Northwest Expansion Area Alternative Urban Areawide Review (AUAR) Update

City of Inver Grove Heights

September, 2007

Inver Grove Heights Northwest Expansion Area Draft AUAR Update
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(Corresponding to AUAR/EAW Form)

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Note to Reviewers

Comments on this Alternative Urban Areawide Review (AUAR) should be submitted to the City of Inver Grove Heights (See Item 3) during the 30-day comment period following notice in the EQB Monitor, similar to the process for an EAW. Contact the City or the EQB to learn when the comment period ends. Comments should address the accuracy and completeness of the information, and potential impacts that may warrant further investigation. Since the AUAR substitutes for an EIS, there is no need to comment on the need for an EIS.

1. *Project Title* Inver Grove Heights Northwest Expansion Area AUAR Update

2. *Proposer* City of Inver Grove Heights

Contact Person Tom Link, Community Development Director
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3. *RGU* City of Inver Grove Heights

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4. *Reason for EAW Preparation*
(technically not applicable to an AUAR)

AUAR Update: The City of Inver Grove Heights, in consultation with the Environmental Quality Board (EQB) and the City Attorney, have determined that a propose Comprehensive Plan Amendment and proposed development application, warrant an Update to the Northwest Expansion Area AUAR per Minnesota Rules Chapter 4410.3610.

5. *Project Location*

Sections (all or portion): Section 5, 6, 7, 8, 17 and 18 of T27N R22W
County: Dakota
City/Township: City of Inver Grove Heights

Attach copies of each of the following to the EAW/AUAR:

a. *Copy(ies) of USGS 7.5 minute, 1:24:000 scale map (photocopy is OK) indicating the project boundaries;*

b. *Maps of the following:*
1) *a map clearly depicting the boundaries of the AUAR and any subdistricts used in the AUAR analysis*
2) *land use and planning and zoning maps as required in conjunction with items 9 and 28; and*
3) *a cover type map as required by item 10.*

Additional maps may be included throughout the document wherever maps are useful for displaying the relevant information.

The maps listed below are included on the pages that follow:

- **Figure 5-1. Project Location:** A map indicating the project location and its regional context.

  AUAR Update: No change to project location.

- **Figure 5-2. Project Boundaries:** A map depicting the project boundary of the AUAR study area.

  AUAR Update: No change to AUAR project boundary.

- **Figure 5-3. Existing Land Use:** A map showing current zoning in and around the AUAR Study Area.

  AUAR Update: No change to existing land uses in the AUAR project boundary.

- **Figure 5-4. Existing Zoning:** A map showing current land use in and around the AUAR Study Area.

  AUAR Update: No changes to existing underlying zoning have been made since the AUAR was completed in August 2005. Review of the City of Inver Grove Height's

Zoning Map, last updated on August 3, 2005, reveals no zoning changes in the AUAR project boundary. The overlay zoning district was adopted by the City May 29, 2007.

- **Figure 5-5. Proposed Land Use:** A map showing proposed land use in and around the AUAR Study Area.

  AUAR Update: Figure 5-5A Updated Proposed Land Use. The proposed land use has been updated in a portion of the Northwest Expansion Area, located in the northwest quadrant of the TH 55 and TH 3 interchange. The proposed land use update and updated Development Scenario that has been developed is consistent with the proposed Comprehensive Plan Amendment and proposed development application. Refer to Updated Table 6.1.

- **Future Zoning:** A zoning map for the area is in progress and not yet complete. Future zoning will be consistent with future Land Use.

  Additional maps are provided throughout the document as needed to display relevant information for each issue.

AUAR Update: The City of Inver Grove Height's Zoning Map has not been changed. Future zoning will be consistent with future Land Use.

Figure 5-1 – Project Location

Figure 5-2 – Project Boundary

Figure 5-3- Existing Land Use

Figure 5-4 – Existing Zoning

Figure 5-5 – Proposed Land Use

Figure 5-5A – Updated Proposed Land Use

6. Description

AUAR replaces the EAW format with a description of:

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

a. *Anticipated types and intensity (density of residential, commercial/warehouse and light industrial development throughout the AUAR area:*

Proposed Land Uses

Table 6.1 Updated

Land Use Category	Existing Acres	Planned Acres	Updated AUAR
Existing Rural Residential	0	0	0
Vacant or Agricultural	1684	0	0
Low Density Residential	404	820	820
Low/Mid Density Residential	96	743	747
Medium Density Residential	94	343	334
High Density Residential	0	65	65
Mixed Use (Residential)	0	46	46
Mixed Use (Commercial)	0	23	23
Commercial	26	59	59
Office/Industrial	67	306	264
Public/Institutional	11	11	11
Natural / Open Space/ Golf	758	724	724
Office/Industrial/ Commercial	0	0	47
Total Area	3,140	3,140	3,140

Study Area Description

The AUAR study area is a 3,140-acre area in the northwest portion of the City of Inver Grove Heights. The location is shown on **Figure 5-1**. The area is bounded by Interstate 494 on the north, Babcock Trail on the East (approximately), the City's boundary with Eagan on the west, and includes an area just south of Highway 55 on the south. The site is currently occupied by rural and large-lot residential uses, wetlands and other natural areas, and a golf course.

