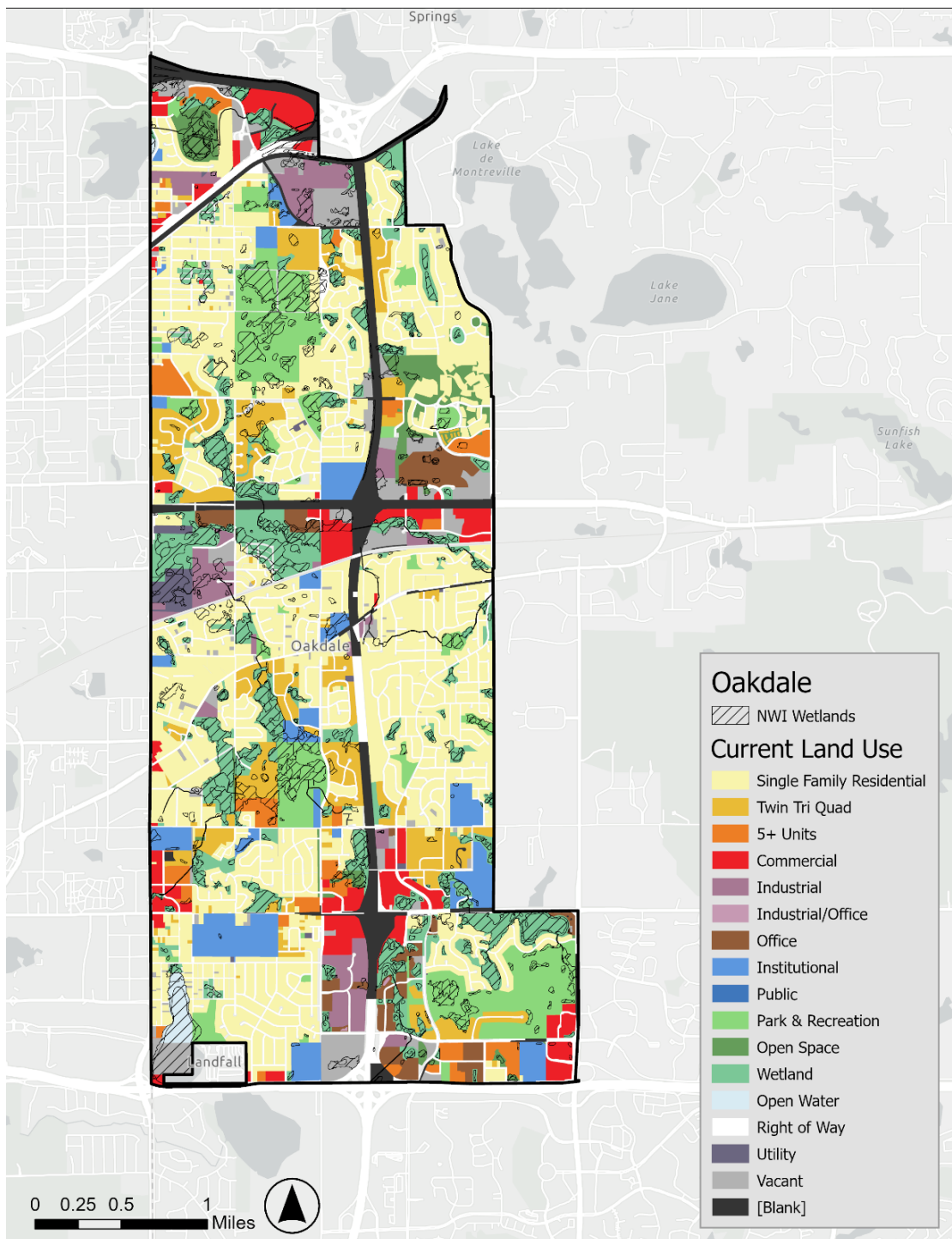


Figure 17 Oakdale Current Land Use

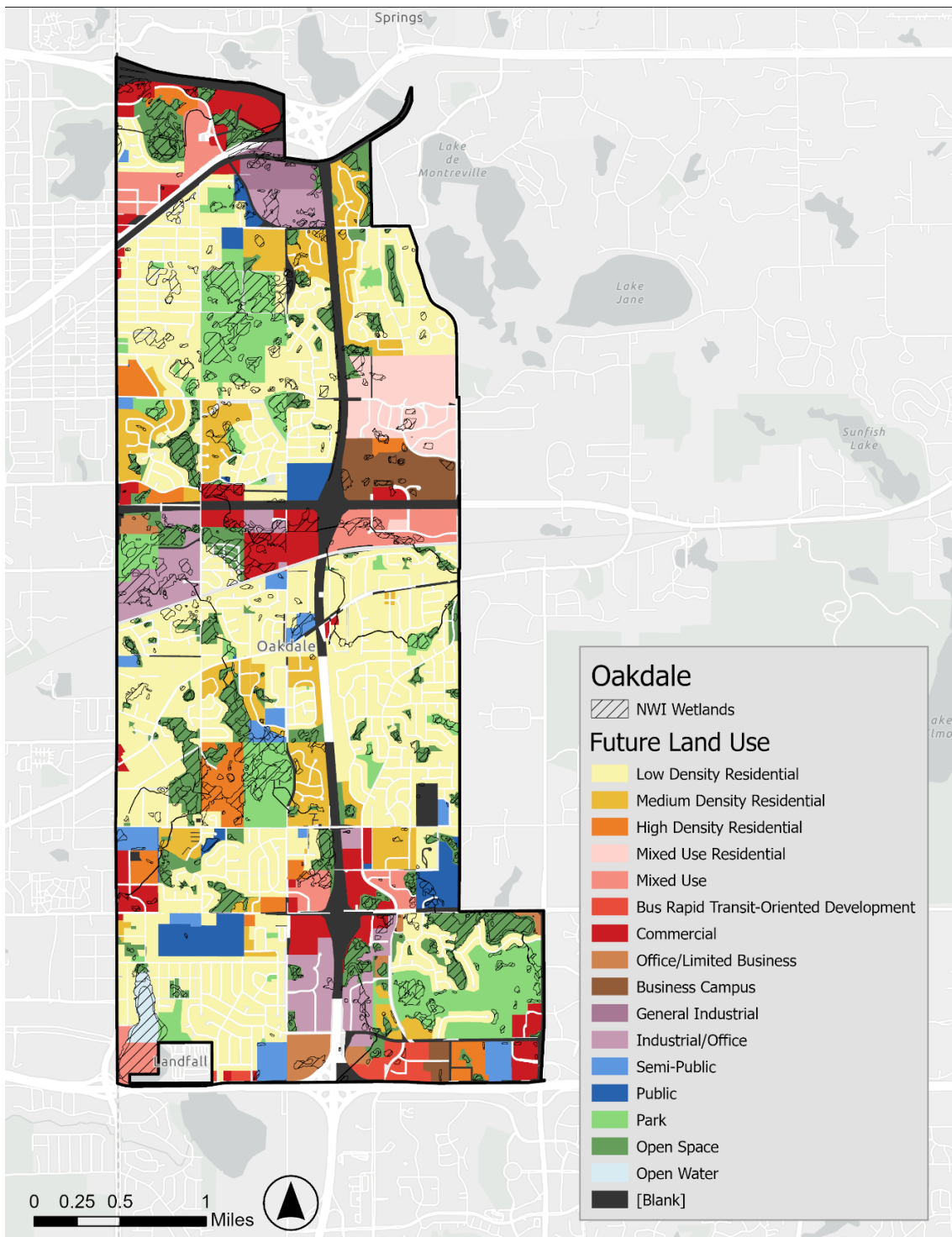


Figure 18 Oakdale Future Land Use

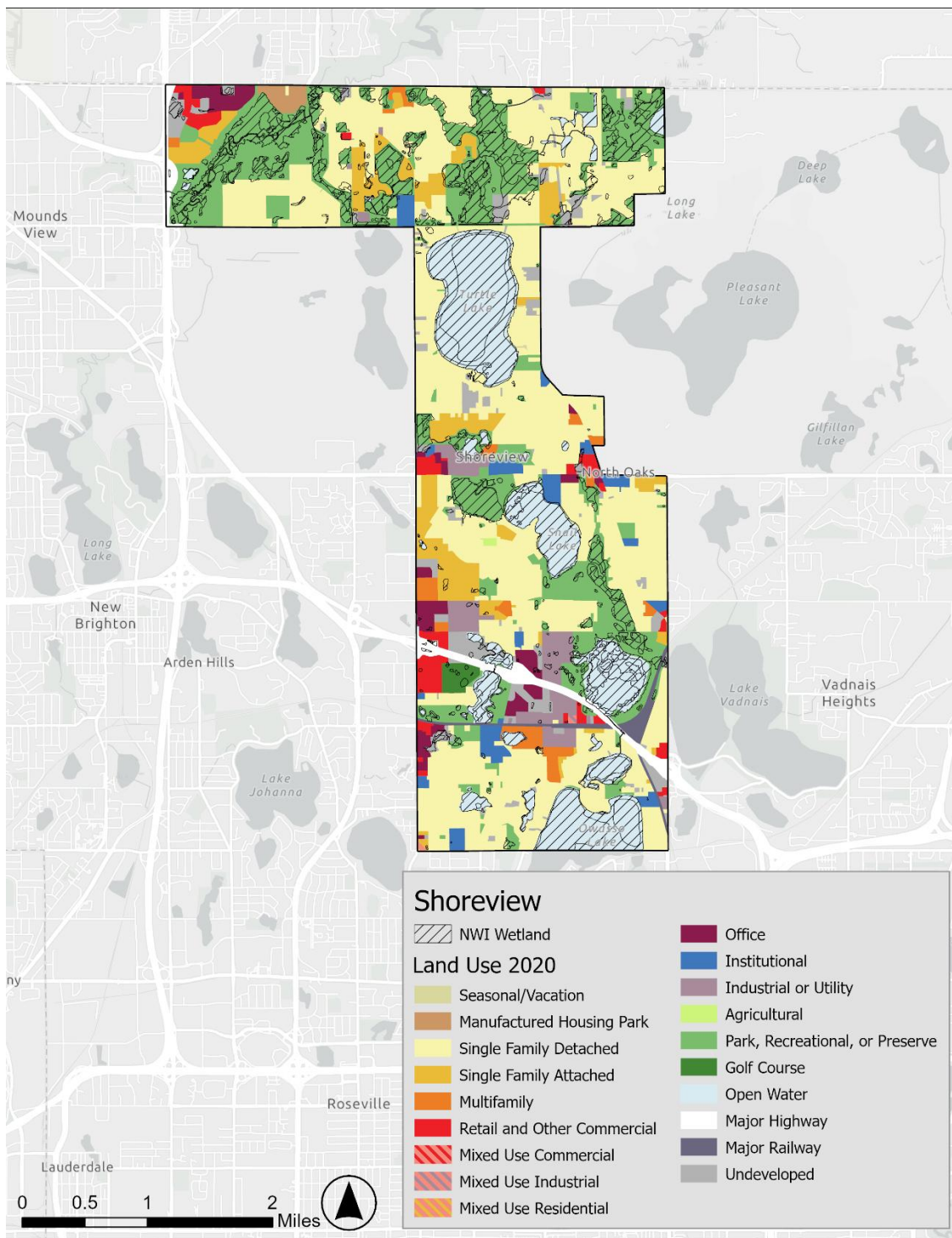


Figure 19. Shoreview Current Land Use

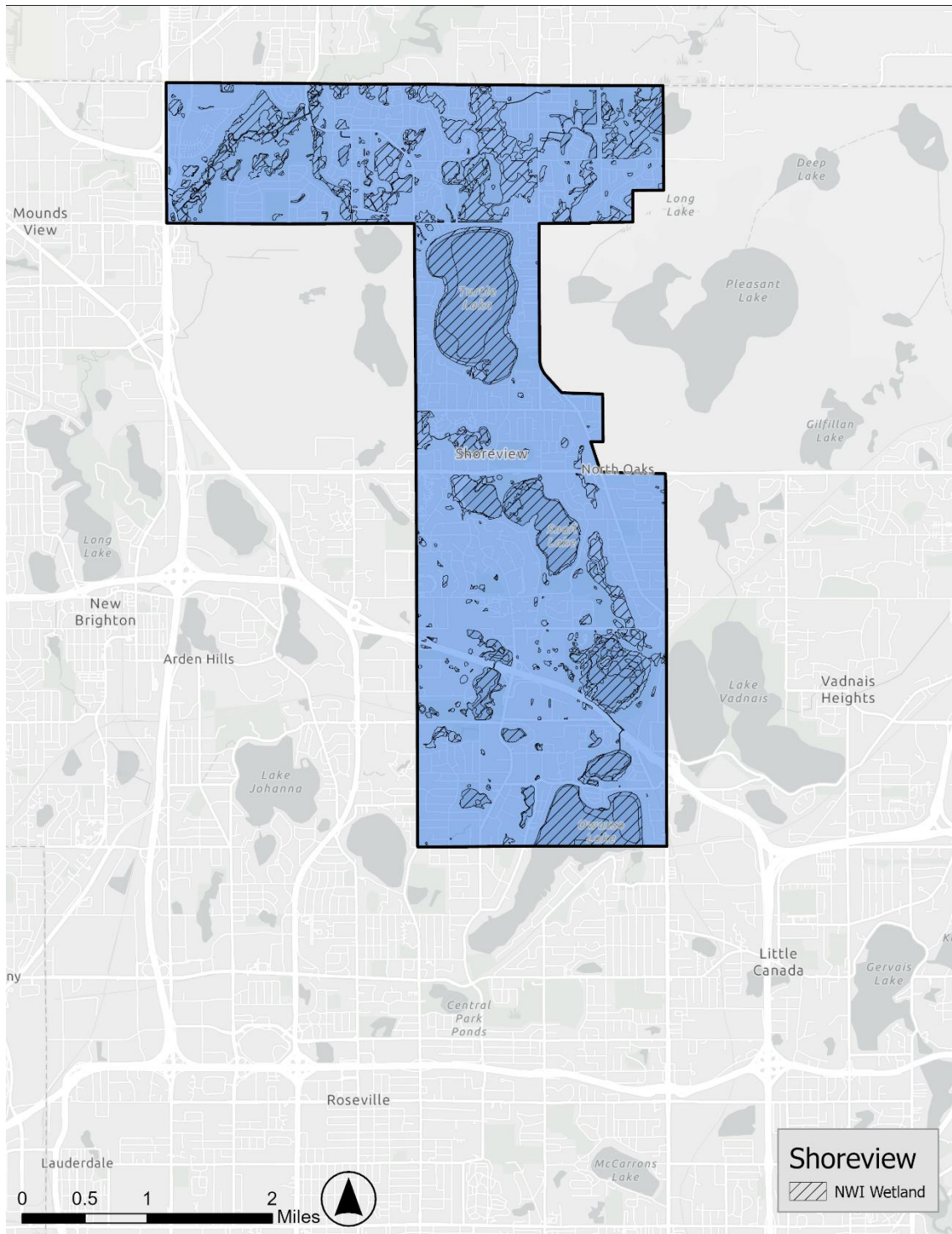


Figure 20. Shoreview Future Land Use

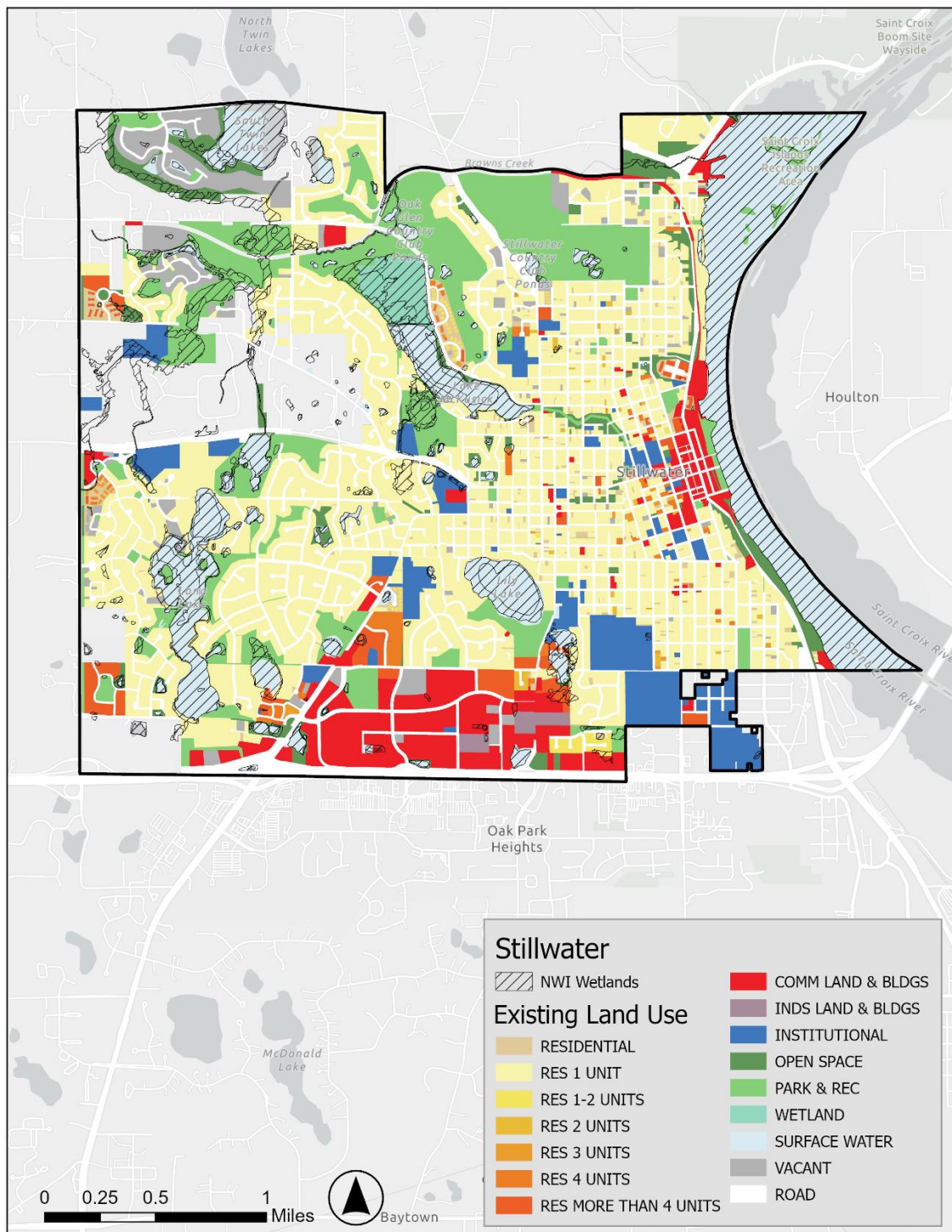


Figure 21 Stillwater Current Land Use

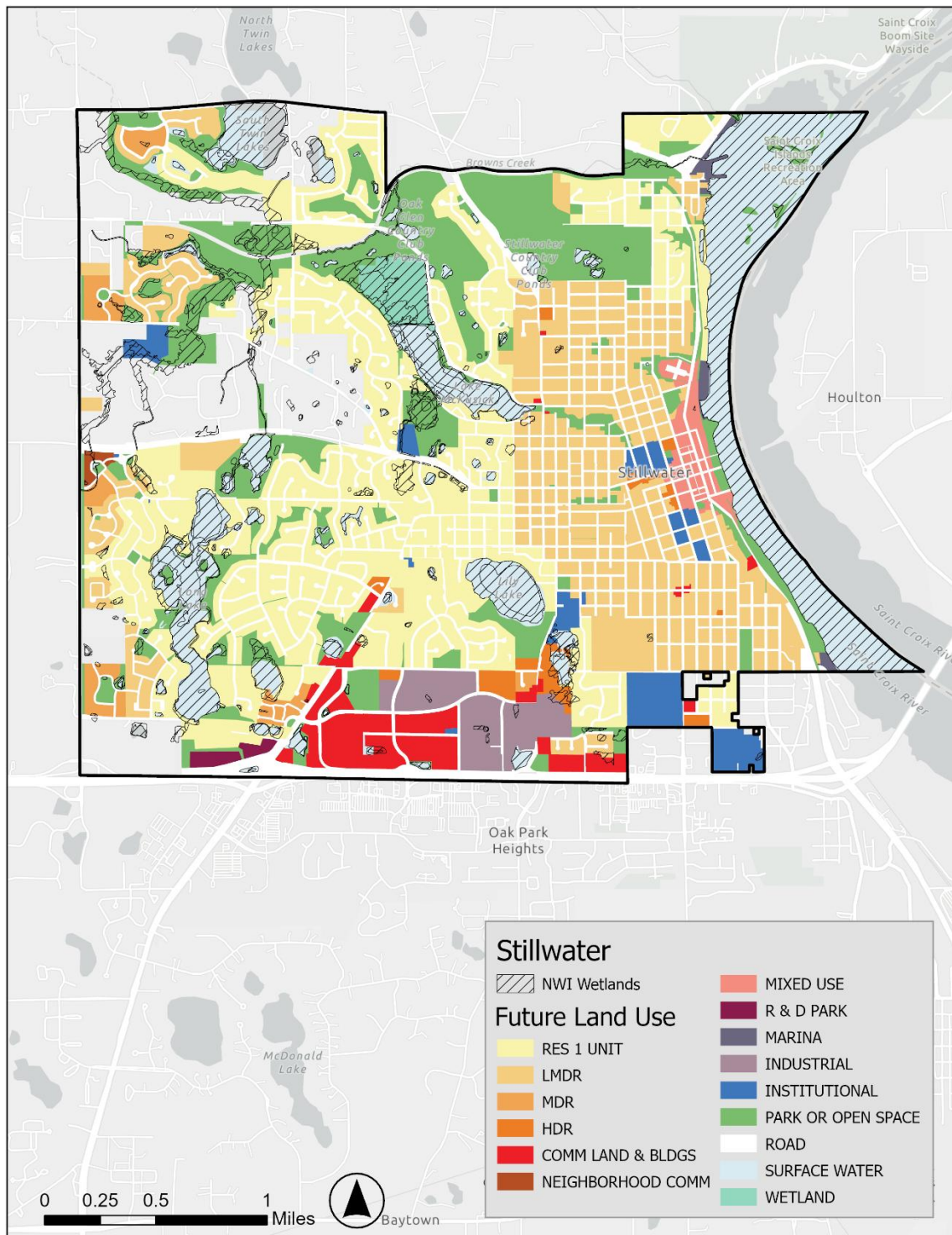


Figure 22 Stillwater Future Land Use

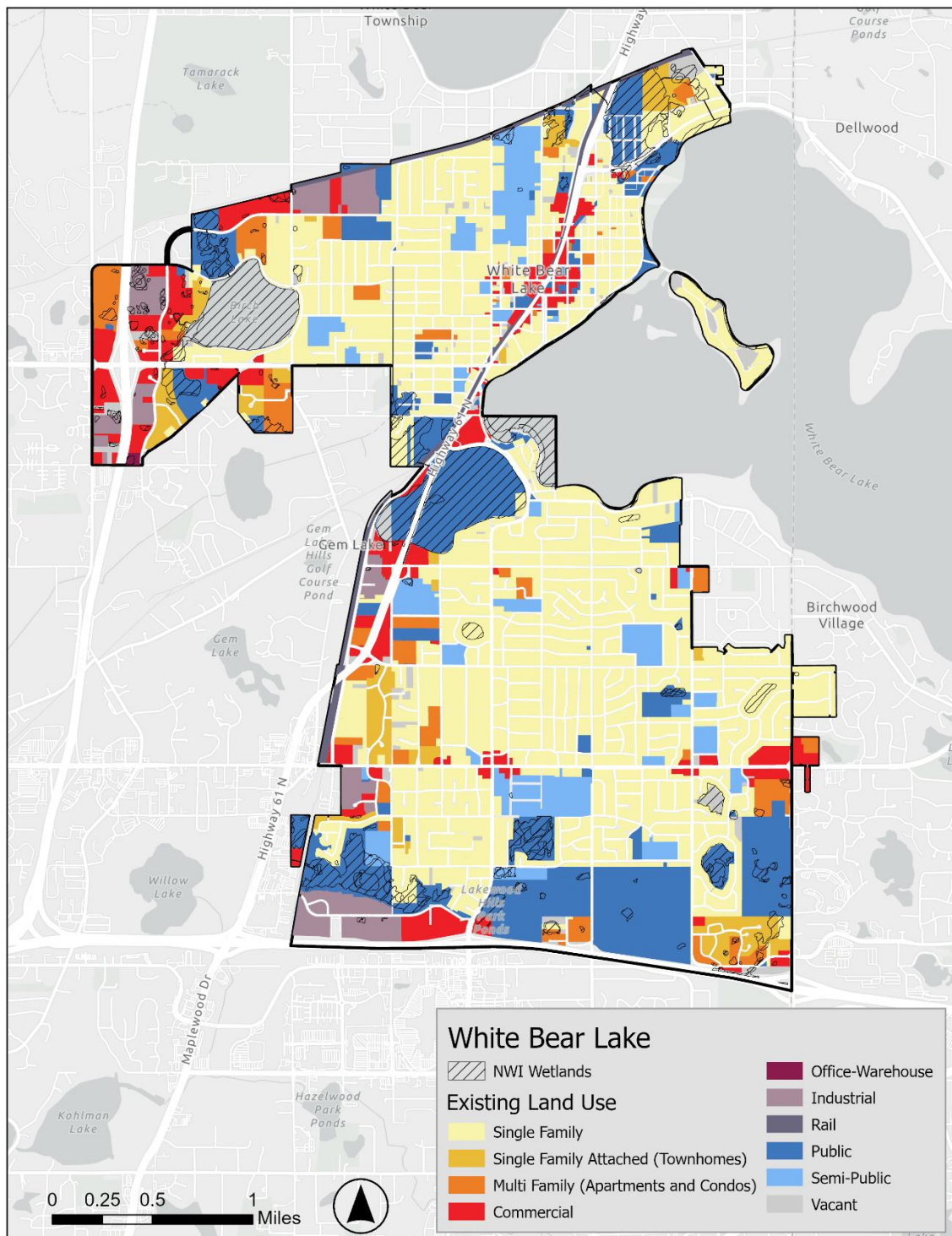


Figure 23 White Bear Lake Current Land Use

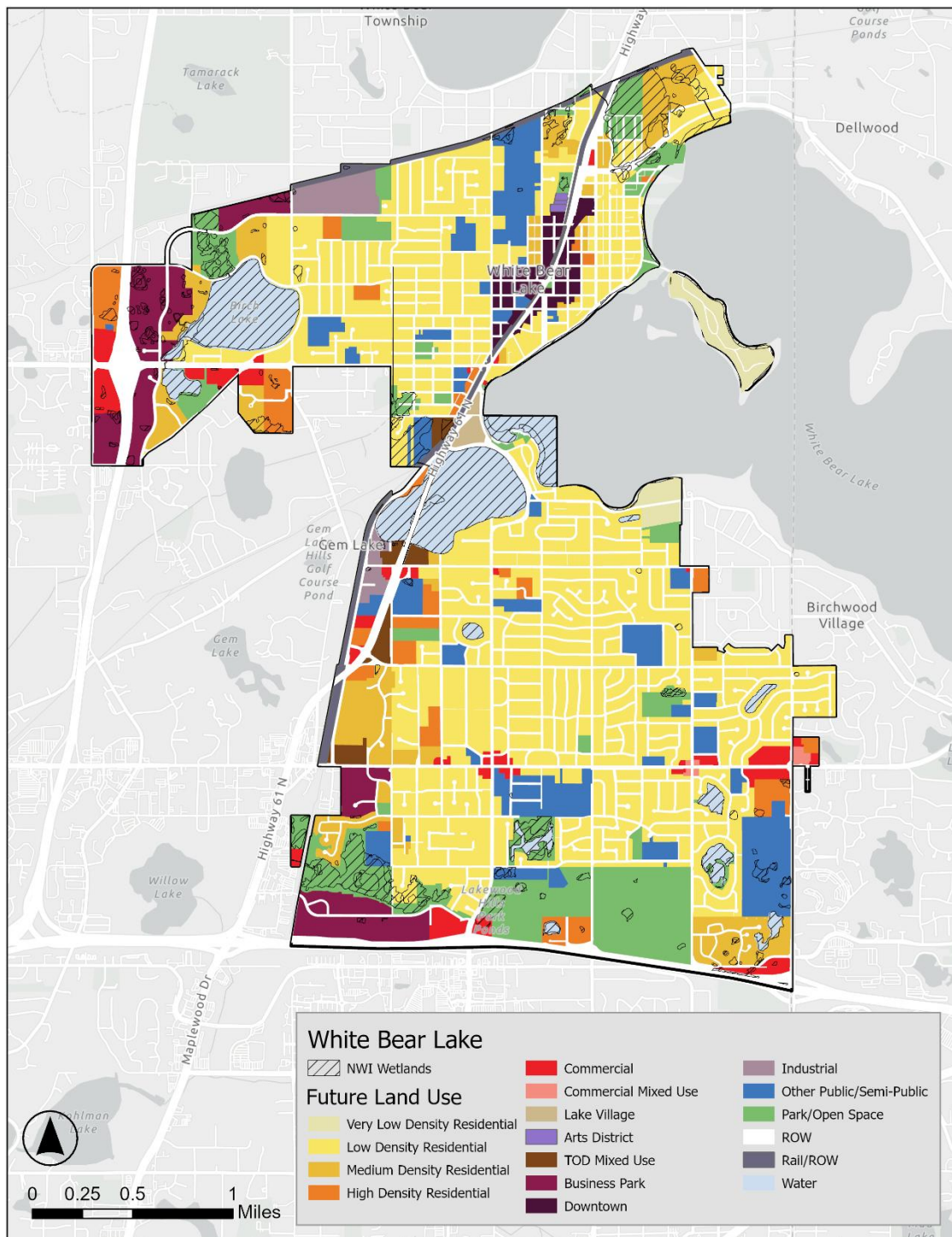


Figure 24. White Bear Lake Future Land Use

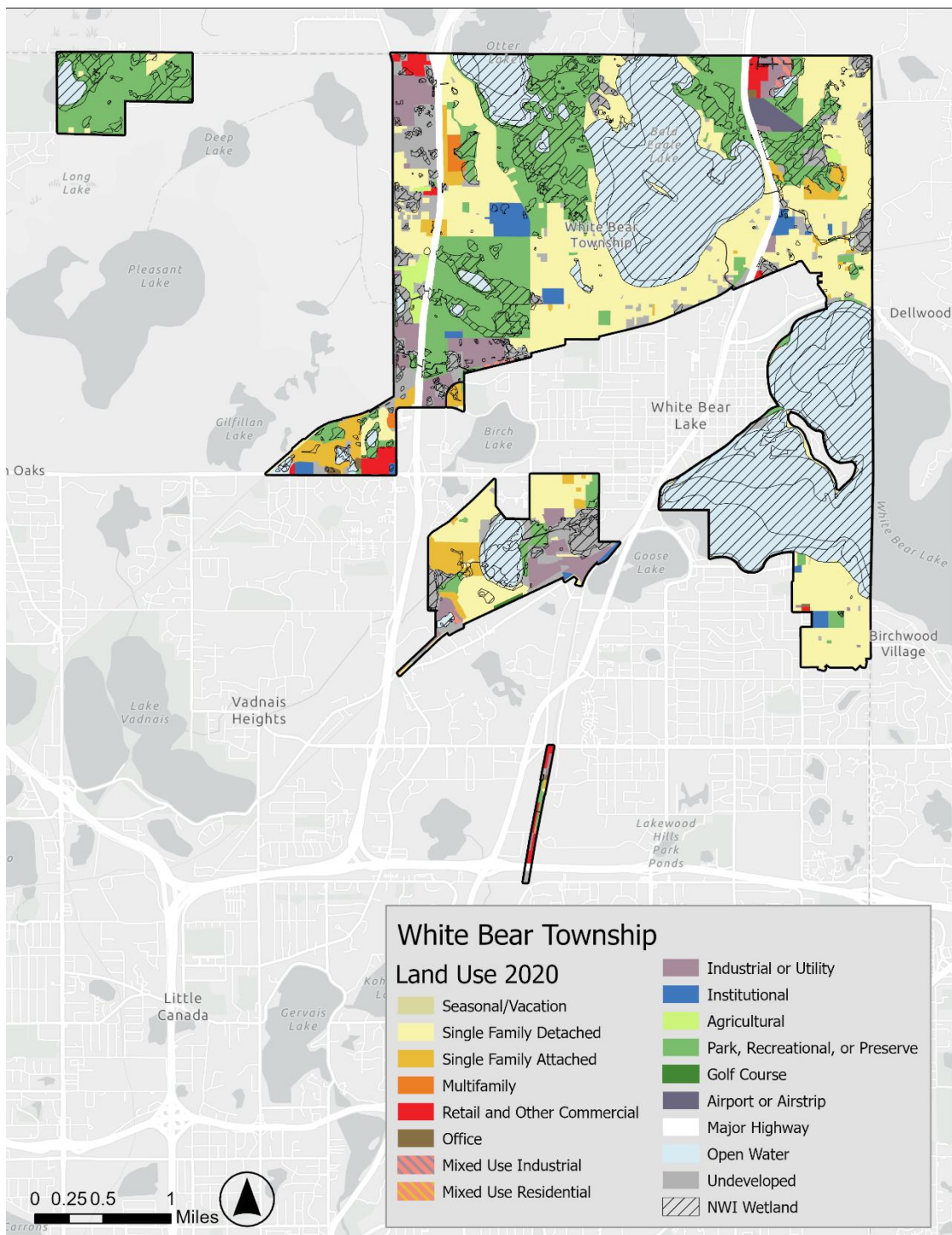


Figure 25 White Bear Township Current Land Use

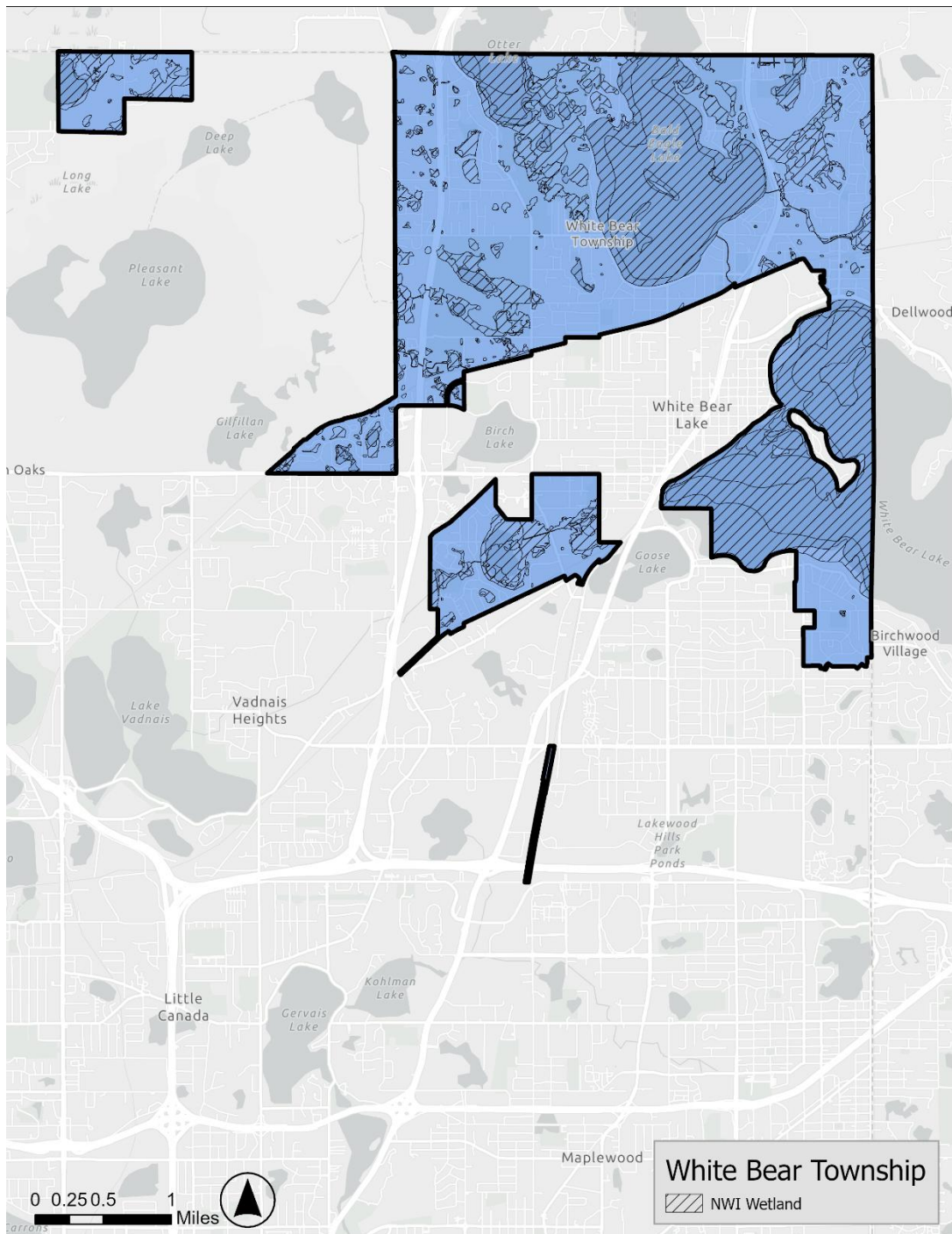


Figure 26 White Bear Township Future Land Use

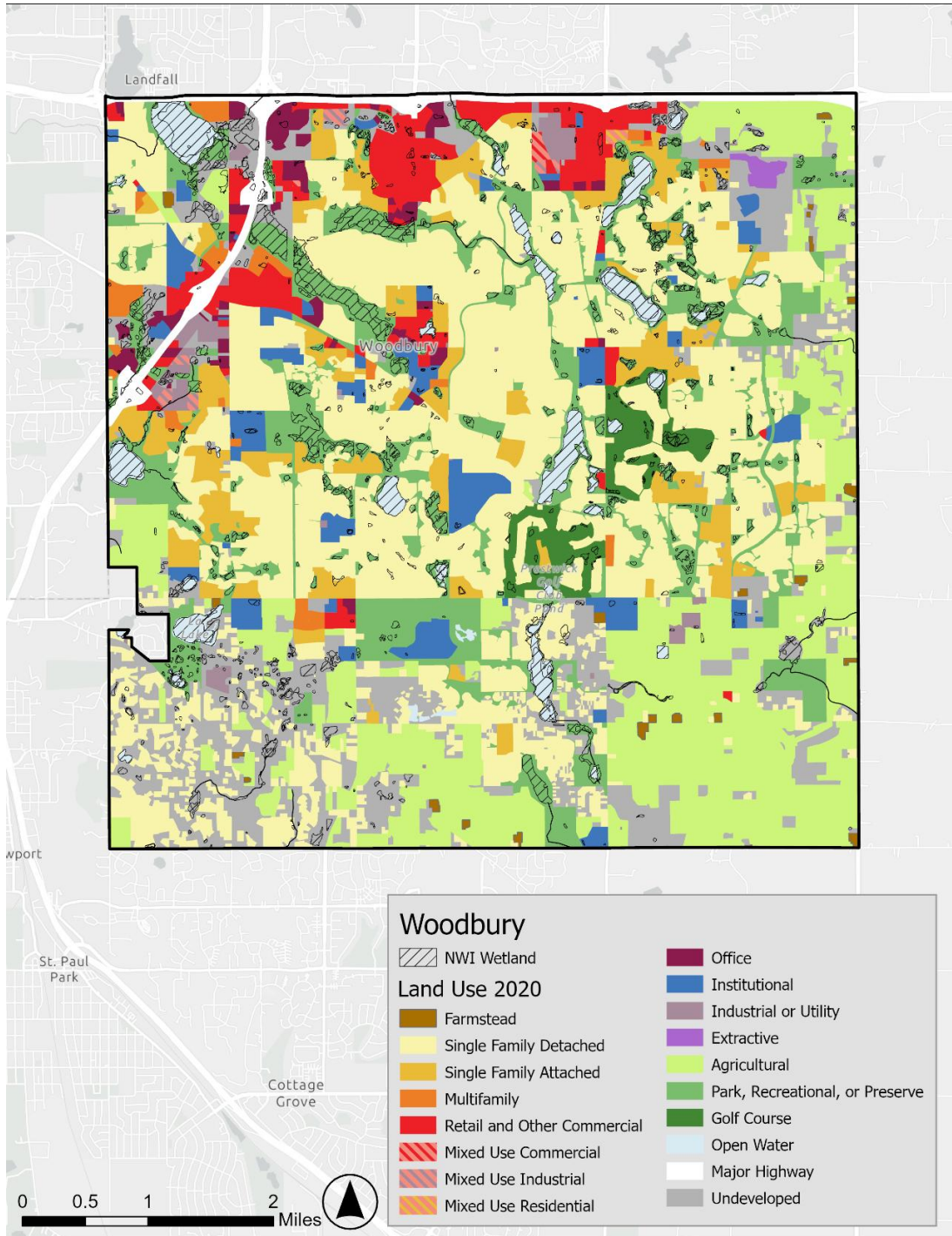


Figure 27 Woodbury Current Land Use

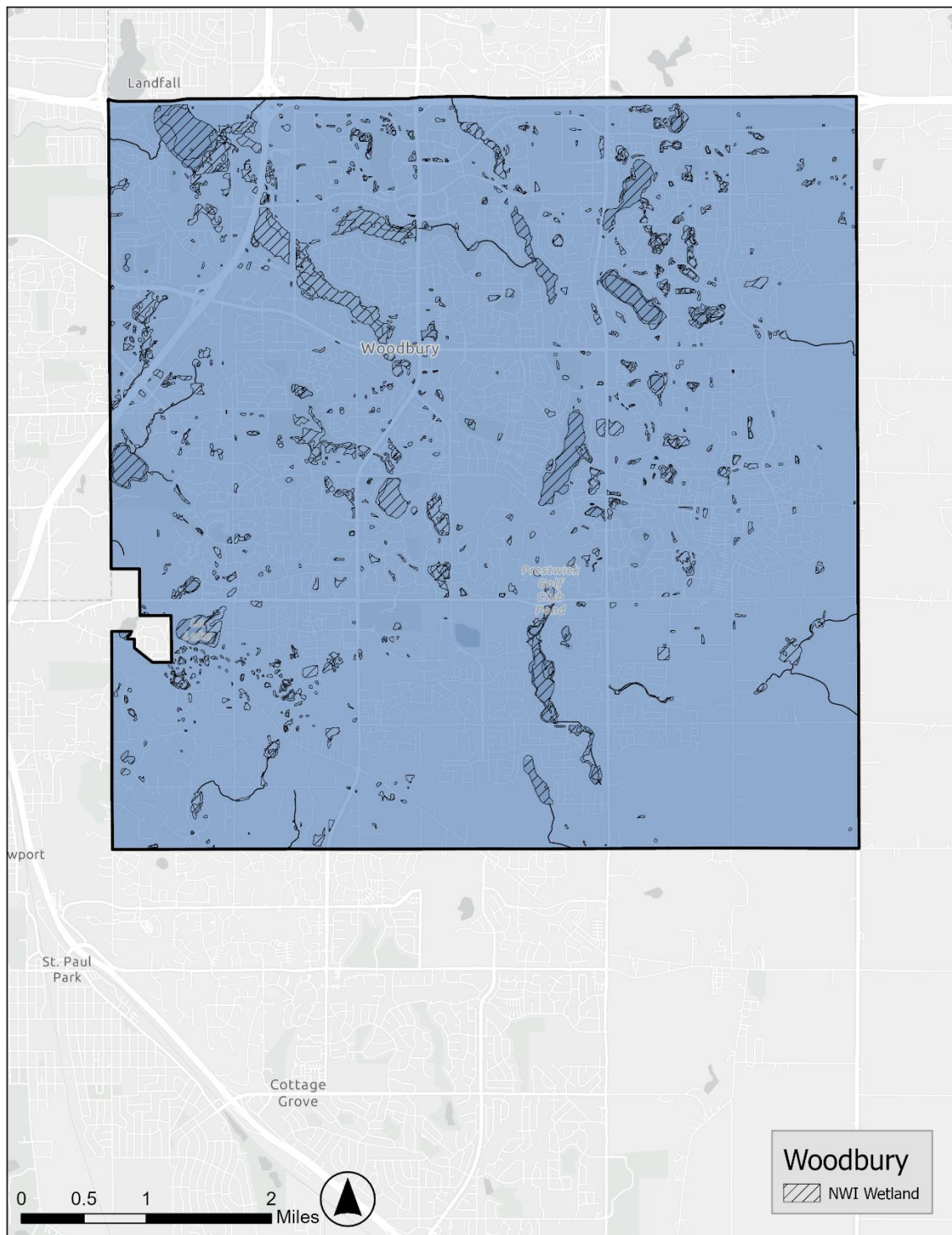


Figure 28 Woodbury Future Land Use

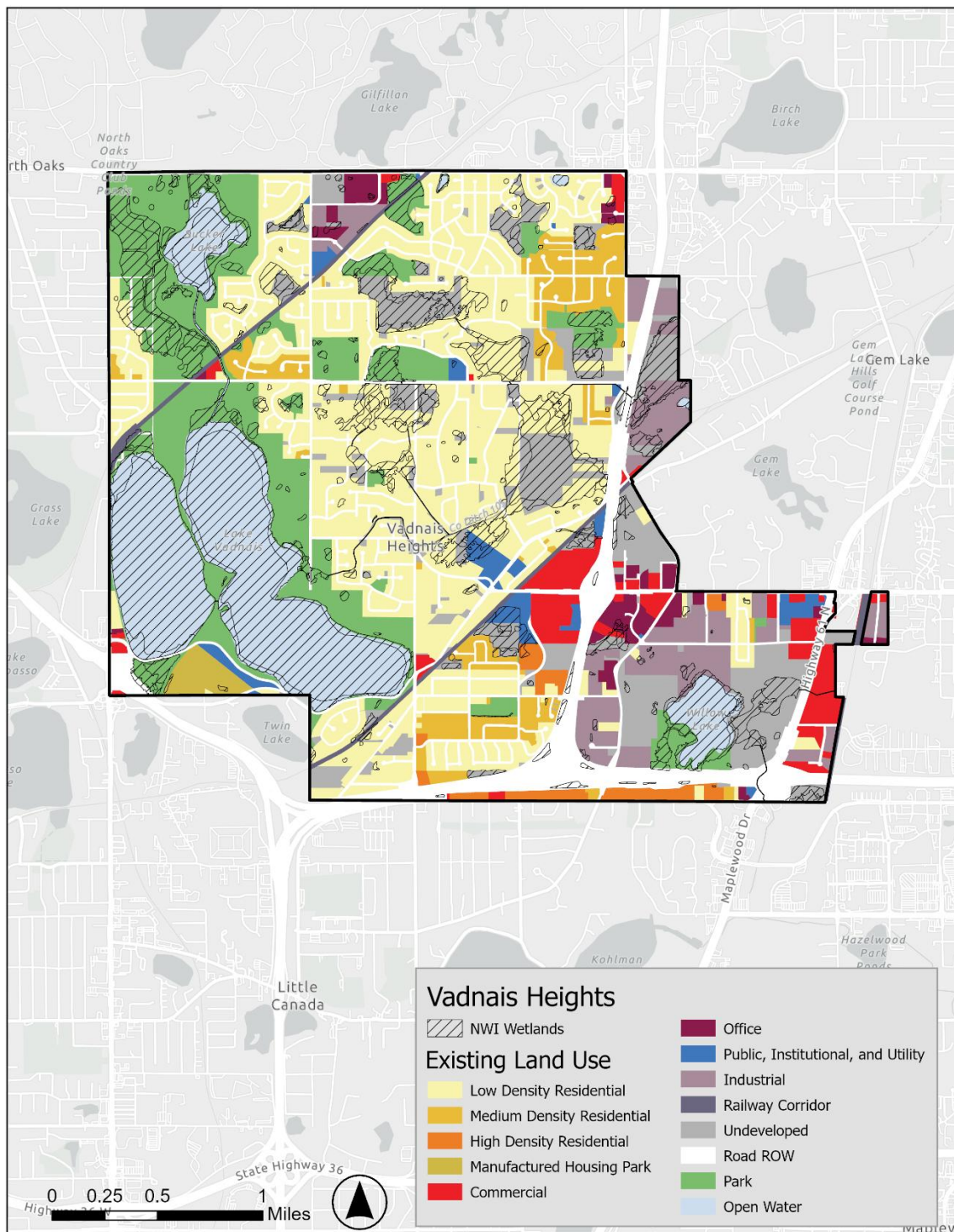


Figure 29 Vadnais Heights Current Land Use

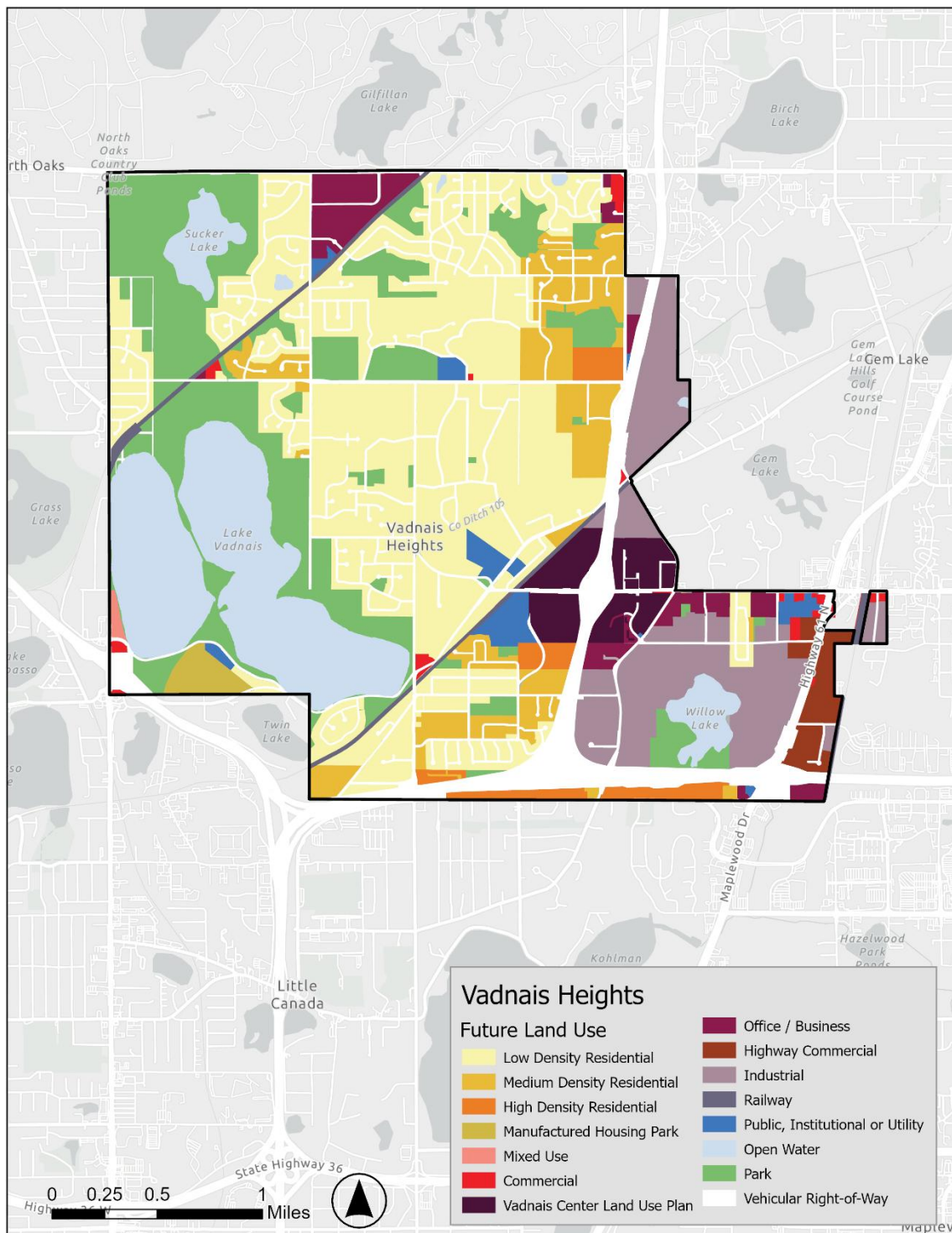


Figure 30. Vadnais Heights Future Land Use

Attachments

Attachment A. General Grass Information

Grass	Establishment Requirements				General Maintenance			Benefits	Drawbacks
	Pounds of seed	Fertilizer	Germination time	Watering Frequency	Watering Frequency	Mowing	Fertilizer		