Current and Future Zoning

The site is currently zoned for Agricultural and Residential uses, with small areas of Commercial uses near State Highway 3—see **Figure 5-4**. The long-term land use proposed for the area in the City's Comprehensive Plan includes a full range of residential uses from low to high density, mixed use commercial/residential areas, industrial, office, commercial, park, golf course, and institutional uses. The zoning for the area will reflect these uses. The proposed land uses are shown in **Figure 5-5.**

AUAR Update: The updated land uses summarized in Updated Table 6.1 are shown on Figure 5-5A - Updated Proposed Land Use. The proposed land use has been updated in a portion of the Northwest Expansion Area, located in the northwest quadrant of the TH 55 and TH 3 interchange. The proposed land use update and updated Development Scenario that has been developed is consistent with the proposed Comprehensive Plan Amendment and proposed development application.

A new land use category was created for the purpose of this update. Office / Industrial / Commercial category was created for a portion of the site that would give the City of Inver Grove Heights the greatest flexibility. The AUAR update will analyze this category as commercial – the most intensive land use.

Proposed Development

The City of Inver Grove Heights has completed several significant planning studies in the Northwest Expansion Area. The City completed a Natural Resources Inventory and Management Plan for the area in 2004. This plan was used in developing the Hydrologic and Hydraulic Analysis for the area, also completed in 2004. Both of these plans have heavily influenced the land use plan proposed for the Northwest Area. The City also worked with a Task Force of local residents in developing all three plans.

The results of the Natural Resources Inventory and Hydrologic and Hydraulic Analysis were used extensively to shape the proposed land uses and patterns for the area, along with existing roadway infrastructure. The Northwest Expansion Area is an area of rolling topography, with closed basins that do not have outlets at normal water levels. The area also has a variety of good and high quality upland and wetland natural resources that the City and its residents would like to protect for the long term. The City and its Northwest Area Task Force have determined that the development plan for the area will use a variety of low-impact development techniques and preservation of existing natural resources and regional basins to manage storm water in the area. The land use plan therefore features relatively large green spaces and corridors to allow for storm water infiltration and collection in the regional basin areas. These areas are shown on figures in Section 17—Water Quality, and are located within the low to medium density residential areas and open space areas shown on the land use plan.

Proposed Industrial areas, Commercial areas, and higher-density Residential areas are associated with major transportation corridors within the study area, particularly Interstate 494 and State Highway 55. The City is also proposing an area of Mixed Use, which would include a mix of residential and commercial uses. This area is located around the intersection of State Highway 3 and 70th Street.

Proposed land uses and densities in the AUAR study area include the following:

- **Low Density Residential—**densities within this area may vary from .3 to 2.9 units per acre, and are likely to average approximately 2.0 units per acre. Some existing residential areas included in this category are currently less than 1 unit per acre.
- **Low/Mid Density Residential—**densities within this area may vary from 3.0 to 5.9 units per acre, and are likely to average approximately 4.0 units per acre.
- **Medium Density Residential—**densities within this area may vary from 6.0 to 11.9 units per acre, and are likely to average approximately 6.5 units per acre.
- **High Density Residential**—densities within this area may vary from 12.0 to 14.9 units per acre, and are likely to average approximately 12.0 units per acre.
- **Mixed Use Residential and Commercial—**this land use will include commercial uses mixed with residential uses on the same parcel. The City estimates that approximately 2/3 of each parcel will be residential in use, and 1/3 commercial. Residential uses in the Mixed Use areas will average 15.0 units/acre, but may vary from 15.0 to 20.0 units per acre.
- **Commercial—**floor area ratios for this land use are between .25 and .35 for retail uses, and .25 and .5 for office uses. Impervious surface coverage is up to 70 percent.
- **Industrial—**floor area ratios for this land use are between .25 and .35. Impervious surface coverage is up to 70 percent
- **Institutional Land Uses**

AUAR Update: A new land use category was created for the purpose of this update. Office / Industrial / Commercial category was created for a portion of the site that would give the City of Inver Grove Heights the greatest flexibility. The AUAR update will analyze this category as commercial – the most intensive land use.

- **Office / Industrial / Commercial – floor area ratios for this land use are between .25 and .35, with impervious coverage up to 70 percent.**

The topography and natural features of the AUAR area are likely to limit the density that may be achieved on many parcels in all of the proposed land use districts. Therefore, the densities that the City has assumed for each of the land use areas for the analysis in this AUAR is at the lower-end of the allowable densities in each land use classification.

Consistency with Inver Grove Height's Comprehensive Plan

The City's Comprehensive Plan was adopted by the City Council on June 8, 1998, and by the Metropolitan Council on March 25, 1999. The land use plan for the Northwest Expansion Area has changed in some minor respects from the land use plan included in the City's Comprehensive Plan, but the overall residential density of approximately 3 units per acre remains the same for the area. The proposed land use plan is therefore consistent with the adopted Comprehensive Plan.

AUAR Update: The City of Inver Grove Heights has proposed a Comprehensive Plan Amendment that is consistent with the updated Development Scenario as discussed above.

b. *Infrastructure planned to serve the development (roads, sewers, water, stormwater system, etc.) Roadways intended primarily to serve the adjoining land uses within an AUAR area are normally expected to be a part of an AUAR. More "arterial" types of roadways that would cross an AUAR area are an optional inclusion in the AUAR analysis; if they are to be included, a more intensive level of review, generally including an analysis of alternative routes, is necessary;)*

Roadway Network

Based on the new traffic that will be generated by development of the Northwest Expansion Area, four primary roads will need to be improved to accommodate future growth. The Mitigation Plan recommends that CR 63 in the southbound direction be widened to a 5 or 6-lane roadway from north of I-494 to south of TH 55. TH 3 should also be widened from south of the interchange with TH 55 to the north of the Interstate 494. CR 73 will require the addition of lanes. CR 26 will need to be widened beginning to the east of CR 73 and continuing to the west of CR 63.