Kentucky Blue Grass	1-2 pounds per 1000 sqft	0.5 pounds of nitrogen, and 1 pound of phosphorus per 1000 sqft	14 days	2-3 times a day (0.3-0.5 inches per day) for the first 14 days after seeding	0.8-1 inches per week	kept at 1.5 -2.5 inches ideally. Generally, every 5-7 days.	4-6 pounds of nitrogen per 1000 sqft annually	able to handle high traffic, more visually appealing for lawns for some	Poor shade/drought tolerance, higher maintenance, higher fertilizer requirements, slow establishment
Fine Fescue	4-6 pounds per 1000 sqft	0.5 pounds of nitrogen, and 1 pound of phosphorus per 1000 sqft	5-12 days	3 times a day for the first 4-8 days (0.3-0.5 inch per day), then 2 times a day for 5-7 days (0.2-0.3), drought-tolerant but requires watering every 5-7 days if rainfall does not occur.	It can go up to 4 weeks without watering, but this depends on the application. But generally requires between 0.25-0.5 inches Per Week	kept ideally at 4 inches, with avoidance of mowing through drought conditions. Generally requires mowing every 5-7 days	A total of 1/2 to 1 pounds of nitrogen per 1,000 square feet per year throughout the growing season and should not exceed 2 pounds of nitrogen per 1,000 square feet per year. The best time to fertilize fine fescue is late August through early October; avoid fertilization from July through August	Drought-tolerant, requires less watering, lower mowing frequency, weed resistance, fungicides are rarely needed, great for no-mow areas or shaded areas	Finer grass is not ideal for high-traffic areas.
Tall Fescue	6-10 pounds per 1000 sqft	0.5 pounds of nitrogen, and 1 pound of phosphorus per 1000 sqft	5-12 days	3 times a day for the first 4-8 days (0.3-0.5 inch per day), then 2 times a day for 5-7 days (0.3-0.5), drought-tolerant but requires watering every 5-7 days if rainfall does not occur.	