The AUAR analysis quantifies the impacts that the proposed development will have on the regional system, including Interstate 494 and TH55. The analysis assumes new interchanges at I-494 and CR 63 and at the intersection of CR 63 and State Highway 55, as described in the City's Thoroughfare Plan.

AUAR Update: No change in the recommended mitigation due to the updated land uses.

Sanitary Sewer System

The estimated sewer flow rate for the Northwest Expansion Area is 1200 gallons per acre per day. All areas within the AUAR study area will be served by sanitary sewer, based on the City's Comprehensive Plan (1998). The proposed City trunk sewer system will connect to the MCES regional system. Proposed sewer system alignments have been routed to avoid impacts to proposed stormwater infiltration basins and areas of high quality natural resources.

The City will construct sanitary sewer improvements to serve the AUAR area in general accordance with the 2020 Comprehensive Plan for the City. The sewer flows from this area will go to the MCES interceptor systems and Metropolitan Wastewater Treatment Facility, which has capacity available to serve this area.

AUAR Update: The City of Inver Grove Heights has completed a feasibility study of these improvements, called the Northwest Area Water and Sanitary Extensions Feasibility Report, dated May 2005. The City awarded the first phase of these improvements, Northwest Area Utility Improvements Lift Station R-9.1, in July 2007.

Municipal Water System

The City of Inver Grove Heights currently operates six municipal supply wells with a total ground-water appropriation of 1250 million gallons per year (MGY) in 2003. The wells are used on a rotating schedule.

The project area will be served by expanding the existing municipal water supply system. Development of the project area will require additional appropriation of ground water for municipal water supply. Five additional wells will likely be required to meet the ultimate system demand. The number of new wells required will depend on the capacities of the future wells. The ultimate projected municipal water system demand is 2295 MGY (2005 estimate).

New wells will be completed in the Jordan Sandstone portion of the Prairie du Chien-Jordan aquifer system. Each new well is expected to have a capacity of 1200 gpm. While the City's current wells will experience a gradual increase in pumping and additional wells will be constructed, the aquifer is expected to be able to accommodate the additional withdrawals, based on recent tests.

AUAR Update: The City of Inver Grove Heights has completed a feasibility study of these improvements, called the Northwest Area Water and Sanitary Extensions Feasibility Report, dated May 2005. The City awarded the first phase of these improvements, Northwest Area Utility Improvements Lift Station R-9.1, in July 2007.

Stormwater System

The City's Surface Water Plan for the Northwest Expansion Area proposes an approach that minimizes connected impervious surfaces, increases flow path and time over pervious surfaces, and decentralizes treatment in local and regional infiltration areas. The approach focuses on a variety of local Best Management Practices, and collection and further treatment/infiltration of excess water in the numerous existing natural basins in the area. The plan includes a number of alternative practices with infiltration to provide for pretreatment before discharge to wetland basins and preserves the infiltration capacity of the natural basins.

The land use plan features relatively large green spaces and corridors to allow for storm water infiltration and collection in the regional basin areas. These areas are shown on figures in Section 17—Water Quality, and are located within the low to medium density residential areas and open space areas shown on the land use plan.

AUAR Update: The City of Inver Grove Heights has adopted stormwater manual May 29, 2007.

c. Information about the anticipated staging of various developments, to the extent known, and of the infrastructure, and how the infrastructure staging will influence the development schedule.

> ***Note:*** *the RGU must assure that the development described complies with the requirements of 4410.3610, subpart 3, and that it properly orders the AUAR and sets the description in that order as required by that section.*

The City of Inver Grove Heights has an approved Comprehensive Plan as required by the referenced rules. The Plan includes a Capital Improvement Program and plans for phasing infrastructure in the AUAR area. The City adopted the Comprehensive Plan on June 8, 1998. The Metropolitan Council approved the plan on March 25, 1999. The Inver Grove Heights City Council adopted an official resolution ordering the AUAR as required on September 27, 2004.

Development of the area will occur over the next 20 years. The pace of development will depend on market conditions and individual property owner decisions regarding development or redevelopment. Infrastructure will be staged so that necessary sewer, water, roadway and other infrastructure is in place to accommodate proposed development. Some roadway infrastructure development will depend on the plans and schedule of the Minnesota Department of Transportation and Dakota County. Other infrastructure phasing will be determined by the City based on its Comprehensive Plan and Infrastructure Plans.

AUAR Update: No change to area development phasing with this update.

Provide a 50 or fewer word abstract for EQB Monitor notice:

The Inver Grove Heights Northwest Expansion Area AUAR is located on 3,140 acres in the northwest portion of Inver Grove Heights, Dakota County. Proposed land uses include a variety of residential, industrial, commercial, mixed-use, institutional and parks/open space uses.

AUAR Update:

The Inver Grove Heights Northwest Expansion Area AUAR is located on 3,140 acres in the northwest portion of the City of Inver Grove Heights, Dakota County. The AUAR was completed in August 2005. An AUAR Update has been prepared to address updates in the proposed land uses and the Development Scenario.

7. Project Magnitude Data

The cumulative totals of the parameters called for should be given for each major development scenario.

One development scenario is proposed for this AUAR. The scenario represents the maximum amount of development that is predicted in the project area, based on the City's Comprehensive Plan, Natural Resource Management Plan, and Surface Water Management Plan. The actual level of development realized on the site may be less than this scenario, based on market conditions and development proposals received and approved by the City.