It can go up to 4 weeks without watering, but this depends on the application. But it requires between 0.25 and 0.5 inches per week.	kept ideally at 4 inches, with avoidance of mowing through drought conditions. Generally requires mowing every 10-14 days	A total of 2 to 3 pounds of nitrogen per 1,000 square feet per year. The best time to fertilize fine fescue is late August through early October; avoid fertilization from July through August	Drought-tolerant, requires less watering, lower mowing frequency, weed resistance, fungicides are rarely needed, great for no-mow areas or shaded areas	Less known and more difficult to obtain, it can be less vibrant green. Overwatering can cause shallow roots and less robust grasses

Attachment B. Water Use Estimator

Establishment Table

Low-Input Turf Grass										
		First 8 Days after Seeding				Next 7 Days				Total Water During Establishment (Gal)
Soil Type	Grass Type	Inches per Day	Acres	Water Per Day (Gal)	Total Water (Gal)	Inches per day	Acres	Water Per Day (Gal)	Total Water (Gal)	
Sandy Soil	Tall Fescue	0.5	1	13,576	108,610	0.3	1	8,146	57,020	165,630
	Fine Fescue	0.5	1	13,576	108,610	0.3	1	8,146	57,020	165,630
Clay Soil	Tall Fescue	0.3	1	8,146	65,166	0.2	1	5,430	38,013	103,179
	Fine Fescue	0.3	1	8,146	65,166	0.2	1	5,430	38,013	103,179
Kentucky Bluegrass										
First Two Weeks After Seeding										
Soil Type	Grass Type	Inches Per Day	Acres	Water Per Day (Gal)					Total Water During Establishment (Gal)	
Sandy Soil	Kentucky Bluegrass	0.5	1	13,576					190,067	
Clay Soil	Kentucky Bluegrass	0.3	1	8,146					114,040	