AUAR Update: An updated Development Scenario has been developed for this Update. A new land use category was created. The Office / Industrial / Commercial land use category was created for a portion of the Northwest Area that would give the City of Inver Grove Heights the greatest flexibility. The AUAR update will analyze this category as commercial – the most intensive land use.

Cumulative Development Totals

The following table represents projected cumulative development totals for the project area. These totals are based on policies and standards as established within the City of Inver Grove Heights Comprehensive Plan and Zoning Ordinance.

Table 7.1

TOTAL PROJECT ACREAGE	**3,140 Acres**	
Number of Residential Units (total units max.) 7,090	Attached (maximum) 4,707	Detached (maximum) 2,383
Maximum Units Per Building	NA	
Industrial and Related Office Uses (max.)	Industrial & Office—410 Acres Office—1,434,760 square feet Commercial—1,674,215 square feet	
Maximum Building Height	35’ Single Family/Townhome 70’ Multifamily residential 50’ Retail 60’ Industrial 100’ Office	

Table 7.1 Updated

TOTAL PROJECT ACREAGE	**3,140 Acres**	
Number of Residential Units (total units max.) 7,054	Attached (maximum) 4,676	Detached (maximum) 2,378
Maximum Units Per Building	NA	
Industrial and Related Office Uses (max.)	Industrial & Office—219 Acres Office—1,330,260 square feet Commercial—2,214,625 square feet	
Maximum Building Height	35’ Single Family/Townhome 70’ Multifamily residential 50’ Retail 60’ Industrial 100’ Office	

8. Permits and Approvals Required

List all known local, state, and federal permits, approvals, and funding required. A list of major approvals likely to be required by the anticipated types of development projects should be given. This list will help orient reviewers to the idea that the AUAR process is only one piece of the regulatory framework that will protect environmental resources. The list can also serve as a starting point for the development of the implementation aspects of the mitigation plan to be developed as part of the AUAR.

Required Permits and Approvals

Unit of Government	*Type of Application*
City of Inver Grove Heights	Preliminary Plat Approvals
	Schematic Plan Approvals
	Final Plat Approvals
	Rezoning Approvals
	Comprehensive Plan Amendment
	Planned Unit Development (PUD) Permits
	Conditional Use Permits
	Grading Permits
	Water Connection Permits
	Building Permits
	Wetland Conservation Act Permits and Approvals
	Road Right-of-Way Permits
	Approval of Sanitary Sewer and Municipal Water Extensions
	Final AUAR and Mitigation Plan Adoption
Dakota County	County Roadway Access Permits
	Contiguous Plat Review
Metropolitan Council/Envir. Services	Tier 2 Sewer Plan
	Sanitary Sewer Extension Permit
	New Freeway Interchange Approvals
Minnesota Pollution Control Agency	Approval of Facility Plan and Construction Plans and Specifications (for Minnesota Public Facilities Authority Funding eligibility)
	Application for National Pollutant Discharge Elimination System (NPDES) General Permit For discharge of storm water during construction Activities
	Application for Sewer Extension Permit
Minnesota Department of Health	Water Main Plan Review
	Wellhead Protection Plan
	Water Well Permits
Minnesota Dept. of Natural Resources	Protected Waters Permit
	Water Appropriation Permit
Minnesota Dept. of Transportation	Utility Permit for Work in Right of Way of Trunk Highway
	New Freeway Interchange Approvals
U.S. Army Corps of Engineers	Application for Wetland/Water Project--Public Linear Utility Project (GP/LOP-98-MN-Section 404 Activities in Minnesota)
Gun Club Lake & Lower Mississippi WMOs	Grading and Stormwater Permits Review

AUAR Update: No change in the permits and approvals required.

9. Land Use

Describe the current and recent past land use and development on the site and on adjacent lands. Discuss the compatibility of the project with adjacent and nearby land uses; indicate whether any potential conflicts involve environmental matters. Identify any potential environmental hazard due to past land uses, such as soil contamination or abandoned storage tanks.

Item 9 is not needed for an AUAR, but can be covered by Items 20 and 28. See items 20 and 28.

AUAR Update: No change with this update.

10. Cover Types

The following information should be provided:

a. *a cover type map, at least at the scale of a USGS topographic map, depicting:*
- *wetlands – identified by type (Circular 39)*
- *watercourses—rivers, streams, creeks, ditches*
- *lakes—identify protected water status and shoreland management classification*
- *woodlands—identify native and old field*
- *cropland*
- *current development*

b. *an "overlay" map showing anticipated development in relation to the cover types; this map should also depict any "protection areas", existing or proposed, that will preserve sensitive cover types. Separate maps for each major development scenario should generally be provided.*

The generalized breakdown of cover types before and after development is shown on the chart that follows. The location of cover types is shown in **Figure 10-1.** The location of cover types in relationship to proposed development is shown in **Figure 10-2**. The natural communities identified in the City's Natural Resource Inventory and their classifications based on ecological quality are shown on **Figure 10-3**.

AUAR Update: Note that Figure 10-2 - Land Cover and Proposed Land Use has been updated to reflect the updated proposed land uses. Refer to Figure 10-2A - Updated Land Cover and Proposed Land Use.