Attachment B. Water Use Estimator

Established Grasses Watering Requirements

Grass Type	Inches Per Week	Acres	Water Per Week (Gal)	Average Weekly Rainfall ¹	Additional Water required Excluding Rainfall Per Year (Gal) ²
Low Input Turf Grass- (Tall Fescue)	0.25-0.5	1	6,900 -13,600	26,500	149,300-298,700
Low Input Turf Grass- (Fine Fescue)	0.25-0.5	1	6,900 -13,600	26,500	149,300-298,700
Kentucky Bluegrass	0.8-1	1	21,700-27,200	26,500	477,900-597,400

¹Based on average MN rainfall in MN between May and September (22 weeks)

²Based on irrigation between May and September and average MN rainfall (22 weeks)

Attachment C. Opinion of Probable Costs

Kentucky Blue Grass

ESTABLISHMENT						
BID ITEM	ITEM DESCRIPTION	UNIT	EST QTY	UNIT PRICE	TOTAL	Notes
1	Seed	LBS	66	\$3.45	\$228	Assuming 66 lbs of seed per Acre (1.5 lbs per 1,000 sq ft)
2	Fertilizer	LBS	217.8	\$0.54	\$118	Assuming 0.5 lb nitrogen per 1,000 sq ft (5 lbs of 11-23-10 fertilizer)
3	Erosion Control Blanket	SQ FT	43,560	\$0.05	\$2,178	
4	Aeration	Acre	1	\$500.00	\$500	
5	Labor	Ea	1	\$250.00	\$250	
Subtotal					\$3,273	
Contingency				30%	\$982	
TOTAL					\$4,255	

GENERAL MAINTENANCE						
BID ITEM	ITEM DESCRIPTION	UNIT	EST QTY	UNIT PRICE	TOTAL	Notes
1	Mowing Frequency	Ea	34	\$150	\$5,100	Ideally keep at 3-4 inches, (May Through September) every 5 days
2	Fertilizer	LBS	479.16	\$0.52	\$249	Assuming 3.5 lbs of nitrogen per 1,000 sq ft annually (11 lbs of 33-0-3 fertilizer)
3	Water Usage	1000/Gal	472.048	\$2.20	\$1,039	Avg Tier 1 rate
Subtotal					\$5,349	
Contingency				30%	\$1,605	
TOTAL					\$6,954	

Attachment C. Opinion of Probable Costs

Tall Fescue

ESTABLISHMENT						
BID ITEM	ITEM DESCRIPTION	UNIT	EST QTY	UNIT PRICE	TOTAL	Notes
1	Seed	LBS	349	\$2.20	\$768	Assuming 349 lbs of seed per Acre (8 lbs per 1,000 sq ft)
2	Fertilizer	LBS	217.8	\$0.54	\$118	Assuming 0.5 lb nitrogen per 1,000 sq ft (5 lbs of 11-23-10 fertilizer)
3	Erosion Blanket	SQ FT	43,560	\$0.04	\$1,847	
4	Aeration	Acre	1	\$500.00	\$500	
5	Labor	Ea	1	\$250.00	\$250	
Subtotal					\$3,482	
Contingency				30%	\$1,045	
TOTAL					\$4,527	

GENERAL MAINTENANCE						
BID ITEM	ITEM DESCRIPTION	UNIT	EST QTY	UNIT PRICE	TOTAL	Notes
1	Mowing Frequency	Ea	34	\$150	\$5,100	Ideally keep at 3-4 (Mays, (May Through September) every 5 days
2	Fertilizer	LBS	326.7	\$0.52	\$170	Assuming 2.5 lbs nitrogen per 1,000 sq ft annually (7.5 lbs of 33-0-4 fertilizer)
3	Water Usage	1000/Gal	64.762	\$2.20	\$142	
Subtotal					\$5,270	
Contingency				30%	\$1,581	
TOTAL					\$6,851	

Attachment C. Opinion of Probable Costs

Fine Fescue

ESTABLISHMENT						
BID ITEM	ITEM DESCRIPTION	UNIT	EST QTY	UNIT PRICE	TOTAL	Notes
1	Seed	LBS	218	\$3	\$654	Assuming 218 lbs of seed per Acre (5 lbs per 1,000 sq ft)
2	Fertilizer	LBS	217.8	\$0.54	\$118	Assuming 0.5 lbs nitrogen per 1,000 sq ft (5 lbs of 11-23-10 fertilizer)
3	Erosion Blanket	SQ FT	43,560	\$0.04	\$1,847	
4	Aeration	Acre	1	\$500.00	\$500	
5	Labor	Ea	1	\$250.00	\$250	
Subtotal					\$3,369	
Contingency				30%	\$1,011	
TOTAL					\$4,379	

GENERAL MAINTENANCE						
BID ITEM	ITEM DESCRIPTION	UNIT	EST QTY	UNIT PRICE	TOTAL	Notes
1	Mowing Frequency	Ea.	17	\$150	\$2,550	Ideally keep at 3-4 inches, (May Through September) every 10 days
2	Fertilizer	LBS	196.02	\$0.54	\$106	Assuming 1.5 lbs nitrogen per 1,000 sq ft annually (4.5 lbs of 33-0-4 fertilizer)
3	Water Usage	1000/Gal	64.762	\$2.20	\$142	Assuming 1.5 lbs nitrogen per 1,000 sq ft annually (4.5 lbs of 33-0-4 fertilizer)
Subtotal					\$2,656	
Contingency				30%	\$797	
TOTAL					\$3,453	

Attachment D. Land Use Calculations

Municipality	Existing or Future	Land Use Data Source	Parcel Based	Land-Use Classification	Private Vs Public Land-Use	Total Area (Sq. M.)	Total Area without Wetlands (Sq. M.)	Pervious (Sq. M) without Trees and Wetlands	Pervious (Acres) without Trees and Wetlands	TOTAL % PERVIOUS
Hugo	Existing	Met Council LU 2020		Agricultural	Agricultural	22,625,100	21,563,100	20,877,417	5,158.9	0.92
Hugo	Existing	Met Council LU 2020		Farmstead	Agricultural	945,900	933,300	687,087	169.8	0.73
Hugo	Existing	Met Council LU 2020		Golf Course	GOLF	513,000	444,600	372,960	92.2	0.73
Hugo	Existing	Met Council LU 2020		Industrial or Utility	NA	1,053,000	1,028,700	396,540	98.0	0.38
Hugo	Existing	Met Council LU 2020		Institutional	PUBLIC	456,300	377,100	222,858	55.1	0.49
Hugo	Existing	Met Council LU 2020		Major Highway	na	73,800	73,800	37,827	9.3	0.51
Hugo	Existing	Met Council LU 2020		Manufactured Housing Park	PRIVATE	90,000	90,000	33,489	8.3	0.37
Hugo	Existing	Met Council LU 2020		Multi-family	PRIVATE	44,100	44,100	20,277	5.0	0.46
Hugo	Existing	Met Council LU 2020		Office	PRIVATE	51,300	50,400	18,612	4.6	0.36
Hugo	Existing	Met Council LU 2020		Open Water	WATER	6,423,300	161,100	130,464	32.2	0.02
Hugo	Existing	Met Council LU 2020		Park, Recreational, or Preserve	PUBLIC	6,120,000	3,933,000	2,765,610	683.4	0.45
Hugo	Existing	Met Council LU 2020		Retail and Other Commercial	PRIVATE	504,900	498,600	217,404	53.7	0.43
Hugo	Existing	Met Council LU 2020		Single Family Attached	PRIVATE	1,307,700	1,188,900	357,912	88.4	0.27
Hugo	Existing	Met Council LU 2020		Single Family Detached	PRIVATE	12,430,800	11,996,100	7,042,149	1,740.2	0.57
Hugo	Existing	Met Council LU 2020		Undeveloped	na	40,734,000	25,447,500	16,892,730	4,174.3	0.41
Hugo	Future (Ultimate)	Hugo		AG	Agricultural	35,756,100	25,116,300	25,972,673	6,418.0	0.73
Hugo	Future (Ultimate)	Hugo		BP	PRIVATE	1,919,700	1,625,400	696,481	172.1	0.36
Hugo	Future (Ultimate)	Hugo		COM	PRIVATE	1,176,300	983,700	426,770	105.5	0.36
Hugo	Future (Ultimate)	Hugo		HD	PRIVATE	985,500	614,700	453,129	112.0	0.46
Hugo	Future (Ultimate)	Hugo		IND	PRIVATE	1,968,300	1,717,200	741,242	183.2	0.38
Hugo	Future (Ultimate)	Hugo		LD	PRIVATE	21,425,400	15,415,200	5,864,042	1,449.0	0.27
Hugo	Future (Ultimate)	Hugo		LL	PRIVATE	15,458,400	12,820,500	4,230,899	1,045.5	0.27
Hugo	Future (Ultimate)	Hugo		MD	PRIVATE	6,782,400	5,034,600	2,523,731	623.6	0.37
Hugo	Future (Ultimate)	Hugo		MIX	PRIVATE	2,611,800	2,286,900	971,851	240.1	0.37
Hugo	Future (Ultimate)	Hugo		Public/Quasi-Public	PUBLIC	3,005,100	973,800	1,293,961	319.7	0.43
Hugo	Future (Ultimate)	Hugo		VLD	PRIVATE	2,246,400	1,226,700	1,272,604	314.5	0.57
Hugo	Future (Ultimate)	Hugo		[Not within a parcel]	na	37,800	15,300	21,414	5.3	0.57

Attachment D. Land Use Calculations

Municipality	Existing or Future	Land Use Data Source	Parcel Based	Land-Use Classification	Private Vs Public Land-Use	Total Area (Sq. M.)	Total Area without Wetlands (Sq. M.)	Pervious (Sq. M) without Trees and Wetlands	Pervious (Acres) without Trees and Wetlands	TOTAL % PERVIOUS
Lake Elmo	Existing	Lake Elmo		blank land use		1,323,900	1,259,100	1,024,344	253.1	0.77
Lake Elmo	Existing	Lake Elmo		AP	Agricultural	1,671,300	1,495,800	1,282,284	316.9	0.77
Lake Elmo	Existing	Lake Elmo		BP	PRIVATE	719,100	701,100	436,176	107.8	0.61
Lake Elmo	Existing	Lake Elmo		C	PRIVATE	207,900	202,500	90,540	22.4	0.44
Lake Elmo	Existing	Lake Elmo		Closed Landfill	NA	269,100	269,100	251,001	62.0	0.93
Lake Elmo	Existing	Lake Elmo		GB	PRIVATE	232,200	222,300	168,318	41.6	0.72
Lake Elmo	Existing	Lake Elmo		Golf Course	PRIVATE	744,300	699,300	586,917	145.0	0.79
Lake Elmo	Existing	Lake Elmo		Industrial	PRIVATE	27,000	27,000	4,842	1.2	0.18
Lake Elmo	Existing	Lake Elmo		Institutional	PRIVATE	1,298,700	1,277,100	699,750	172.9	0.54
Lake Elmo	Existing	Lake Elmo		LB	PRIVATE	253,400	265,500	129,366	32.0	0.44
Lake Elmo	Existing	Lake Elmo		LDR	PRIVATE	756,900	752,400	316,935	78.3	0.42
Lake Elmo	Existing	Lake Elmo		MDR	PRIVATE	939,600	894,600	465,381	115.0	0.50
Lake Elmo	Existing	Lake Elmo		MXD	PRIVATE	14,400	14,400	4,941	1.2	0.34
Lake Elmo	Existing	Lake Elmo		Park/OS	PUBLIC	10,408,500	9,314,100	7,042,563	1,740.3	0.68
Lake Elmo	Existing	Lake Elmo		PSP	PUBLIC	546,300	530,100	348,579	86.1	0.64
Lake Elmo	Existing	Lake Elmo		RAD	NA	23,744,700	22,086,000	17,369,721	4,292.1	0.73
Lake Elmo	Existing	Lake Elmo		RE	PRIVATE	3,313,800	3,152,700	2,183,499	539.6	0.66
Lake Elmo	Existing	Lake Elmo		ROW	ROW	994,500	961,200	485,451	120.0	0.49
Lake Elmo	Existing	Lake Elmo		RSF	PRIVATE	7,001,100	6,557,400	2,834,145	700.3	0.40
Lake Elmo	Existing	Lake Elmo		Undeveloped	NA	1,827,000	1,715,400	1,100,889	272.0	0.60
Lake Elmo	Existing	Lake Elmo		V-LDR	PRIVATE	252,900	243,000	176,697	43.7	0.70
Lake Elmo	Existing	Lake Elmo		V-MDR	PRIVATE	196,200	196,200	98,919	24.4	0.50
Lake Elmo	Existing	Lake Elmo		[Not within a parcel]	NA	6,980,400	3,387,600	1,631,052	403.0	0.23
Lake Elmo	Future (Ultimate)	Lake Elmo		blank land use	NA	900	900	696	0.2	0.77
Lake Elmo	Future (Ultimate)	Lake Elmo		Agriculture Preserve	Agricultural	1,419,300	1,305,000	1,088,940	269.1	0.77
Lake Elmo	Future (Ultimate)	Lake Elmo		Business Park	PRIVATE	1,371,600	1,337,400	831,955	205.6	0.61
Lake Elmo	Future (Ultimate)	Lake Elmo		Closed Landfill	NA	269,100	269,100	251,001	62.0	0.93
Lake Elmo	Future (Ultimate)	Lake Elmo		Commercial	PRIVATE	632,700	620,100	275,539	68.1	0.44
Lake Elmo	Future (Ultimate)	Lake Elmo		Golf Course Community	GOLF	1,793,700	1,641,600	1,414,420	349.5	0.79
Lake Elmo	Future (Ultimate)	Lake Elmo		High Density Residential	PRIVATE	390,600	385,200	193,463	47.8	0.50
Lake Elmo	Future (Ultimate)	Lake Elmo		Institutional	PUBLIC	1,610,100	1,582,200	867,535	214.4	0.54
Lake Elmo	Future (Ultimate)	Lake Elmo		Limited Business	PRIVATE	189,000	162,000	83,334	20.6	0.44
Lake Elmo	Future (Ultimate)	Lake Elmo		Low Density Residential	PRIVATE	2,012,400	1,976,400	842,648	208.2	0.42
Lake Elmo	Future (Ultimate)	Lake Elmo		Medium Density Residential	PRIVATE	1,539,900	1,493,100	762,708	188.5	0.50
Lake Elmo	Future (Ultimate)	Lake Elmo		Mixed Use - Business Park	PRIVATE	371,700	353,700	127,540	31.5	0.34
Lake Elmo	Future (Ultimate)	Lake Elmo		Mixed Use - Commercial	PRIVATE	560,700	540,900	192,390	47.5	0.34
Lake Elmo	Future (Ultimate)	Lake Elmo		Park/Open Space	PUBLIC	11,159,100	10,021,500	7,550,431	1,865.8	0.68
Lake Elmo	Future (Ultimate)	Lake Elmo		Public/Semi-Public	PUBLIC	834,300	790,200	532,344	131.5	0.64
Lake Elmo	Future (Ultimate)	Lake Elmo		ROW	ROW	1,016,100	982,800	496,995	122.6	0.49
Lake Elmo	Future (Ultimate)	Lake Elmo		Rural Area Development	PRIVATE	17,523,000	16,150,500	12,818,424	3,167.5	0.73
Lake Elmo	Future (Ultimate)	Lake Elmo		Rural Single Family	PRIVATE	9,661,500	9,085,500	6,366,068	1,573.1	0.66
Lake Elmo	Future (Ultimate)	Lake Elmo		Rural Single Family Sewered	PRIVATE	1,707,300	1,577,700	1,124,959	278.0	0.66
Lake Elmo	Future (Ultimate)	Lake Elmo		Village - High Density Residential	PRIVATE	86,400	86,400	43,561	10.8	0.50
Lake Elmo	Future (Ultimate)	Lake Elmo		Village - Low Density Residential	PRIVATE	1,683,900	1,526,400	848,979	209.8	0.50
Lake Elmo	Future (Ultimate)	Lake Elmo		Village - Medium Density Residential	PRIVATE	639,000	637,200	322,167	79.6	0.50
Lake Elmo	Future (Ultimate)	Lake Elmo		Village - Mixed Use	PRIVATE	310,500	310,500	153,790	38.0	0.50
Lake Elmo	Future (Ultimate)	Lake Elmo		[Not within a parcel]	NA	6,980,400	3,387,600	-	-	0.00