Figure 10-1 - Land Cover

Figure 10-2 – Land Cover and Proposed Land Use

Figure 10-2A – Updated Land Cover and Proposed Land Use

Figure 10-3 - NRI Communities Map

Table 10.1 Cover Types Updated

	Before	*After*	***Update***
Types 1 to 7 Wetlands	267	267	**267**
Woodland/Brushland	652	359	**359**
Field/Grassland	1523	98	**98**
Residential	594	2017	**2012**
Comm/Industrial/Off	93	388	**393**
Institutional	11	11	**11**
	3,140	3,140	**3140**

AUAR Update: Table 10.1 has been updated to reflect the changes in land uses in the AUAR project boundary.

Northwest Expansion Area Natural Resource Inventory

The City of Inver Grove Heights completed a Natural Resource Inventory and Management Plan for the Northwest Expansion Area in 2004. The inventory included using existing natural resource data for the area, aerial photos, and field visits to identify natural areas by experienced ecologists. In a few cases, landowners did not give permission for ecologists to visit their properties, so that only aerial photos or views from adjacent areas were used to identify resources in these areas.

The field inventory was a qualitative assessment of wetland and upland communities. It included identification of major plant species in the canopy, subcanopy, shrub and ground cover of forest and woodland natural communities. In non-forested natural communities, dominant grasses and forbs were identified. The field inventory emphasized gathering data on disturbance indicators of natural communities such as exotic species and erosion.

Classification of the natural areas to determine the natural community type was done using methodology outlined in *Minnesota's Native Vegetation, a Key to Natural Communities* (Minnesota DNR, 1993). Each community was assigned a qualitative rank, ranging from A to D, with "A" quality communities being the highest in ecological quality, and "D" communities being the lowest. Standard ecological criteria were used to evaluate the health of natural communities were used to determine the quality rankings. These criteria included degree of native species diversity, age of trees, and amount of disturbance, such as invasion by non-native plant species. The rankings reflect how closely the natural community area resembles an intact or "pristine" community of its type in the local area—"A" quality communities are most like intact natural areas, "D" quality communities have been highly altered from this standard.

The wetland field inventory included identification of plant species and a determination of predominant hydrology for each wetland basin. The Minnesota Routine Assessment Method (MnRAM) Version 2.0 was used to assess wetland functions on a qualitative basis. Wetlands were evaluated for floristic quality, wildlife habitat value, aesthetic, recreational, educational, and cultural values, and storm water susceptibility.

Rare Species and Native Plant Communities

The Minnesota DNR's Natural Heritage Database identified two plant species that are present in the AUAR area that have no legal protection status, but are tracked by the DNR database. These include Liparis lilifolia (Lilia-leaved twayblade), and Triodanis leptocarpa (Venus' looking glass).

The DNR's Database also identified an Oak Forest of sufficient size and quality to be included in state lists of significant natural communities identified by the County Biological Survey.

The database describes the locations and conditions of these communities. All are on privately-owned sites. The locations of these plants and communities have also been noted in the Inver Grove Heights Natural Resources Inventory and Management Plan. The Plan includes recommendations for restoration of the Oak Forest and the natural communities that include the identified plant species. Copies of the DNR Natural Heritage Database information are included in the Attachments.

Greenway Corridors

A local advisory community reviewed the upland and wetland ranking criteria, and identified greenway corridors in the study area. Both Primary and Secondary Greenways are identified on the NRI maps included in the Attachments. The Conceptual Greenway corridors that were developed during the NRI are consistent with those developed later during the North Dakota County Greenway Planning project completed by the Dakota County SWCD.

Summary

The Natural Resources Inventory identified and classified 43 upland sites, 184 wetland sites and 25 semi-natural areas based on their natural resource quality. A summary of the areas inventoried is presented in Table 10.1, and shown on **Figure 10-3**. (Semi-natural areas are open space communities that are composed of an assemblage of plants that have resulted largely due to recent human activities, such as conifer plantations and old fields.)

Table 10.1 – Summary of Natural Areas and Semi-Natural Areas Inventoried

Land Cover Type	# Areas	Acres	Percent of Total	Percent of Land in Study Area
Wetland Natural Areas	184	267	21.1%	8.5%
Upland Natural Areas	43	452	35.7%	14.4%
Semi-natural Areas	25	547	43.2%	17.4%
TOTAL	252	1,266	100.0%	

Upland Communities

Table 10.2 shows a summary of Management Classifications for upland natural communities identified in the Northwest Expansion Area. These areas are shown on **Figure 10.3.** The table indicates that only a fraction of the total number of natural communities identified fell into the highest quality categories of Manage 1 and Manage 2.

Although Oak Woodland-brushland represent the vast majority of upland natural area occurrences in the study area, they are generally in moderate to poor condition as a result of past grazing and subsequent lack of management. There is one area of Oak Woodland-brushland

classified Manage 1 in the study area. The area also includes two Manage 1 Mesic Oak Forests, and one Manage 2 occurrence for each Dry Oak Forest and Dry Prairie.

Table 10.2 Upland Management Classification Summary

Community Type	Management Class	No. of Occurrences	Acres of Community Type
Dry Prairie (hill subtype)	3	2	5.0
Dry Prairie (sand-gravel subtype)	2	1	
Dry Oak Savanna	3	1	2.4
	4	6	
Oak Woodland-Brushland	3	18	340.8
	2	1	
	1	1	
Oak Forest, Dry	4	1	50.0
Oak Forest, Mesic	3	2	28.5
	1	2	
Lowland Hardwood Forest	4	4	24.8
	3	3	
TOTAL		43	451.5

Wetlands

The most common wetland community types in the Northwest Expansion Area are Wet Meadow, Shallow Marsh, Shallow Open Water and Deep Marsh. Roughly two-thirds of these community types are classified as Manage 3 or Manage 4. In a general sense, this would tend to indicate that many of these areas are of somewhat lower quality and adversely affected by runoff, surrounding land uses and invasive species. Some wetland types that are uncommon in the Metro Area, but occur in the Norwest Expansion Area, are Shrub Carr and Alder Thicket. Table 10.3 summaries the wetland types and their quality rankings in the study area.

10.3 Wetland Management Classification Summary

Community Type	Management Class	No. of Occurrences	Acres of Community Type
Seasonally flooded basin	1	1	1.1
Sedge Meadow	1	3	10.7
	2	1	
	3	2	
Wet meadow	1	7	68.7
	2	8	
	3	19	
	4	20	
Alder thicket	1	1	3.5
Shrub carr	1	1	6.0
	2	1	
	3	1	
Hardwood swamp	1	4	14.8
	3	7	
	4	6	
Shallow marsh	1	8	52.4

	2	7	
	3	15	
Shallow open water	1	2	51.5
	2	2	
	3	10	
	4	10	
Deep marsh	1	6	49.5
	2	4	
	3	10	
	4	9	
Other	1	1	8.6
	4	2	
TOTAL		184	266.8

Management Recommendations

The Natural Resources Inventory and Management Plan for the Northwest Expansion Area includes general recommendations for management and restoration of each natural community type, as well as specific recommendations for protection, management and restoration of the natural areas in study area. This plan and its recommendations were accepted by the City of Inver Grove Heights in January, 2004. These management recommendations have been incorporated into the Mitigation Plan for this AUAR.

Mitigation Plan Recommendations for Natural Communities (additional recommendations that apply specifically to wetland communities are included in Section 12)

- Implement the Land Use Plan and Surface Water Management Plan for the AUAR study area. These plans recommend protection of large areas of the existing upland and wetland open spaces. The highest level of protection is proposed for the upland and wetland natural communities in the Manage 1 and Manage 2 Classes (**Figure 12.1**), and areas identified for storm water infiltration (Figure17.2). The protection of infiltration areas is discussed in Section 17. Water Quality—Surface Water Runoff. The City anticipates adoption of ordinances to implement these plans before development occurs in the AUAR area.
- Adopt a Zoning Ordinance that provides for protection of higher quality natural community areas.
  The City is currently developing a new Zoning Ordinance, called *Subdivision 37-Northwest Area Planned Unit Development Overlay District*. The draft ordinance proposes the following:
  - 20% of each development area be set aside as permanent open space,
    - Half of this open space area be left in its natural state
    - The remaining half of this open space area may be used for passive or active recreation, or the location of storm water management facilities
  - Priorities for design of the remaining developable areas (80%)include
    - Avoiding impacts to areas identified as Manage 1 and Manage 2 communities in the Natural Resource Inventory and Management Plan
    - Avoiding impacts to identified corridors, buffers and storm water management areas
    - Avoiding impacts to identified park and trail areas

- The ordinance will provide a "density bonus" on developable portions of the property, so that the landowner/developer can develop the total number of units within the developable portion of the site that would have been allowed on the property before exclusions for natural areas, corridors, and parks/trails.
- Prior to adoption of the final zoning and subdivision ordinances for the area, the City will conduct public hearings, gather more information and seek input from the community, the landowners and potential developers. As a result of this investigative process, the ordinances as adopted may vary from the draft ordinance, and the City may also adopt alternate means to achieve the proposed mitigation. However, the goals and objectives relating to mitigation and the desired quality of development will remain substantially similar to those envisioned by the draft ordinance.

- Implement the recommendations of The Natural Resource Inventory and Management Plan to protect and restore natural community areas in the Northwest Expansion Area. This plan makes general and specific recommendations to reduce the impact of development in the Northwest Expansion Area, including the following:
  - Create and maintain buffer strips around natural resource areas
  - Avoid impacts to high quality sites (identified as Manage 1 and 2 areas in the Plan)—preserve these areas and if needed, redirect unavoidable impacts to lowest quality areas
  - Minimize the area of grading or clearing in natural communities to develop buildings, lots, and other structures
  - Implement techniques to reduce the amount of phosphorus entering wetlands and other water bodies.
  - Implement strategies to manage and restore natural community areas identified in the plan
  - Several sites within the City are well-suited for use as wetland restoration or banking sites. This includes sites containing degraded wetlands, or in some cases, sites with proper hydrology and soils for restoration as wetlands. These sites should be considered for wetland restoration or banking sites as the City implements its surface water management plan.
  - Many of the forest/woodland areas within the city lack sufficient groundcover to prevent sheet erosion. Actively eroding areas degrade the quality of the woodland as well as wetlands downstream. The City and prospective developers should identify areas of potential sheet erosion and restore groundcover in these areas to prevent erosion and sedimentation.
  - Harmon Park and the Inver Wood Golf Course represent opportunities to restore prairie and savanna. The City should seek grant funds or willing partners to restore natural communities on this site.
  - Protect the Greenway corridors identified in the Natural Resource Inventory and Management Plan, and use the corridors to provide trails and to implement the Surface Water Management Plan where this is compatible with the natural resources in the corridors.
  - Identify and implement strategies to manage and restore some significant resources within the city, including the Argenta Trail wetlands, Marcott Chain of Lakes and associated upland areas, Nichols' Sedge Meadow, Kladek's Prairie, and several other natural areas identified in Section 7.4 of the Management Plan.
- Implement the City's Stormwater,Wetland, and Tree Preservation ordinances to protect natural communities in the Northwest Expansion Area. These ordinances are currently being revised by the City to reflect the Surface Water Management Plan and Natural

Resources Inventory and Management Plan. The new ordinances are scheduled to be completed and adopted before development occurs in the Expansion Area.