Attachment D. Land Use Calculations

Municipality	Existing or Future	Land Use Data Source	Parcel Based	Land-Use Classification	Private Vs Public Land-Use	Total Area (Sq. M.)	Total Area without Wetlands (Sq. M.)	Pervious (Sq. M.) without Trees and Wetlands	Pervious (Acres) without Trees and Wetlands	TOTAL % PERVIOUS
Lino Lakes	Existing	Lino Lakes	Yes	AGRICULTURAL	Agricultural	15,093,900	11,412,000	10,614,447	2,622.9	0.70
Lino Lakes	Existing	Lino Lakes	Yes	AIRPORT	PUBLIC	274,500	226,800	177,372	43.8	0.65
Lino Lakes	Existing	Lino Lakes	Yes	CEMETERY	NA	32,400	31,500	19,935	4.9	0.62
Lino Lakes	Existing	Lino Lakes	Yes	CITY PARK AND RECREATION	PUBLIC	836,100	643,500	452,403	111.8	0.54
Lino Lakes	Existing	Lino Lakes	Yes	COMMERCIAL	PRIVATE	700,200	634,500	208,305	51.5	0.30
Lino Lakes	Existing	Lino Lakes	Yes	COUNTY PARK & RECREATION	PUBLIC	12,661,200	4,551,300	2,239,767	553.5	0.18
Lino Lakes	Existing	Lino Lakes	Yes	GOVERNMENT FACILITIES	PUBLIC	916,200	765,000	366,957	90.7	0.40
Lino Lakes	Existing	Lino Lakes	Yes	HOUSE OF WORSHIP	PRIVATE	764,100	511,200	324,909	80.3	0.43
Lino Lakes	Existing	Lino Lakes	Yes	INDUSTRIAL	PRIVATE	1,075,500	1,044,000	333,691	82.5	0.31
Lino Lakes	Existing	Lino Lakes	Yes	MIXED USE(PRIMARILY RESIDENTIAL)	PRIVATE	900	900	270	0.1	0.30
Lino Lakes	Existing	Lino Lakes	Yes	MULTI-FAMILY RESIDENTIAL	PRIVATE	682,200	536,400	195,030	48.2	0.29
Lino Lakes	Existing	Lino Lakes	Yes	OPEN SPACE/CONSERVATION	NA	4,182,300	1,065,600	581,931	143.8	0.14
Lino Lakes	Existing	Lino Lakes	Yes	OPEN WATER	WATER	2,700	1,800	801	0.2	0.30
Lino Lakes	Existing	Lino Lakes	Yes	ROADWAY RIGHTS-OF-WAY	ROW	27,000	26,100	10,359	2.6	0.38
Lino Lakes	Existing	Lino Lakes	Yes	RURAL RESIDENTIAL	PRIVATE	16,697,700	12,961,000	7,785,720	1,923.9	0.47
Lino Lakes	Existing	Lino Lakes	Yes	SCHOOLS	PUBLIC	694,800	583,200	322,380	79.7	0.46
Lino Lakes	Existing	Lino Lakes	Yes	SINGLE FAMILY RESIDENTIAL	PRIVATE	8,832,600	8,117,100	3,138,201	775.5	0.36
Lino Lakes	Existing	Lino Lakes	Yes	UTILITY	ROW	742,500	352,800	187,641	46.4	0.25
Lino Lakes	Existing	Lino Lakes	Yes	VACANT-COMMERICAL	NA	943,300	702,900	505,809	125.0	0.60
Lino Lakes	Existing	Lino Lakes	Yes	VACANT-INDUSTRIAL	NA	239,400	230,400	163,413	40.4	0.68
Lino Lakes	Existing	Lino Lakes	Yes	VACANT-RESIDENTIAL	NA	1,655,100	1,440,000	1,008,954	249.3	0.61
Lino Lakes	Existing	Lino Lakes	Yes	VACANT-RURAL RESIDENTIAL	NA	1,854,000	1,133,100	639,135	157.9	0.34
Lino Lakes	Existing	Lino Lakes	Yes	[Not within a parcel]	NA	17,325,000	6,599,700	3,033,369	749.6	0.18
Lino Lakes	Future (Ultimate)	Lino Lakes		Business Campus	PRIVATE	1,466,100	1,319,400	436,155	107.8	0.30
Lino Lakes	Future (Ultimate)	Lino Lakes		Civic/Institutional	PUBLIC	1,964,700	1,434,600	584,486	144.4	0.30
Lino Lakes	Future (Ultimate)	Lino Lakes		Commercial	PRIVATE	2,030,400	1,815,300	604,031	149.3	0.30
Lino Lakes	Future (Ultimate)	Lino Lakes		High Density Residential	PRIVATE	783,900	603,000	224,104	55.4	0.29
Lino Lakes	Future (Ultimate)	Lino Lakes		Industrial	PRIVATE	2,540,700	2,359,800	788,765	194.9	0.31
Lino Lakes	Future (Ultimate)	Lino Lakes		Low Density Mixed Residential	PRIVATE	1,522,800	1,465,200	435,344	107.6	0.29
Lino Lakes	Future (Ultimate)	Lino Lakes		Low Density Sewered Residential	PRIVATE	18,504,000	14,998,500	6,574,426	1,624.6	0.36
Lino Lakes	Future (Ultimate)	Lino Lakes		Medium Density Residential	PRIVATE	3,020,400	2,465,100	906,120	223.9	0.30
Lino Lakes	Future (Ultimate)	Lino Lakes		Office Residential	PRIVATE	567,000	381,600	162,096	40.1	0.29
Lino Lakes	Future (Ultimate)	Lino Lakes		Open Water	WATER	2,700	1,800	1,843	0.5	0.68
Lino Lakes	Future (Ultimate)	Lino Lakes		Park & Open Space	PUBLIC	15,259,500	5,869,800	8,256,720	2,040.3	0.54
Lino Lakes	Future (Ultimate)	Lino Lakes		Permanent Rural	NA	3,615,300	954,000	1,685,724	416.6	0.47
Lino Lakes	Future (Ultimate)	Lino Lakes		Planned Residential / Commercial	PUBLIC	364,500	360,900	108,436	26.8	0.30
Lino Lakes	Future (Ultimate)	Lino Lakes		Private Airfield	PRIVATE	273,600	225,900	176,790	43.7	0.65
Lino Lakes	Future (Ultimate)	Lino Lakes		Right-of-Way	ROW	121,500	88,100	46,616	11.5	0.38
Lino Lakes	Future (Ultimate)	Lino Lakes		Signature Gateway District	PRIVATE	321,300	314,100	95,585	23.6	0.30
Lino Lakes	Future (Ultimate)	Lino Lakes		Town Center	PUBLIC	190,800	186,300	56,762	14.0	0.30
Lino Lakes	Future (Ultimate)	Lino Lakes		Urban Reserve	PRIVATE	16,402,500	12,245,400	5,092,187	1,258.3	0.31
Lino Lakes	Future (Ultimate)	Lino Lakes		[Not within a parcel]	NA	17,181,900	6,462,000	6,881,705	1,700.5	0.40

Attachment D. Land Use Calculations

Municipality	Existing or Future	Land Use Data Source	Parcel Based	Land-Use Classification	Private Vs Public Land-Use	Total Area (Sq. M.)	Total Area without Wetlands (Sq. M.)	Pervious (Sq. M) without Trees and Wetlands	Pervious (Acres) without Trees and Wetlands	TOTAL % PERVIOUS
Mahtomedi	Existing	Mahtomedi		blank land use	NA	135,000	73,800	32,751	8.1	0.24
Mahtomedi	Existing	Mahtomedi		Community Commercial	PRIVATE	102,600	99,900	28,926	7.1	0.28
Mahtomedi	Existing	Mahtomedi		High Density Residential	PRIVATE	186,300	148,500	35,460	8.8	0.19
Mahtomedi	Existing	Mahtomedi		Industrial/Business Mix	PRIVATE	501,300	416,700	123,066	30.4	0.25
Mahtomedi	Existing	Mahtomedi		Low Density Residential	PRIVATE	4,768,200	4,465,800	1,360,044	336.1	0.29
Mahtomedi	Existing	Mahtomedi		Medium Density Residential	PRIVATE	301,500	278,100	64,323	15.9	0.21
Mahtomedi	Existing	Mahtomedi		Mixed Residential Commercial	PRIVATE	20,700	20,700	5,760	1.4	0.28
Mahtomedi	Existing	Mahtomedi		Neighborhood Commercial	PRIVATE	10,800	10,800	2,664	0.7	0.25
Mahtomedi	Existing	Mahtomedi		Open Water	WATER	567,000	184,500	61,308	15.1	0.11
Mahtomedi	Existing	Mahtomedi		Public Institutional	PUBLIC	889,200	816,300	305,091	75.4	0.34
Mahtomedi	Existing	Mahtomedi		Public or Private Open Space	PUBLIC	261,900	153,000	41,220	10.2	0.16
Mahtomedi	Existing	Mahtomedi		Public Park	PUBLIC	619,200	496,800	192,942	47.7	0.31
Mahtomedi	Existing	Mahtomedi		Rural Residential	PRIVATE	242,100	188,100	129,393	32.0	0.53
Mahtomedi	Existing	Mahtomedi		Utility	ROW	900	900	675	0.2	0.75
Mahtomedi	Existing	Mahtomedi		Village Mixed Use	PRIVATE	16,200	14,400	3,510	0.9	0.22
Mahtomedi	Existing	Mahtomedi		[Not within a parcel]	NA	6,332,400	1,181,700	342,918	84.7	0.05
Mahtomedi	Future (Ultimate)	Mahtomedi		blank land use	NA	4,500	3,600	1,092	0.3	0.24
Mahtomedi	Future (Ultimate)	Mahtomedi		Community Commercial	PRIVATE	71,100	69,300	20,045	5.0	0.28
Mahtomedi	Future (Ultimate)	Mahtomedi		High Density Res	PRIVATE	192,600	148,500	36,659	9.1	0.19
Mahtomedi	Future (Ultimate)	Mahtomedi		Ind-Bus Mix	PRIVATE	591,300	463,500	145,160	35.9	0.25
Mahtomedi	Future (Ultimate)	Mahtomedi		Low Density Res	PRIVATE	4,826,700	4,419,900	1,376,730	340.2	0.29
Mahtomedi	Future (Ultimate)	Mahtomedi		Lower Density Res	PRIVATE	50,400	50,400	10,753	2.7	0.21
Mahtomedi	Future (Ultimate)	Mahtomedi		Medium Density Res	PRIVATE	308,700	285,300	85,899	21.2	0.28
Mahtomedi	Future (Ultimate)	Mahtomedi		Mixed Res Com	PRIVATE	43,200	43,200	10,656	2.6	0.25
Mahtomedi	Future (Ultimate)	Mahtomedi		Neighborhood Com.	PRIVATE	11,700	11,700	1,265	0.3	0.11
Mahtomedi	Future (Ultimate)	Mahtomedi		Park/Private Open Sp	PUBLIC	280,800	150,300	87,497	21.6	0.31
Mahtomedi	Future (Ultimate)	Mahtomedi		Public Institutional	PUBLIC	903,600	827,100	310,032	76.6	0.34
Mahtomedi	Future (Ultimate)	Mahtomedi		Public Park	PUBLIC	669,600	537,300	208,647	51.6	0.31
Mahtomedi	Future (Ultimate)	Mahtomedi		ROW	ROW	51,300	47,700	38,475	9.5	0.75
Mahtomedi	Future (Ultimate)	Mahtomedi		Rural Residential	PRIVATE	293,400	195,300	156,811	38.7	0.53
Mahtomedi	Future (Ultimate)	Mahtomedi		Utility	ROW	900	900	675	0.2	0.75
Mahtomedi	Future (Ultimate)	Mahtomedi		Village Mixed Use	PRIVATE	16,200	14,400	3,510	0.9	0.22
Mahtomedi	Future (Ultimate)	Mahtomedi		Water	WATER	306,900	99,900	16,620	4.1	0.05
Mahtomedi	Future (Ultimate)	Mahtomedi		[Not within a parcel]	NA	6,332,400	1,181,700	342,918	84.7	0.05

Attachment D. Land Use Calculations

Municipality	Existing or Future	Land Use Data Source	Parcel Based	Land-Use Classification	Private Vs Public Land-Use	Total Area (Sq. M.)	Total Area without Wetlands (Sq. M.)	Pervious (Sq. M) without Trees and Wetlands	Pervious (Acres) without Trees and Wetlands	TOTAL % PERVIOUS
New Brighton	Existing	New Brighton		blank land use	NA	112,500	108,900	25,173	6.2	0.22
New Brighton	Existing	New Brighton		AGRICULTURAL VACANT LAND	NA	2,700	2,700	468	0.1	0.17
New Brighton	Existing	New Brighton		APARTMENT VACANT LAND	NA	7,200	7,200	1,512	0.4	0.21
New Brighton	Existing	New Brighton		APARTMENTS 20-49 RENTAL UNITS	PRIVATE	40,500	36,000	9,450	2.3	0.23
New Brighton	Existing	New Brighton		APARTMENTS 4-6 RENTAL UNITS	PRIVATE	4,500	4,500	1,134	0.3	0.25
New Brighton	Existing	New Brighton		APARTMENTS 50-99 RENTAL UNITS	PRIVATE	243,000	241,200	66,141	16.3	0.27
New Brighton	Existing	New Brighton		APARTMENTS 7-19 RENTAL UNITS	PRIVATE	45,000	45,000	11,385	2.8	0.25
New Brighton	Existing	New Brighton		APT OR COMPLEX 100+ UNITS	PRIVATE	315,000	305,100	80,929	20.0	0.26
New Brighton	Existing	New Brighton		AUTO SALES AND SERVICE CTR	PRIVATE	34,200	34,200	5,427	1.3	0.16
New Brighton	Existing	New Brighton		AUTOMOTIVE SERVICE STATION	PRIVATE	78,300	78,300	15,804	3.9	0.20
New Brighton	Existing	New Brighton		CAR WASH	PRIVATE	1,800	1,800	225	0.1	0.13
New Brighton	Existing	New Brighton		COMM LD&M PRO OWN BY PUB UTI TH RAIL	PRIVATE	4,500	4,500	1,656	0.4	0.37
New Brighton	Existing	New Brighton		COMMERCIAL VACANT LAND	NA	41,400	41,400	7,254	1.8	0.18
New Brighton	Existing	New Brighton		CONDO	PRIVATE	3,124,800	3,016,800	591,561	146.2	0.19
New Brighton	Existing	New Brighton		CONDO GARAGE	PRIVATE	99,000	96,300	14,355	3.5	0.15
New Brighton	Existing	New Brighton		CONDOMINIUM OFFICE UNIT	PRIVATE	93,600	93,600	21,294	5.3	0.23
New Brighton	Existing	New Brighton		CONVENIENCE STORE	PRIVATE	18,000	18,000	3,717	0.9	0.21
New Brighton	Existing	New Brighton		DRIVE-IN REST/FOOD SRV FACILITY	PRIVATE	12,600	12,600	2,079	0.5	0.17
New Brighton	Existing	New Brighton		EXEMPT PROP. OWNED BY BD OF EDUC.	PUBLIC	321,300	321,300	146,736	36.3	0.46
New Brighton	Existing	New Brighton		EXEMPT PROP. OWNED BY COUNTY	PUBLIC	394,200	235,800	130,158	32.2	0.33
New Brighton	Existing	New Brighton		EXEMPT PROP. OWNED BY MUNICIPALS	PUBLIC	475,200	373,500	181,908	45.0	0.38
New Brighton	Existing	New Brighton		EXEMPT PROP. OWNED BY PRIVATE SCHOOL	PUBLIC	35,100	35,100	16,812	4.2	0.48
New Brighton	Existing	New Brighton		EXEMPT PROP. OWNED BY USA	PUBLIC	17,100	17,100	8,586	2.1	0.50
New Brighton	Existing	New Brighton		EXEMPT, CHARITABLE HOSP/NURS HOME	PUBLIC	28,800	28,800	7,371	1.8	0.26
New Brighton	Existing	New Brighton		EXEMPT, CHURCH, PUBLIC WORSHIP, PRIV	PRIVATE	228,900	210,600	56,556	14.0	0.25
New Brighton	Existing	New Brighton		EXEMPT, GOLF COURSE	GOLF	126,900	111,600	70,947	17.5	0.56
New Brighton	Existing	New Brighton		EXEMPT, GRAVEYARD MONUMENT, CEMETERNA		16,200	16,200	9,459	2.3	0.58
New Brighton	Existing	New Brighton		EXEMPT, OFFICE BUILDING	PRIVATE	3,600	3,600	1,170	0.3	0.33
New Brighton	Existing	New Brighton		EXEMPT, VACANT LAND	NA	2,315,700	1,121,400	417,132	103.1	0.18
New Brighton	Existing	New Brighton		EXEMPT, WELFARE/CHARIT FACILITY	PRIVATE	9,000	9,000	2,565	0.6	0.29
New Brighton	Existing	New Brighton		FLEX COMMERCIAL CENTER	PRIVATE	71,100	71,100	14,580	3.6	0.21
New Brighton	Existing	New Brighton		FLEX INDUSTRIAL CENTER	PRIVATE	301,500	297,000	50,841	12.6	0.17
New Brighton	Existing	New Brighton		FOUNDERY AND HEAVY MFG PLANT	PRIVATE	25,200	25,200	5,445	1.3	0.22
New Brighton	Existing	New Brighton		FULL SERVICE BANK	PRIVATE	9,000	9,000	2,061	0.5	0.23
New Brighton	Existing	New Brighton		FUNERAL HOME	PRIVATE	2,700	2,700	1,017	0.3	0.38
New Brighton	Existing	New Brighton		GAS STATION	PRIVATE	3,600	3,600	747	0.2	0.21
New Brighton	Existing	New Brighton		GREENHOUSES, NURSERY, VEG., FLORA.	PRIVATE	25,200	25,200	6,426	1.6	0.26
New Brighton	Existing	New Brighton		HOTEL	PRIVATE	11,700	11,700	3,087	0.8	0.26
New Brighton	Existing	New Brighton		IND WAREHOUSE	PRIVATE	478,800	463,500	94,095	23.3	0.20
New Brighton	Existing	New Brighton		INDUSTRIAL MINIMUM IMPROVEMENT	PRIVATE	19,800	14,400	3,699	0.9	0.19
New Brighton	Existing	New Brighton		INDUSTRIAL VACANT LAND	NA	274,500	270,000	84,429	20.9	0.31
New Brighton	Existing	New Brighton		LODGE, HALL, PRIV/SOCIAL CLUB	PRIVATE	7,200	7,200	1,224	0.3	0.17
New Brighton	Existing	New Brighton		MANUFACTURING AND ASSEMBLY LIGHT	PRIVATE	397,800	351,000	87,219	21.6	0.22
New Brighton	Existing	New Brighton		MEDICAL CLINIC	PRIVATE	1,800	1,800	522	0.1	0.29
New Brighton	Existing	New Brighton		MEDICAL OFFICE	PRIVATE	5,400	5,400	2,025	0.5	0.38
New Brighton	Existing	New Brighton		MEDIUM DETACHED RETAIL	PRIVATE	13,500	13,500	2,727	0.7	0.20
New Brighton	Existing	New Brighton		MINI STORAGE/WAREHOUSE	PRIVATE	67,500	57,600	15,408	3.8	0.23
New Brighton	Existing	New Brighton		MIXED RESID/COMMERCIAL	PRIVATE	1,800	1,800	342	0.1	0.19
New Brighton	Existing	New Brighton		MIXED RETAIL/COMMERCIAL	PRIVATE	11,700	11,700	2,574	0.6	0.22
New Brighton	Existing	New Brighton		NEIGHBORHOOD SHOPPING CENTER	PRIVATE	46,800	46,800	6,435	1.6	0.14
New Brighton	Existing	New Brighton		NURSING HOME AND PRIVATE HOSPITAL	PRIVATE	15,300	15,300	2,781	0.7	0.18
New Brighton	Existing	New Brighton		OFFICE BUILDING 1-2 STORIES	PRIVATE	119,700	119,700	26,289	6.5	0.22
New Brighton	Existing	New Brighton		OFFICE BUILDING 3+ STORIES	PRIVATE	51,300	45,900	9,261	2.3	0.18
New Brighton	Existing	New Brighton		OTHER COMMERCIAL STRUCTURE	PRIVATE	26,100	26,100	13,473	3.3	0.52
New Brighton	Existing	New Brighton		RAILROAD REAL PROP USED IN OPERATION	RAIL	313,200	309,600	120,582	29.8	0.39
New Brighton	Existing	New Brighton		RES/EXEMPT OTHER	NA	1,800	1,800	612	0.2	0.34
New Brighton	Existing	New Brighton		RES/EXEMPT SINGLE FAMILY DWELLING	PRIVATE	7,200	7,200	1,161	0.3	0.16
New Brighton	Existing	New Brighton		RES/EXEMPT TWO FAM DWEL - SIDE/SIDE	PRIVATE	1,800	1,800	540	0.1	0.30
New Brighton	Existing	New Brighton		RESID/EXEMPT VACANT LAND	PRIVATE	63,900	57,600	27,819	6.9	0.44
New Brighton	Existing	New Brighton		RESIDENTIAL CO-OP	PRIVATE	4,860,000	3,240,000	866,160	214.0	0.18
New Brighton	Existing	New Brighton		RESIDENTIAL, OTHER	PRIVATE	27,000	18,000	3,915	1.0	0.15
New Brighton	Existing	New Brighton		RESIDENTIAL, VACANT LAND, LOT	NA	52,200	39,600	10,728	2.7	0.21
New Brighton	Existing	New Brighton		RESTAURANT AND/OR BAR	PRIVATE	22,500	22,500	4,005	1.0	0.18
New Brighton	Existing	New Brighton		SINGLE FAMILY DWELLING, PLATTED LOT	PRIVATE	6,447,600	5,972,400	1,746,864	431.7	0.27
New Brighton	Existing	New Brighton		SINGLE FAMILY W/ACCESSORY UNIT	PRIVATE	1,800	1,800	315	0.1	0.18
New Brighton	Existing	New Brighton		SMALL (UNDER 10,000 SF) DET. RETAIL	PRIVATE	8,100	8,100	1,467	0.4	0.18
New Brighton	Existing	New Brighton		SMALL STRIP CENTER	PRIVATE	19,800	19,800	3,987	1.0	0.20
New Brighton	Existing	New Brighton		SUPERMARKET	PRIVATE	22,500	22,500	4,437	1.1	0.20
New Brighton	Existing	New Brighton		TAXABLE MANUFACTURED HOME	PRIVATE	27,000	27,000	4,959	1.2	0.18
New Brighton	Existing	New Brighton		THREE FAMILY DWELLING, PLATTED LOT	PRIVATE	900	900	81	0.0	0.09
New Brighton	Existing	New Brighton		TOWNHOME - GARAGE ONLY	PRIVATE	472,500	472,500	70,560	17.4	0.15
New Brighton	Existing	New Brighton		TOWNHOME - NON-TAX OUTLOT	PRIVATE	158,400	116,100	25,227	6.2	0.16
New Brighton	Existing	New Brighton		TOWNHOME - OUTER UNIT	PRIVATE	39,600	39,600	8,622	2.1	0.22
New Brighton	Existing	New Brighton		TOWNHOME - TICO	PRIVATE	1,432,800	1,432,800	277,371	68.5	0.19
New Brighton	Existing	New Brighton		TOWNHOME-INNER UNIT	PRIVATE	40,500	40,500	10,116	2.5	0.25
New Brighton	Existing	New Brighton		TRAILER OR MOBILE HOME PARK	PRIVATE	227,700	189,900	36,558	9.0	0.16
New Brighton	Existing	New Brighton		TRUCK TERMINAL	PUBLIC	56,700	56,700	9,324	2.3	0.16
New Brighton	Existing	New Brighton		TWIN HOME	PRIVATE	20,700	20,700	6,381	1.6	0.31
New Brighton	Existing	New Brighton		TWO FAMILY DWELLING - SIDE/SIDE	PRIVATE	64,800	64,800	23,814	5.9	0.37
New Brighton	Existing	New Brighton		TWO FAMILY DWELLING - UP/DOWN	PRIVATE	38,700	38,700	10,539	2.6	0.27
New Brighton	Existing	New Brighton		TWO RESIDENCES ON ONE PARCEL	PRIVATE	9,000	8,100	1,791	0.4	0.20
New Brighton	Existing	New Brighton		VETERINARY CLINIC	PRIVATE	3,600	3,600	1,044	0.3	0.29
New Brighton	Existing	New Brighton		[Not within a parcel]	NA	3,555,900	3,500,100	936,657	231.5	0.26
New Brighton	Future (Ultimate)	New Brighton		C, Commercial	PRIVATE	94,500	94,500	34,776	8.6	0.37
New Brighton	Future (Ultimate)	New Brighton		HDR, High Density Residential	PRIVATE	2,127,600	2,007,900	468,072	115.7	0.22
New Brighton	Future (Ultimate)	New Brighton		HI, Heavy Industrial	PRIVATE	333,900	322,200	73,458	18.2	0.22
New Brighton	Future (Ultimate)	New Brighton		LDR, Low Density Residential	PRIVATE	7,226,100	6,516,900	1,957,785	483.8	0.27
New Brighton	Future (Ultimate)	New Brighton		LI, Light Industrial	PRIVATE	1,366,200	1,328,400	255,231	63.1	0.19
New Brighton	Future (Ultimate)	New Brighton		MDR, Medium Density Residential	PRIVATE	1,692,900	1,533,600	422,849	104.5	0.25
New Brighton	Future (Ultimate)	New Brighton		MU, City Center Node	PUBLIC	694,800	676,800	173,546	42.9	0.25
New Brighton	Future (Ultimate)	New Brighton		MU, Neighborhood Node	PRIVATE	2,314,800	2,309,400	578,186	142.9	0.25
New Brighton	Future (Ultimate)	New Brighton		MU, Regional Node	PRIVATE	5,268,600	3,605,400	1,315,979	325.2	0.25
New Brighton	Future (Ultimate)	New Brighton		Open Water	WATER	135,000	900	-	-	0.00
New Brighton	Future (Ultimate)	New Brighton		P, Park	PUBLIC	2,578,500	1,520,100	1,040,443	257.1	0.40
New Brighton	Future (Ultimate)	New Brighton		P-QP, Public & Quasi-Public	PUBLIC	521,100	521,100	188,416	46.6	0.36
New Brighton	Future (Ultimate)	New Brighton		ROW, Right Of Way	ROW	3,600	3,600	-	-	0.00
New Brighton	Future (Ultimate)	New Brighton		RR, Railroad	RAIL	321,300	316,800	-	-	0.00
New Brighton	Future (Ultimate)	New Brighton		[Not within a parcel]	NA	3,555,900	3,500,100	-	-	0.00