AUAR Update:

No change in the natural resources inventory with this update. The City has implemented the following mitigation measures:

- **The City of Inver Grove Heights adopted the Northwest Area Overlay Zoning Ordinance (Section 515.80, Subdivision 39) in May 2007. The Ordinance requires the preservation of significant natural resources through open space regulations.**
- **The City of Inver Grove Heights adopted a revised Tree Protection and Preservation Ordinance (Section 515.90, Subdivision 28) in June 2007.**
- **The City of Inver Grove Heights adopted the Northwest Area Stormwater Manual, dated May 29, 2007.**

11. Fish, Wildlife and Sensitive Resources

a. *Describe fish and wildlife resources on or near the site and discuss how they would be affected by the project. Describe any measures to be taken to minimize or avoid adverse impacts. The description of wildlife and fish resources should be related to the habitat types depicted on the cover type maps (of item 10). Any differences in impacts between development scenarios should be highlighted in the discussion.*

b. *Are there any state-listed endangered, threatened, or special-concern species; rare plant communities; colonial waterbird nesting colonies; native prairie or other rare habitats; or other sensitive ecological resources on or near the site?*
_X_ Yes __ No

Fish Resources

There are no fishery resources within the project area. The City's Surface Water Management Plan for the Northwest Expansion Area is designed to control the quantity and quality of runoff from the AUAR area to avoid any negative impacts to downstream resources. The detailed analysis is included in Section 17--Water Quality—Surface Water Runoff.

Wildlife Resources

The Minnesota County Biological Survey did not identify any endangered, threatened, or special-concern wildlife species within the project area. Wildlife resources in the area are birds, mammals, amphibians and reptiles that are common in suburban and exurban areas of the Twin Cities.

The Minnesota DNR's Natural Heritage Database identified two plant species that are present in the AUAR area that have no legal protection status, but are tracked by the DNR database. These include Liparis lilifolia (Lilia-leaved twayblade), and Triodanis leptocarpa (Venus' looking glass).

The DNR's Database also identified an Oak Forest of sufficient size and quality to be included in state lists of significant natural communities identified by the County Biological Survey.

The database describes the locations and conditions of these communities. All are on privately-owned sites. The locations of these plants and communities have also been noted in the Inver Grove Heights Natural Resources Inventory and Management Plan. The Plan includes recommendations for restoration of the Oak Forest and the natural communities that include the identified plant species. Copies of the DNR Natural Heritage Database information are included in the Attachments.

The wildlife species currently using the AUAR area include a variety of animals that are common in suburban and exurban areas in the Twin Cities. Development of residential, commercial and other land uses in the Northwest Area and the infrastructure to serve new land uses will result in loss or change of some habitat areas, and movement of some animals to other locations. The protection of high quality habitat areas in the Northwest Expansion Area, as specified in the City's Natural Resources Inventory and Management Plan, as well as management and restoration of other wetland and upland habitat areas and the connections among habitat areas will provide habitat for the wildlife species that are using the area. Since protection of wildlife resources is dependent on protection and restoration of habitat, the recommendations for protection of wildlife resources are the same as those listed in Section 10—Cover Types.

Mitigation Plan Recommendations for Protection of Fish and Wildlife Habitat

The significant wildlife habitat in the AUAR study area includes the remaining woodland and wetlands on the site. These are identified in the City's Natural Resource Inventory and Management Plan.

- The City will implement the recommendations included in Section 10—Cover Types to protect Fish and Wildlife Habitat in the Northwest Expansion Area.

AUAR Update: No change to existing fish, wildlife, and sensitive resources or habitat with this update.

12. Physical Impacts on Water Resources

Will the project involve the physical or hydrologic alteration (dredging, filling, stream diversion, outfall structure, diking, impoundment) of any surface water (lake, pond, wetland, stream, drainage ditch)?

X Yes ___ No

If yes, identify the water resource to be affected and describe: the alteration, including the construction process; volumes of dredged or fill material; area affected; length of stream diversion; water surface area affected; timing and extent of fluctuations in water surface elevations; spoil disposal sites; and proposed mitigation to minimize impacts.

Proposed development in the project area has the potential to impact the wetlands in the area. The potential impacts of development on these resources are detailed and quantified in Sections

10 and 17. The City's Natural Resource Inventory and Management Plan, and Surface Water Management Plan have identified methods to avoid or minimize impacts to wetlands in the project area and water resources downstream are summarized below.

Wetlands

Wetlands in the project area are regulated by several agencies, including the U.S. Army Corps of Engineers, Minnesota Board of Water and Soil Resources (BWSR), the Minnesota Pollution Control Agency (MPCA), and City of Inver Grove Heights. The City of Inver Grove Heights has accepted the responsibility for the administration of the Minnesota Wetland Conservation Act (WCA). The City uses the Dakota County Soil and Water Conservation District for technical assistance for WCA issues. Construction plans for the site that propose direct alteration or indirect impact to wetlands within the project area will require permits from the appropriate regulatory agencies.