Attachment D. Land Use Calculations

Municipality	Existing or Future	Land Use Data Source	Parcel Based	Land-Use Classification	Private Vs Public Land-Use	Total Area (Sq M.)	Total Area without Wetlands (Sq M.)	Pervious (Sq. M) without Trees and Wetlands	Pervious (Acres) without Trees and Wetlands	TOTAL % PERVIOUS
North Oaks	Existing	Met Council LU 2020	No	Agricultural	Agricultural	-	-	-	-	-
North Oaks	Existing	Met Council LU 2020	No	Farmstead	Agricultural	29,700	28,800	27,504	6.8	0.93
North Oaks	Existing	Met Council LU 2020	No	Golf Course	Recreational	716,400	701,100	531,540	131.3	0.74
North Oaks	Existing	Met Council LU 2020	No	Industrial or Utility	Utilities	22,500	21,600	7,119	1.8	0.32
North Oaks	Existing	Met Council LU 2020	No	Institutional	PUBLIC	306,100	297,900	143,235	35.4	0.47
North Oaks	Existing	Met Council LU 2020	No	Multifamily	PRIVATE	75,600	73,600	17,631	4.4	0.23
North Oaks	Existing	Met Council LU 2020	No	Office	PRIVATE	57,600	55,800	15,102	3.7	0.26
North Oaks	Existing	Met Council LU 2020	No	Open Water	WATER	3,819,600	38,700	21,465	5.3	0.01
North Oaks	Existing	Met Council LU 2020	No	Park, Recreational, or Preserve	PUBLIC	4,742,100	1,593,000	703,827	173.9	0.15
North Oaks	Existing	Met Council LU 2020	No	Retail or other Commercial	PRIVATE	54,000	54,000	13,167	3.3	0.24
North Oaks	Existing	Met Council LU 2020	No	Seasonal/Vacation	PRIVATE	12,600	11,700	3,681	0.9	0.29
North Oaks	Existing	Met Council LU 2020	No	Single Family Attached	PRIVATE	140,400	140,400	34,083	8.4	0.24
North Oaks	Existing	Met Council LU 2020	No	Single Family Detached	PRIVATE	10,181,700	9,232,200	2,959,488	731.3	0.29
North Oaks	Existing	Met Council LU 2020	No	Undeveloped	NA	2,174,400	1,494,000	715,590	176.8	0.33
North Oaks	Future (Ultimate)	North Oaks Comp 2040 Comp Plan	No	Low Density	PRIVATE	10827778.62	9,818,028	3,147,282	777.7	0.29
North Oaks	Future (Ultimate)	North Oaks Comp 2040 Comp Plan	No	Medium Density	PRIVATE	190000.077	190,000	60,907	15.1	0.32
North Oaks	Future (Ultimate)	North Oaks Comp 2040 Comp Plan	No	Mixed Residential	PRIVATE	733655.2494	714,246	228,960	56.6	0.31
North Oaks	Future (Ultimate)	North Oaks Comp 2040 Comp Plan	No	Commercial	PRIVATE	118572.998	118,573	28,912	7.1	0.24
North Oaks	Future (Ultimate)	North Oaks Comp 2040 Comp Plan	No	Mixed Use	PRIVATE	520385.7274	506,619	121,361	30.0	0.23
North Oaks	Future (Ultimate)	North Oaks Comp 2040 Comp Plan	No	Light Industrial	PRIVATE	18008.527	17,584	5,795	1.4	0.32
North Oaks	Future (Ultimate)	North Oaks Comp 2040 Comp Plan	No	Institutional	PUBLIC	262,722	256,522	123,340	30.5	0.47
North Oaks	Future (Ultimate)	North Oaks Comp 2040 Comp Plan	No	Recreational/OpenSpace	PUBLIC	5,349,463	1,797,030	793,972	196.2	0.15
North Oaks	Future (Ultimate)	North Oaks Comp 2040 Comp Plan	No	Open Water	WATER	4,070,858	41,246	22,877	5.7	0.01
North Oaks	Future (Ultimate)	North Oaks Comp 2040 Comp Plan	No	Utilities	Utilities	11,129	3,738	1,232	0.3	0.11
North Oaks	Future (Ultimate)	North Oaks Comp 2040 Comp Plan	No	East Oaks PUD	NA	0	0	-	-	0.00

Attachment D. Land Use Calculations

Municipality	Existing or Future	Land Use Data Source	Parcel Based	Land-Use Classification	Private Vs Public Land-Use	Total Area (Sq. M.)	Total Area without Wetlands (Sq. M.)	Pervious (Sq. M) without Trees and Wetlands	Pervious (Acres) without Trees and Wetlands	TOTAL % PERVIOUS	
North Saint Paul	Existing	Met Council LU 2020		Agricultural	Agricultural	900	900		684	0.2	0.76
North Saint Paul	Existing	Met Council LU 2020		Golf Course	GOLF	34,200	31,500		18,639	4.6	0.55
North Saint Paul	Existing	Met Council LU 2020		Industrial or Utility	PRIVATE	194,400	192,600		40,959	10.1	0.21
North Saint Paul	Existing	Met Council LU 2020		Institutional	PUBLIC	538,200	532,800		212,544	52.5	0.39
North Saint Paul	Existing	Met Council LU 2020		Major Highway	NA	208,800	202,500		60,516	15.0	0.29
North Saint Paul	Existing	Met Council LU 2020		Mixed Use Commercial	PRIVATE	47,700	47,700		9,252	2.3	0.19
North Saint Paul	Existing	Met Council LU 2020		Mixed Use Industrial	PRIVATE	37,800	37,800		6,660	1.6	0.18
North Saint Paul	Existing	Met Council LU 2020		Mixed Use Residential	PRIVATE	13,500	13,500		2,286	0.6	0.17
North Saint Paul	Existing	Met Council LU 2020		Multifamily	PRIVATE	323,100	322,200		98,721	24.4	0.31
North Saint Paul	Existing	Met Council LU 2020		Office	PRIVATE	44,100	44,100		11,277	2.8	0.26
North Saint Paul	Existing	Met Council LU 2020		Open Water	WATER	386,100	19,800		10,692	2.6	0.03
North Saint Paul	Existing	Met Council LU 2020		Park, Recreational, or Preserve	PUBLIC	701,100	607,500		286,524	70.8	0.41
North Saint Paul	Existing	Met Council LU 2020		Retail and Other Commercial	PRIVATE	239,400	239,400		49,689	12.3	0.21
North Saint Paul	Existing	Met Council LU 2020		Single Family Attached	PRIVATE	178,200	178,200		52,722	13.0	0.30
North Saint Paul	Existing	Met Council LU 2020		Single Family Detached	PRIVATE	4,526,100	4,513,500		1,432,692	354.0	0.32
North Saint Paul	Existing	Met Council LU 2020		Undeveloped	NA	328,500	321,300		88,137	21.8	0.27
North Saint Paul	Future (Ultimate)	City Comp Plan 2040		Low-Density Residential	PRIVATE	3646221			1154174.998	285.2	0.32
North Saint Paul	Future (Ultimate)	City Comp Plan 2040		Medium-Density Residential	PRIVATE	250905			79421.58696	19.6	0.32
North Saint Paul	Future (Ultimate)	City Comp Plan 2040		Multi-Family Residential	PRIVATE	246658			75425.91776	18.6	0.31
North Saint Paul	Future (Ultimate)	City Comp Plan 2040		Downtown Mixed Use	PRIVATE	113312			28975.5176	7.2	0.26
North Saint Paul	Future (Ultimate)	City Comp Plan 2040		Transitional Mixed Use	PRIVATE	28328			5494.566898	1.4	0.19
North Saint Paul	Future (Ultimate)	City Comp Plan 2040		Corridor Mixed Use	PRIVATE	1469010			375646.8889	92.8	0.26
North Saint Paul	Future (Ultimate)	City Comp Plan 2040		Parks	PUBLIC	740575			302656.7111	74.8	0.41

Attachment D. Land Use Calculations

Municipality	Existing or Future	Land Use Data Source	Parcel Based	Land-Use Classification	Private Vs Public Land-Use	Total Area (Sq. M.)	Total Area without Wetlands (Sq. M.)	Pervious (Sq. M) without Trees and Wetlands	Pervious (Acres) without Trees and Wetlands	TOTAL % PERVIOUS
Oakdale	Existing	Oakdale		Blank Land Use	NA	1,563,300	1,502,100	681,255	168.3	0.44
Oakdale	Existing	Oakdale		5+ Units	PRIVATE	862,200	796,500	371,853	91.9	0.43
Oakdale	Existing	Oakdale		Commercial	PRIVATE	1,401,300	1,337,400	399,474	98.7	0.29
Oakdale	Existing	Oakdale		General Industrial	PRIVATE	1,800	1,800	513	0.1	0.29
Oakdale	Existing	Oakdale		Industrial	PRIVATE	875,700	786,600	272,421	67.3	0.31
Oakdale	Existing	Oakdale		Industrial/Office	PRIVATE	18,900	18,900	4,851	1.2	0.26
Oakdale	Existing	Oakdale		Institutional	PRIVATE	1,284,300	1,196,100	571,572	141.2	0.45
Oakdale	Existing	Oakdale		Office	PRIVATE	658,800	601,200	211,284	52.2	0.32
Oakdale	Existing	Oakdale		Open Space	NA	666,900	480,800	483,201	119.4	0.72
Oakdale	Existing	Oakdale		Open Water	WATER	141,300	10,800	126,936	31.4	0.90
Oakdale	Existing	Oakdale		Park & Recreation	PUBLIC	2,416,500	1,648,800	1,512,639	373.8	0.63
Oakdale	Existing	Oakdale		Right of Way	ROW	333,000	315,900	143,964	35.6	0.43
Oakdale	Existing	Oakdale		Single Family Residential	PRIVATE	10,008,000	9,712,800	4,107,798	1,015.1	0.41
Oakdale	Existing	Oakdale		Twin Tri Quad	PRIVATE	4,652,100	4,496,400	1,396,719	345.1	0.30
Oakdale	Existing	Oakdale		Utility	UTILITIES	190,800	110,700	131,049	32.4	0.69
Oakdale	Existing	Oakdale		Vacant	NA	1,266,300	1,026,000	808,965	199.9	0.64
Oakdale	Existing	Oakdale		Wetland	NA	3,224,700	1,339,200	1,778,913	439.6	0.55
Oakdale	Existing	Oakdale		[Not within a parcel]	NA	3,456,900	3,355,200	1,283,238	317.1	0.37
Oakdale	Future (Ultimate)	Oakdale		Blank Land Use	NA	1,773,900	1,711,800	773,030	191.0	0.44
Oakdale	Future (Ultimate)	Oakdale		Bus Rapid Transit-Oriented Development	PRIVATE	259,200	252,000	73,891	18.3	0.29
Oakdale	Future (Ultimate)	Oakdale		Business Campus	PRIVATE	524,700	472,500	163,229	40.3	0.31
Oakdale	Future (Ultimate)	Oakdale		Commercial	PRIVATE	1,629,000	1,395,900	464,385	114.8	0.29
Oakdale	Future (Ultimate)	Oakdale		General Industrial	PRIVATE	216,900	190,800	61,817	15.3	0.29
Oakdale	Future (Ultimate)	Oakdale		High Density Residential	PRIVATE	818,100	702,000	254,502	62.9	0.31
Oakdale	Future (Ultimate)	Oakdale		Industrial/Office	PRIVATE	1,251,900	994,500	321,321	79.4	0.26
Oakdale	Future (Ultimate)	Oakdale		Low Density Residential	PRIVATE	9,384,300	9,023,400	3,851,799	951.8	0.41
Oakdale	Future (Ultimate)	Oakdale		Medium Density Residential	PRIVATE	4,414,500	4,275,900	1,325,383	327.5	0.30
Oakdale	Future (Ultimate)	Oakdale		Mixed Use	PRIVATE	985,500	777,600	295,881	73.1	0.30
Oakdale	Future (Ultimate)	Oakdale		Mixed Use Residential	PRIVATE	1,443,600	1,365,300	433,418	107.1	0.30
Oakdale	Future (Ultimate)	Oakdale		null	NA	153,900	144,000	57,129	14.1	0.37
Oakdale	Future (Ultimate)	Oakdale		Office/Limited Business	PRIVATE	282,600	259,200	90,633	22.4	0.32
Oakdale	Future (Ultimate)	Oakdale		Open Space	NA	2,578,500	1,033,200	1,868,247	461.7	0.72
Oakdale	Future (Ultimate)	Oakdale		Open Water	NA	132,300	8,100	49,111	12.1	0.37
Oakdale	Future (Ultimate)	Oakdale		Park	PUBLIC	2,505,600	1,674,000	1,568,412	387.6	0.63
Oakdale	Future (Ultimate)	Oakdale		Public	PUBLIC	694,900	639,000	428,722	105.9	0.63
Oakdale	Future (Ultimate)	Oakdale		Semi-Public	PUBLIC	526,500	462,600	329,569	81.4	0.63
Oakdale	Future (Ultimate)	Oakdale		[Not within a parcel]	NA	3,456,900	3,355,200	-	-	0.00

Attachment D. Land Use Calculations

Municipality	Existing or Future	Land Use Data Source	Parcel Based	Land-Use Classification	Private Vs Public Land-Use	Total Area (Sq. M.)	Total Area without Wetlands (Sq. M.)	Pervious (Sq. M) without Trees and Wetlands	Pervious (Acres) without Trees and Wetlands	TOTAL % PERVIOUS
Shoreview	Existing	Met Council LU 2020		Agricultural	Agricultural	20,700	20,700	11,844	2.9	0.57
Shoreview	Existing	Met Council LU 2020		Golf Course	GOLF	148,500	133,200	91,998	22.7	0.62
Shoreview	Existing	Met Council LU 2020		Industrial or Utility	PRIVATE	873,000	842,400	330,543	81.7	0.38
Shoreview	Existing	Met Council LU 2020		Institutional	PUBLIC	708,300	695,700	295,299	73.0	0.42
Shoreview	Existing	Met Council LU 2020		Major Highway	PRIVATE	543,600	521,100	199,647	49.3	0.37
Shoreview	Existing	Met Council LU 2020		Major Railway	PRIVATE	280,800	278,100	94,140	23.3	0.34
Shoreview	Existing	Met Council LU 2020		Manufactured Housing Park	PRIVATE	161,100	161,100	35,307	8.7	0.22
Shoreview	Existing	Met Council LU 2020		Mixed Use Industrial	PRIVATE	14,400	14,400	2,520	0.6	0.18
Shoreview	Existing	Met Council LU 2020		Mixed Use Residential	PRIVATE	12,600	10,800	2,565	0.6	0.20
Shoreview	Existing	Met Council LU 2020		Multifamily	PRIVATE	503,100	495,900	158,211	39.1	0.31
Shoreview	Existing	Met Council LU 2020		Office	PRIVATE	670,500	661,500	166,293	41.1	0.25
Shoreview	Existing	Met Council LU 2020		Open Water	WATER	4,680,900	97,200	46,809	11.6	0.01
Shoreview	Existing	Met Council LU 2020		Park, Recreational, or Preserve	PUBLIC	7,513,200	3,803,400	1,866,159	461.1	0.25
Shoreview	Existing	Met Council LU 2020		Retail and Other Commercial	PRIVATE	669,600	662,400	162,837	40.2	0.24
Shoreview	Existing	Met Council LU 2020		Seasonal/Vacation	PRIVATE	8,100	8,100	3,114	0.8	0.38
Shoreview	Existing	Met Council LU 2020		Single Family Attached	PRIVATE	1,899,900	1,837,800	542,754	134.1	0.29
Shoreview	Existing	Met Council LU 2020		Single Family Detached	PRIVATE	12,762,000	12,438,900	3,960,954	978.8	0.31
Shoreview	Existing	Met Council LU 2020		Undeveloped	na	1,287,000	1,062,000	395,505	97.7	0.31
Shoreview	Future (Ultimate)	City Comp Plan 2040		RL, Low-Density Residential	PRIVATE	11,789,393.49		3,659,095.198	904.2	0.31
Shoreview	Future (Ultimate)	City Comp Plan 2040		RM, Medium-Density Residential	PRIVATE	16,119,452.75		4,604,925.238	1,138	0.29
Shoreview	Future (Ultimate)	City Comp Plan 2040		RH, High-Density Residential	PRIVATE	29,6715.7752		9,2091.95554	22.8	0.31
Shoreview	Future (Ultimate)	City Comp Plan 2040		SR, Senior Residential	PRIVATE	59,246.0304		18,206.76088	4.5	0.31
Shoreview	Future (Ultimate)	City Comp Plan 2040		MU, Mixed Use	PRIVATE	99,1116.4826		201,762.9982	49.9	0.20
Shoreview	Future (Ultimate)	City Comp Plan 2040		C, Commercial	PRIVATE	33,657.73462		83,475.69967	20.6	0.25
Shoreview	Future (Ultimate)	City Comp Plan 2040		O, Office	PRIVATE	23,5082.0974		58,303.51562	14.4	0.25
Shoreview	Future (Ultimate)	City Comp Plan 2040		BPK, Business Park	PRIVATE	60,6826.657		132,993.3506	32.9	0.22
Shoreview	Future (Ultimate)	City Comp Plan 2040		LT-I, Light Industrial	PRIVATE	26,9278.0644		47,123.66127	11.6	0.18
Shoreview	Future (Ultimate)	City Comp Plan 2040		INST, Institutional	PUBLIC	66,1540.2042		27,5804.2648	68.2	0.42
Shoreview	Future (Ultimate)	City Comp Plan 2040		P, Park	PUBLIC	119,2407.299		29,6174.9471	73.2	0.25
Shoreview	Future (Ultimate)	City Comp Plan 2040		ROS, Recreation Open Space	PUBLIC	54,08385.578		134,356.682	332.0	0.25
Shoreview	Future (Ultimate)	City Comp Plan 2040		N, Natural	NA	130,6083.596		32,4410.3256	80.2	0.25
Shoreview	Future (Ultimate)	City Comp Plan 2040		W, Water	WATER	35,311,281.162		35,311.28162	8.7	0.01
Shoreview	Future (Ultimate)	City Comp Plan 2040		RR, Railroad	RAIL	27,6683.8182		92,760.02367	22.9	0.34
Shoreview	Future (Ultimate)	City Comp Plan 2040		ROW, Right-of-Way	ROW	42,422,42.401		15,58040.781	385.0	0.37

Attachment D. Land Use Calculations

Municipality	Existing or Future	Land Use Data Source	Parcel Based	Land-Use Classification	Private Vs Public Land-Use	Total Area (Sq. M.)	Total Area without Wetlands (Sq. M.)	Pervious (Sq. M) without Trees and Wetlands	Pervious (Acres) without Trees and Wetlands	TOTAL % PERVIOUS
Stillwater	Existing	Stillwater		COMM LAND & BLDGS	PRIVATE	1,348,200	1,322,100	315,756	78.0	0.23
Stillwater	Existing	Stillwater		INDS LAND & BLDGS	PRIVATE	71,100	69,300	14,283	3.5	0.20
Stillwater	Existing	Stillwater		INSTITUTIONAL	PUBLIC	1,087,200	1,043,100	458,514	113.3	0.42
Stillwater	Existing	Stillwater		OPEN SPACE	PUBLIC	737,100	601,200	183,861	45.4	0.25
Stillwater	Existing	Stillwater		PARK & REC	PUBLIC	2,793,600	2,334,600	1,538,919	380.3	0.55
Stillwater	Existing	Stillwater		RES 1 UNIT	PRIVATE	6,770,700	6,582,600	1,876,509	463.7	0.28
Stillwater	Existing	Stillwater		RES 1-2 UNITS	PRIVATE	71,100	67,500	18,927	4.7	0.27
Stillwater	Existing	Stillwater		RES 2 UNITS	PRIVATE	40,500	39,600	9,819	2.4	0.24
Stillwater	Existing	Stillwater		RES 3 UNITS	PRIVATE	32,400	32,400	7,227	1.8	0.22
Stillwater	Existing	Stillwater		RES 4 UNITS	PRIVATE	140,400	139,500	28,755	7.1	0.20
Stillwater	Existing	Stillwater		RES MORE THAN 4 UNITS	PRIVATE	366,300	326,700	77,328	19.1	0.21
Stillwater	Existing	Stillwater		RESIDENTIAL	PRIVATE	270,900	262,800	69,750	17.2	0.26
Stillwater	Existing	Stillwater		ROAD	ROW	3,276,000	3,243,600	891,135	220.2	0.27
Stillwater	Existing	Stillwater		SURFACE WATER	WATER	2,807,100	104,400	38,637	9.5	0.01
Stillwater	Existing	Stillwater		VACANT	NA	707,400	687,600	258,120	63.8	0.36
Stillwater	Existing	Stillwater		WETLAND	NA	201,600	1,800	342	0.1	0.00
Stillwater	Existing	Stillwater		[Not within a parcel]	NA	2,867,400	2,546,100	1,373,085	339.3	0.48
Stillwater	Future (Ultimate)	Stillwater		COMM LAND & BLDGS	PRIVATE	605,700	593,100	141,858	35.1	0.23
Stillwater	Future (Ultimate)	Stillwater		HDR	PRIVATE	200,700	172,800	41,105	10.2	0.29
Stillwater	Future (Ultimate)	Stillwater		INDUSTRIAL	PRIVATE	473,400	462,600	95,099	23.5	0.20
Stillwater	Future (Ultimate)	Stillwater		INSTITUTIONAL	PUBLIC	504,000	475,200	212,556	52.5	0.42
Stillwater	Future (Ultimate)	Stillwater		LMDR	PRIVATE	3,270,600	3,240,900	906,451	224.0	0.28
Stillwater	Future (Ultimate)	Stillwater		MARINA	PUBLIC	66,600	64,800	36,688	9.1	0.55
Stillwater	Future (Ultimate)	Stillwater		MOR	PRIVATE	282,600	270,000	68,515	16.9	0.24
Stillwater	Future (Ultimate)	Stillwater		MIXED USE	PRIVATE	197,100	197,100	46,162	11.4	0.23
Stillwater	Future (Ultimate)	Stillwater		NEIGHBORHOOD COMM	PUBLIC	29,700	26,100	7,906	2.0	0.27
Stillwater	Future (Ultimate)	Stillwater		PARK OR OPEN SPACE	PUBLIC	3,474,900	2,895,300	1,914,229	473.0	0.55
Stillwater	Future (Ultimate)	Stillwater		R & D PARK	PUBLIC	56,700	56,700	31,235	7.7	0.55
Stillwater	Future (Ultimate)	Stillwater		RES 1 UNIT	PRIVATE	5,291,100	5,070,800	1,466,436	362.4	0.28
Stillwater	Future (Ultimate)	Stillwater		ROAD	NA	3,262,500	3,230,100	887,463	219.3	0.27
Stillwater	Future (Ultimate)	Stillwater		SURFACE WATER	WATER	2,804,400	101,700	38,600	9.5	0.01
Stillwater	Future (Ultimate)	Stillwater		WETLAND	NA	199,800	-	-	-	0.00
Stillwater	Future (Ultimate)	Stillwater		[Not within a parcel]	NA	2,869,200	2,547,900	-	-	0.00

Attachment D. Land Use Calculations

Municipality	Existing or Future	Land Use Data Source	Parcel Based	Land-Use Classification	Private Vs Public Land-Use	Total Area (Sq. M.)	Total Area without Wetlands (Sq. M.)	Pervious (Sq. M) without Trees and Wetlands	Pervious (Acres) without Trees and Wetlands	TOTAL % PERVIOUS
Vadnais Heights	Existing	Vadnais Heights	No	Commercial	PRIVATE	665,100	657,000	146,556	36.2	0.22
Vadnais Heights	Existing	Vadnais Heights	No	High Density Residential	PRIVATE	246,600	241,200	77,328	19.1	0.31
Vadnais Heights	Existing	Vadnais Heights	No	Industrial	PRIVATE	1,085,400	943,200	254,709	62.9	0.23
Vadnais Heights	Existing	Vadnais Heights	No	Low Density Residential	PRIVATE	5,768,100	5,004,000	1,815,786	448.7	0.31
Vadnais Heights	Existing	Vadnais Heights	No	Manufactured Housing Park	PRIVATE	148,500	144,000	36,756	9.1	0.25
Vadnais Heights	Existing	Vadnais Heights	No	Medium Density Residential	PRIVATE	887,400	873,900	303,903	75.1	0.34
Vadnais Heights	Existing	Vadnais Heights	No	Office	PRIVATE	365,400	346,500	100,746	24.9	0.28
Vadnais Heights	Existing	Vadnais Heights	No	Open Water	WATER	2,939,400	29,700	12,348	3.1	0.00
Vadnais Heights	Existing	Vadnais Heights	No	Park	PUBLIC	3,107,700	2,041,200	683,775	169.0	0.22
Vadnais Heights	Existing	Vadnais Heights	No	Public, Institutional, and Utility	PUBLIC	337,500	275,400	89,415	22.1	0.26
Vadnais Heights	Existing	Vadnais Heights	No	Railway Corridor	RAIL	257,400	239,400	93,069	23.0	0.36
Vadnais Heights	Existing	Vadnais Heights	No	Road ROW	ROW	3,133,800	3,026,700	983,520	243.0	0.31
Vadnais Heights	Existing	Vadnais Heights	No	Undeveloped	NA	2,418,300	1,217,700	585,927	144.8	0.24
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	Commercial	PRIVATE	103,500	103,500	22,806	5.6	0.22
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	High Density Residential	PRIVATE	380,700	324,000	119,379	29.5	0.31
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	Highway Commercial	PRIVATE	266,400	265,500	58,702	14.5	0.22
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	Industrial	PRIVATE	1,777,500	1,389,600	417,123	103.1	0.23
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	Low Density Residential	PRIVATE	6,145,200	4,896,000	1,934,496	478.0	0.31
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	Manufactured Housing Park	PRIVATE	153,000	148,500	37,870	9.4	0.25
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	Medium Density Residential	PRIVATE	1,315,800	1,206,900	450,615	111.3	0.34
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	Mixed Use	PRIVATE	27,900	27,900	7,692	1.9	0.28
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	Office / Business	PRIVATE	566,100	479,700	2,378	0.6	0.00
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	Open Water	WATER	837,900	26,100	184,360	45.6	0.22
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	Park	PUBLIC	3,291,300	2,071,800	871,975	215.5	0.26
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	Public, Institutional or Utility	PUBLIC	317,700	210,600	114,872	28.4	0.36
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	Railway	RAIL	220,500	201,600	69,202	17.1	0.31
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	Vadnais Center Land Use Plan	PRIVATE	591,300	549,000	156,655	38.7	0.26
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	Vehicular Right-of-Way	ROW	16,200	11,700	5,084	1.3	0.31
Vadnais Heights	Future (Ultimate)	Vadnais Heights	Yes	[Not within a parcel]	NA	5,348,700	3,127,500	1,295,930	320.2	0.24

Attachment D. Land Use Calculations

Municipality	Existing or Future	Land Use Data Source	Parcel Based	Land-Use Classification	Private Vs Public Land-Use	Total Area (Sq. M.)	Total Area without Wetlands (Sq. M.)	Pervious (Sq. M) without Trees and Wetlands	Pervious (Acres) without Trees and Wetlands	TOTAL % PERVIOUS
White Bear Lake	Existing	White Bear Lake	Yes	Commercial	PRIVATE	1,292,400	1,231,200	297,594	73.5	0.23
White Bear Lake	Existing	White Bear Lake	Yes	Industrial	PRIVATE	706,500	665,100	169,965	42.0	0.24
White Bear Lake	Existing	White Bear Lake	Yes	Multi Family (Apartments and Condos)	PRIVATE	870,300	805,500	260,901	64.5	0.30
White Bear Lake	Existing	White Bear Lake	Yes	Office-Warehouse	PRIVATE	10,800	7,200	2,124	0.5	0.20
White Bear Lake	Existing	White Bear Lake	Yes	Public	PUBLIC	3,411,900	2,079,000	1,150,929	284.4	0.34
White Bear Lake	Existing	White Bear Lake	Yes	Rail	RAIL	259,200	246,600	104,589	25.8	0.40
White Bear Lake	Existing	White Bear Lake	Yes	Semi-Public	Private	1,212,300	1,164,600	589,833	145.8	0.49
White Bear Lake	Existing	White Bear Lake	Yes	Single Family	PRIVATE	8,591,400	8,336,700	3,128,913	773.2	0.36
White Bear Lake	Existing	White Bear Lake	Yes	Single Family Attached (Townhomes)	PRIVATE	736,200	612,000	158,895	39.3	0.22
White Bear Lake	Existing	White Bear Lake	Yes	Vacant	NA	369,900	293,400	116,181	28.7	0.31
White Bear Lake	Existing	White Bear Lake	Yes	[Not within a parcel]	NA	4,826,700	4,121,100	1,414,170	349.4	0.29
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	Arts District	PRIVATE	18,000	18,000	4,145	1.0	0.23
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	Business Park	PRIVATE	961,200	874,800	221,330	54.7	0.23
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	Commercial	PRIVATE	513,000	490,500	118,126	29.2	0.23
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	Commercial Mixed Use	PRIVATE	27,000	27,000	6,495	1.6	0.24
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	Downtown	PUBLIC	255,600	255,600	76,624	18.9	0.30
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	High Density Residential	PRIVATE	691,200	650,700	135,936	33.6	0.20
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	Industrial	PRIVATE	255,600	251,100	86,221	21.3	0.34
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	Lake Village	PUBLIC	54,000	54,000	21,789	5.4	0.48
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	Low Density Residential	PRIVATE	7,951,500	7,777,800	3,868,726	956.0	0.49
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	Medium Density Residential	PRIVATE	1,355,400	1,173,600	493,625	122.0	0.36
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	Other Public/Semi-Public	PUBLIC	1,640,700	1,534,500	354,114	87.5	0.22
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	Park/Open Space	PRIVATE	2,187,900	1,585,800	687,192	169.8	0.31
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	Rail/ROW	RAIL	268,200	257,400	78,580	19.4	0.29
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	ROW	ROW	4,096,900	3,986,100	943,141	233.1	0.23
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	TOD Mixed Use	PRIVATE	170,100	157,500	39,168	9.7	0.23
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	Very Low Density Residential	PRIVATE	308,700	297,000	71,083	17.6	0.23
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	Water	WATER	1,413,900	52,200	24,828	6.1	0.02
White Bear Lake	Future (Ultimate)	White Bear Lake	Yes	[Not within a parcel]	NA	119,700	116,800	35,071	8.7	0.29

Attachment D. Land Use Calculations

Municipality	Existing or Future	Land Use Data Source	Parcel Based	Land-Use Classification	Private Vs Public Land-Use	Total Area (Sq. M.)	Total Area without Wetlands (Sq. M.)	Pervious (Sq. M) without Trees and Wetlands	Pervious (Acres) without Trees and Wetlands	TOTAL % PERVIOUS
White Bear Township	Existing	Met Council LU 2020		Agricultural	Agricultural	171,000	167,400	150,921	37.3	0.88
White Bear Township	Existing	Met Council LU 2020		Airport or Airstrip	PUBLIC	148,500	145,800	120,051	29.7	0.81
White Bear Township	Existing	Met Council LU 2020		Golf Course	GOLF	10,800	10,800	5,616	1.4	0.52
White Bear Township	Existing	Met Council LU 2020		Industrial or Utility	PRIVATE	1,041,300	987,300	300,699	74.3	0.29
White Bear Township	Existing	Met Council LU 2020		Institutional	PUBLIC	408,600	386,100	200,637	49.6	0.49
White Bear Township	Existing	Met Council LU 2020		Major Highway	row	591,300	561,600	234,891	58.0	0.40
White Bear Township	Existing	Met Council LU 2020		Mixed Use Industrial	PRIVATE	76,500	72,000	26,811	6.6	0.35
White Bear Township	Existing	Met Council LU 2020		Multifamily	PRIVATE	82,800	77,400	33,570	8.3	0.41
White Bear Township	Existing	Met Council LU 2020		Office	PRIVATE	38,700	34,200	10,746	2.7	0.28
White Bear Township	Existing	Met Council LU 2020		Open Water	WATER	9,274,500	54,900	26,307	6.5	0.00
White Bear Township	Existing	Met Council LU 2020		Park, Recreational, or Preserve	PUBLIC	6,014,700	3,432,600	1,984,788	490.5	0.33
White Bear Township	Existing	Met Council LU 2020		Retail and Other Commercial	PRIVATE	304,200	286,200	85,005	21.0	0.28
White Bear Township	Existing	Met Council LU 2020		Seasonal/Vacation	PRIVATE	6,300	6,300	2,016	0.5	0.32
White Bear Township	Existing	Met Council LU 2020		Single Family Attached	PRIVATE	887,400	818,100	220,833	54.6	0.25
White Bear Township	Existing	Met Council LU 2020		Single Family Detached	PRIVATE	7,249,500	7,040,700	2,685,213	663.5	0.37
White Bear Township	Existing	Met Council LU 2020		Undeveloped	na	2,143,800	1,125,000	555,381	137.2	0.26
White Bear Township	Future (Ultimate)	City Comp Plan 2040		Low Density Residential	PRIVATE	5523963.9		2046074.857	505.6	0.37
White Bear Township	Future (Ultimate)	City Comp Plan 2040		Medium Density Residential	PRIVATE	356123.68		88622.78637	21.9	0.25
White Bear Township	Future (Ultimate)	City Comp Plan 2040		High Density Residential	PRIVATE	129499.52		82503.80974	13.0	0.41
White Bear Township	Future (Ultimate)	City Comp Plan 2040		Residential PUD	PRIVATE	54632.61		13595.54109	3.4	0.25
White Bear Township	Future (Ultimate)	City Comp Plan 2040		Com	PRIVATE	226624.16		62927.73187	15.5	0.28
White Bear Township	Future (Ultimate)	City Comp Plan 2040		Institutional	PUBLIC	384451.7		188779.3337	46.6	0.49
White Bear Township	Future (Ultimate)	City Comp Plan 2040		Industrial	PRIVATE	1242386.02		358767.1505	88.7	0.29
White Bear Township	Future (Ultimate)	City Comp Plan 2040		Airport or Airstrip	PUBLIC	133546.38		107962.1311	26.7	0.81
White Bear Township	Future (Ultimate)	City Comp Plan 2040		RAIL	rail	388498.56		154329.1312	38.1	0.40
White Bear Township	Future (Ultimate)	City Comp Plan 2040		Open Water	WATER	9542495.88		27067.16687	6.7	0.00
White Bear Township	Future (Ultimate)	City Comp Plan 2040		Green Space	PUBLIC	68796.62		22702.164	5.6	0.33
White Bear Township	Future (Ultimate)	City Comp Plan 2040		City Park	PUBLIC	509904.36		168263.0979	41.6	0.33
White Bear Township	Future (Ultimate)	City Comp Plan 2040		County Park	PUBLIC	2116807.78		698425.3984	172.6	0.33
White Bear Township	Future (Ultimate)	City Comp Plan 2040		ROW, Right-of-Way	row	2322897.64		922759.5967	228.0	0.40
White Bear Township	Future (Ultimate)	City Comp Plan 2040		Undeveloped	na	48562.32		12580.73974	3.1	0.26
White Bear Township	Future (Ultimate)	City Comp Plan 2040		Wetland	na	5418745.54		1403800.875	346.9	0.26

Attachment D. Land Use Calculations

Municipality	Existing or Future	Land Use Data Source	Parcel Based	Land-Use Classification	Private Vs Public Land-Use	Total Area (Sq. M.)	Total Area without Wetlands (Sq. M.)	Pervious (Sq. M) without Trees and Wetlands	Pervious (Acres) without Trees and Wetlands	TOTAL % PERVIOUS
Woodbury	Existing	Met Council LU 2020		Agricultural	Agricultural	16,230,600	16,169,400	14,864,553	3,673.1	0.92
Woodbury	Existing	Met Council LU 2020		Extractive	na	172,800	172,800	73,107	18.1	0.42
Woodbury	Existing	Met Council LU 2020		Farmstead	Agricultural	319,500	319,500	220,680	54.5	0.69
Woodbury	Existing	Met Council LU 2020		Golf Course	GOLF	1,702,800	1,550,700	1,229,778	303.9	0.72
Woodbury	Existing	Met Council LU 2020		Industrial or Utility	PRIVATE	856,800	842,400	324,000	80.1	0.38
Woodbury	Existing	Met Council LU 2020		Institutional	PUBLIC	3,174,300	3,109,500	1,605,186	396.6	0.51
Woodbury	Existing	Met Council LU 2020		Major Highway	NA	1,780,200	1,743,300	584,172	144.4	0.33
Woodbury	Existing	Met Council LU 2020		Mixed Use Commercial	PRIVATE	76,500	76,500	24,426	6.0	0.32
Woodbury	Existing	Met Council LU 2020		Mixed Use Industrial	PRIVATE	177,300	174,600	46,701	11.5	0.26
Woodbury	Existing	Met Council LU 2020		Mixed Use Residential	PRIVATE	49,500	49,500	11,106	2.7	0.22
Woodbury	Existing	Met Council LU 2020		Multifamily	PRIVATE	902,700	894,600	301,167	74.4	0.33
Woodbury	Existing	Met Council LU 2020		Office	PRIVATE	1,211,400	1,179,000	369,954	91.4	0.31
Woodbury	Existing	Met Council LU 2020		Open Water	WATER	2,556,900	169,200	96,561	23.9	0.04
Woodbury	Existing	Met Council LU 2020		Park, Recreational, or Preserve	PUBLIC	12,606,100	9,837,300	5,047,992	1,247.4	0.40
Woodbury	Existing	Met Council LU 2020		Retail and Other Commercial	PRIVATE	3,523,500	3,464,100	879,111	217.2	0.25
Woodbury	Existing	Met Council LU 2020		Single Family Attached	PRIVATE	5,925,600	5,861,700	1,835,298	453.5	0.31
Woodbury	Existing	Met Council LU 2020		Single Family Detached	PRIVATE	29,570,400	29,332,800	11,272,041	2,785.4	0.38
Woodbury	Existing	Met Council LU 2020		Undeveloped	NA	11,721,600	10,627,200	6,450,561	1,594.0	0.55
Woodbury	Future (Ultimate)	City Comp Plan 2040		Low Density Mixed Residential	PRIVATE	39719930.9		15,140,975	3,741.4	0.38
Woodbury	Future (Ultimate)	City Comp Plan 2040		Medium Density Residential	PRIVATE	1578275.4		488,829	120.8	0.31
Woodbury	Future (Ultimate)	City Comp Plan 2040		High Density Residential	PRIVATE	1740149.8		390,426	96.5	0.22
Woodbury	Future (Ultimate)	City Comp Plan 2040		Rural Estate	PRIVATE	7907564.44		3,014,311	744.9	0.38
Woodbury	Future (Ultimate)	City Comp Plan 2040		Urban Estate	PRIVATE	768903.4		172,514	42.6	0.22
Woodbury	Future (Ultimate)	City Comp Plan 2040		Places to Shop	PRIVATE	2424069.14		773,991	191.3	0.32
Woodbury	Future (Ultimate)	City Comp Plan 2040		Places to Work	PRIVATE	5273058.58		1,683,657	416.0	0.32
Woodbury	Future (Ultimate)	City Comp Plan 2040		Gateway	PRIVATE	509904.36		155,722	38.5	0.31
Woodbury	Future (Ultimate)	City Comp Plan 2040		City Center	PUBLIC	279233.34		141,203	34.9	0.51
Woodbury	Future (Ultimate)	City Comp Plan 2040		Urban Village	PRIVATE	275186.48		87,865	21.7	0.32
Woodbury	Future (Ultimate)	City Comp Plan 2040		Mixed Use	PRIVATE	1088805.34		286,740	70.9	0.26
Woodbury	Future (Ultimate)	City Comp Plan 2040		Urban Reserve	PRIVATE	5714166.32		1,624,500	450.8	0.32
Woodbury	Future (Ultimate)	City Comp Plan 2040		Open Space (Public/Private)	PUBLIC	15074553.5		6,035,503	1,491.4	0.40
Woodbury	Future (Ultimate)	City Comp Plan 2040		Public / Semi-Public	PUBLIC	3804048.4		1,523,053	376.4	0.40
Woodbury	Future (Ultimate)	City Comp Plan 2040		Other/ROW	ROW	6147180.34		2,017,195	498.5	0.33

Attachment E: Potential Water Savings by Land Use and Municipality

Municipality & Land Use	Sum of TOTAL % PERVIOUS	Sum of Pervious (Acres) without Trees and Wetlands	Estimates Based on 20% shift to Low Input Turf Grass		Estimates Based on 30% shift to Low Input Turf Grass		Estimates Based on 40% shift to Low Input Turf Grass		Estimates Based on 50% shift to Low Input Turf Grass	
			Acres	Estimated Range of Water Reduction (gallons)	Acres	Estimated Range of Water Reduction (gallons)	Acres	Estimated Range of Water Reduction (gallons)	Acres	Estimated Range of Water Reduction (gallons)
Lake Elmo	18.04217625	12.238								
PRIVATE	14.87399221	8.200								
Existing	7.238282731	2.025	405	26,856,528	607.6	40,284,792	810.2	53,713,056	1,012.7	67,141,320
Future (Ultimate)	7.635709478	6.175	630	55,017,953	1,244.8	82,526,930	1,659.7	110,035,906	2,074.6	137,544,883
PUBLIC	3.168196045	4.038								
Existing	1.314689003	1.826	365	24,217,923	547.9	36,326,884	730.6	48,435,846	913.2	60,544,807
Future (Ultimate)	1.853497042	2.212	77	5,108,793	115.6	7,663,189	154.1	10,217,585	192.6	12,771,982
Lino Lakes	9.775346822	9.896								
PRIVATE	6.113117464	6.791								
Existing	2.440619795	2.962	592	39,274,560	888.6	58,911,854	1,184.8	78,549,138	1,480.9	98,186,423
Future (Ultimate)	3.672497669	3.829	173	11,488,550	260.1	17,247,825	346.9	22,997,100	433.6	28,746,375
PUBLIC	3.662239358	3.105								
Existing	2.228661448	879	176	11,661,074	263.8	17,491,612	351.8	23,322,149	439.7	29,152,686
Future (Ultimate)	1.43356791	2,226	269	17,849,439	403.8	26,774,158	538.4	35,698,877	673.1	44,623,596
New Brighton	20.21561416	2,813								
PRIVATE	16.62961409	2,343								
Existing	14.61453013	1,081	216	14,336,718	324.4	21,505,078	432.5	28,673,437	540.6	35,841,796
Future (Ultimate)	2.015083955	1,262	36	2,394,774	54.2	3,592,161	72.2	4,789,549	90.3	5,986,936
PUBLIC	3.596000072	470								
Existing	2.571141923	124	25	1,641,240	37.1	2,461,860	49.5	3,282,480	61.9	4,103,100
Future (Ultimate)	1.014858149	347	45	2,953,898	66.8	4,430,847	89.1	5,907,796	111.4	7,384,745
North Oaks	4.52274483	2,076								
PRIVATE	3.266964871	1,640								
Existing	1.56480176	752	150	9,971,236	225.6	14,956,854	300.8	19,942,472	376.0	24,928,090
Future (Ultimate)	1.722163111	888	27	1,802,352	40.8	2,703,528	54.4	3,604,704	68.0	4,505,880
PUBLIC	1.23577959	458								
Existing	0.617889979	209	42	2,775,496	62.8	4,163,243	83.7	5,550,991	104.7	6,938,739
Future (Ultimate)	0.617889979	227	3	230,183	5.2	345,275	6.9	460,367	8.7	575,458
Oakdale	8.915263649	4,574								
PRIVATE	6.411412625	3,626								
Existing	3.045595325	1,813	363	24,038,833	543.9	36,058,249	725.2	48,077,666	906.4	60,097,082
Future (Ultimate)	3.3658573	1,813	--	--	--	--	--	--	--	--
PUBLIC	2.503851024	949								
Existing	0.625962756	374	75	4,956,335	112.1	7,434,502	149.5	9,912,670	186.9	12,390,837
Future (Ultimate)	1.877882598	5,75	40	2,667,376	60.3	4,001,064	80.5	5,334,751	100.8	6,688,439
Yadmas Heights	5.489129525	1,904								
PRIVATE	4.387663367	1,469								
Existing	1.949088675	676	135	8,964,109	202.8	13,446,164	270.4	17,928,219	338.0	22,410,274
Future (Ultimate)	2.438574692	793	23	1,546,340	35.0	2,319,510	46.6	3,092,680	58.3	3,865,850
PUBLIC	1.111466158	435								
Existing	0.484959398	191	38	2,533,446	57.3	3,800,168	76.4	5,066,891	95.5	6,333,614
Future (Ultimate)	0.62650676	244	11	700,071	15.8	1,050,107	21.1	1,400,143	26.4	1,750,179
White Bear Lake	6.381009621	2,951								
PRIVATE	5.124560665	2,555								
Existing	2.033850413	1,139	228	15,099,377	341.6	22,649,065	455.5	30,198,753	569.4	37,748,442
Future (Ultimate)	3.080710253	1,416	56	3,682,334	83.3	5,523,500	111.1	7,364,667	138.9	9,205,834
PUBLIC	1.256448956	396								
Existing	0.337327882	284	57	3,771,151	85.3	5,656,726	113.8	7,542,301	142.2	9,427,877
Future (Ultimate)	0.919121074	112	--	--	--	--	--	--	--	--
Mahtomedi	6.871311029	1,173								
PRIVATE	5.082911627	880								
Existing	2.492392321	433	87	5,744,384	130.0	8,616,575	173.3	11,488,767	216.6	14,360,959
Future (Ultimate)	2.600519305	457	5	309,124	7.0	463,686	9.3	618,247	11.7	772,809
PUBLIC	1.778399403	283								
Existing	0.812094441	133	27	1,766,924	40.0	2,650,386	53.3	3,533,848	66.6	4,417,310
Future (Ultimate)	0.966304962	150	3	219,279	5.0	328,918	6.6	438,557	8.3	548,196
Stillwater	7.350796237	2,364								
PRIVATE	3.788186276	1,281								
Existing	2.117334044	598	120	7,924,014	179.3	11,886,021	239.0	15,848,027	298.8	19,810,034
Future (Ultimate)	1.670852232	683	17	1,137,878	25.7	1,706,818	34.3	2,275,757	42.9	2,844,696
PUBLIC	3.56260996	1,083								
Existing	1.222049817	539	108	7,147,259	161.7	10,720,889	215.6	14,294,519	269.5	17,868,149
Future (Ultimate)	2.340560143	544	1	69,857	1.6	104,785	2.1	139,714	2.6	174,642
North Saint Paul	4.987679142	1,044								
PRIVATE	3.75740717	846								
Existing	2.131393024	421	84	5,584,196	126.3	8,376,295	168.5	11,168,393	210.6	13,960,491
Future (Ultimate)	1.644014146	425	1	48,761	1.1	73,141	1.5	97,522	1.8	121,902
PUBLIC	1.212271972	198								
Existing	0.80399418	123	25	1,635,253	37.0	2,452,880	49.3	3,270,507	61.7	4,088,134
Future (Ultimate)	0.403677782	75	--	--	--	--	--	--	--	--
Hugo	7.25648215	7,204								
PRIVATE	5.88594491	6,146								
Existing	2.465495082	1,900	380	25,196,651	570.1	37,794,976	760.1	50,393,302	950.1	62,991,627
Future (Ultimate)	3.42009941	4,245	469	31,098,036	703.6	46,647,054	938.1	62,196,072	1,172.6	77,745,090
PUBLIC	1.370887661	1,058								
Existing	0.940209426	738	148	9,792,057	221.5	14,688,086	295.4	19,584,115	369.2	24,480,144
Future (Ultimate)	0.430588235	320	--	--	--	--	--	--	--	--
Shoreview	7.351510217	3,580								
PRIVATE	5.772533435	2,573								
Existing	3.465048531	1,398	280	18,541,984	419.5	27,812,977	559.3	37,083,969	699.2	46,354,961
Future (Ultimate)	2.307494903	1,175	--	--	--	--	--	--	--	--
PUBLIC	1.578976783	1,007								
Existing	0.665296369	534	107	7,082,265	160.2	10,623,397	213.6	14,164,529	267.1	17,705,661
Future (Ultimate)	0.913680413	473	--	--	--	--	--	--	--	--
Woodbury	8.34395256	13,204								
PRIVATE	6.131468094	9,658								
Existing	2.764649225	3,722	744	49,358,278	1,116.7	74,037,417	1,488.9	98,716,556	1,861.2	123,395,695
Future (Ultimate)	3.366808869	5,935	443	29,344,461	663.9	44,016,691	885.2	58,688,922	1,106.5	73,361,152
PUBLIC	2.212494467	3,547								
Existing	0.906058783	1,644	329	21,799,899	493.2	32,699,849	657.6	43,599,799	822.0	54,499,748
Future (Ultimate)	1.306435684	1,903	52	3,429,244	77.6	5,143,865	103.4	6,858,487	129.3	8,573,109
White Bear Township	8.209910678	2,342								
PRIVATE	4.381033606	1,480								
Existing	2.541044054	831	166	11,025,457	249.4	16,538,186	332.6	22,050,914	415.7	27,563,643
Future (Ultimate)	1.839989552	648	--	--	--	--	--	--	--	--
PUBLIC	3.918677072	863								
Existing	1.62944901	570	114	7,554,156	170.9	11,331,234	227.9	15,108,312	284.8	18,885,390
Future (Ultimate)	2.289428062	293	--	--	--	--	--	--	--	--

Notes: Volumes are based on a irrigation season between May and September

DROUGHT-RESILIENT LAWNS

FOR TWIN CITIES COMMUNITIES

In partnership with the Metropolitan Council, the Turfgrass Science research team at the University of Minnesota is leading a multi-year study to identify grass seed mixtures that can thrive without supplemental irrigation and help develop drought-tolerant lawn options for Minnesotans.

- Create grass seed mixes based on what performs best in our trials.

- Provide clear guidance for cities and homeowners.

- Make the mixes easy to understand, label, and use.

- Keep an updated list of approved grass varieties for seed suppliers.

25+ Seed Mixtures Under Review

Researchers are evaluating over two dozen of seed combinations for performance under zero supplemental irrigation.

Rigorous Trial Protocols

Sites are maintained at a 3-inch mowing height with no additional watering to test true resilience.

Data-Driven Resident Resources

Findings will result in vendor-supported seed lists for public use through UMN Extension.

Locations across the Twin Cities metro area



Brooklyn Park

Water Treatment Plant
5100 Edinbrook Terrace N
Brooklyn Park, MN 55443

Lake Elmo

Lake Elmo Water Tower
120 Lake Elmo Ave N
Lake Elmo, MN 55042

Savage

Next to Savage Sports Center
13450 Dakota Ave S
Savage, MN 55378

UMN St. Paul Campus

Turfgrass Research, Outreach
and Education Center (TROE)
2037 Larpenteur Ave W
Falcon Heights, MN 55113



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