Information about the types and acreage of wetlands in the project area are detailed in Section 10, above. Wetlands in the AUAR were inventoried using the Minnesota Routine Assessment Methodology (MnRAM), and classified in four types based on their vegetation communities and susceptibility to storm water impacts. The task force for the Natural Resource Inventory developed recommendations for management of the wetlands based on their classification, with the greatest protection begin given to the highest quality wetlands. Recommended Wetland Management Standards adopted by the City are as follows:

Management Classification	**Buffer Strip (slopes <15%)**	**Buffer Strip (slopes >15%)**	**Structural Setback from Edge of Buffer**	**Stormwater Phosphorus Pretreatment Required**	**Stormwater Quantity Required**
Manage 1	60'	90'	10'	Limit loadings to 2X predevelopment loadings (0.28 lbs./ac/yr)	Storm bounce—maintain HWL at or below existing conditions for 100 yr. Storm
Manage 2	30'	45'	10'	Limit concentration to 150 parts per billion (ppb)	Storm bounce—maintain HWL bounce at or below existing conditions plus 0.5 ft. for 100 yr. Storm
Manage 3	20'	30'	10'	Limit concentration to predevelopment concentrations (200 ppb)	No requirement
Manage 4	15'	20'	10'	No requirement—Enhancement Recommended	No requirement

The City will implement these standards along with standards adopted in the Surface Water Management Plan (see Section 17) for water bodies in the AUAR area. Section 17 provides detailed analysis of the potential stormwater impacts to wetlands and basins in the AUAR area, and includes recommendations for management of surface water runoff to avoid or minimize potential impacts.

Mitigation Plan Recommendations Regarding Physical and Hydrologic Impacts on Water Resources

Protection measures for water bodies in the AUAR area include the following:

- Implement the recommendations of the Surface Water Management Plan and *Subdivision 37-Northwest Area Planned Unit Development Overlay District* for the Northwest Expansion Area for managing development and the potential impacts of runoff quantity and quality to water bodies in the AUAR area (additional discussion Section 17 of this analysis and in Section 17 of the Mitigation Plan). Prior to adoption of the final zoning and subdivision ordinances for the area, the City will conduct public hearings, gather more information and seek input from the community, the landowners and potential developers. As a result of this investigative process, the ordinances as adopted may vary from the draft ordinance, and the City may also adopt alternate means to achieve the proposed mitigation. However, the goals and objectives relating to mitigation and the desired quality of development will remain substantially similar to those envisioned by the draft ordinance.
- Wetlands in Gun Club Lake Watershed (not included in the Surface Water Plan for the Northwest Expansion Area) that potentially need to be mitigated for stormwater bounce should be identified through H&H modeling. This could be completed on a site-by-site basis, or a comprehensive effort that includes the entire area. Protection requirements for wetlands in this watershed are those included in the Natural Resource Inventory and Management Plan. Combinations of conventional and alternative stormwater systems can be used to mitigate excessive stormwater bounce in wetlands in the Gun Club Lake Watershed, with an emphasis on alternative infiltration methods.
- Assure no net loss of wetlands in the study area as it develops by protecting existing wetlands or mitigating for wetland losses based on the requirements of the Wetland Conservation Act and the City's Wetland Ordinance.
- Implement the recommendations in the Natural Resource Inventory for management of wetlands, including vegetated buffer strips, structural setbacks, stormwater pretreatment requirements, and restoration and management recommendations for specific wetland included in Section 7.4 of the NRI Management Plan.
- Update the City's Wetland Ordinance, including buffer requirements. This ordinance is scheduled to be updated and adopted before development occurs in the Northwest Expansion Area.
- Require the use, management, and enforcement of BMP's to control erosion and sedimentation during and after construction as required by the NPDES construction permit.

AUAR Update:

No change in the physical impact in water resources with this update. The City has implemented the following mitigation measures:

- **The City of Inver Grove Heights adopted the Northwest Area Overlay Zoning Ordinance (Section 515.80, Subdivision 39) in May 2007. The Ordinance requires the preservation of significant water resources through open space regulation.**
- **The City of Inver Grove Heights adopted the Northwest Area Stormwater Manual, dated May 29, 2007.**
- **The City of Inver Grove Heights adopted the Hydrologic & Hydraulic modeling study for the Gun Club Lake Watershed in 2007.**

Figure 12-1 – Wetland Management Classifications

13. Water Use

Will the project involve the installation or abandonment of any wells? **X** *Yes*
___ *No*

For abandoned wells, give the location and unique well number. For new wells, or other Previously unpermitted wells, give the location and purpose of the well and the Unique Well Number (if known).

A search of the Minnesota Geological Survey's County Well Index was performed, and records were found for 176 wells in the project area. A majority of the wells are used for domestic water supply. **Figure 13-2** shows the location of these wells and **Table 13.1** summarizes what is known about these wells. One of the wells is recorded in the database as being inactive. Just over half of the wells were located using the coordinates provided in database files distributed with CWI. The remaining wells were located using the address and/or public land survey system data provided in CWI. Other wells recorded in the CWI database may be located within the project area, but the location information provided for these wells is either insufficient or inaccurate.

The County Well Index only identifies wells that have been assigned a unique identification number and only includes a minority of the wells in Minnesota. Aerial photographs and a USGS 7 ½ minute topographic map were used to identify properties not identified in the CWI database that are expected to contain or to have contained a water well. 118 properties were identified as probable well locations (See **Figure 13-2** and **Table 13.2**).

Since this area has historically been used for farming and rural residences, it is possible that there are other wells in this area that are not accounted for. The possibility exists that unsealed, abandoned wells may be encountered after construction begins. In that event, those wells will have to be properly sealed and abandoned to meet codes required by the Minnesota Department of Health.

The City's Comprehensive Plan calls for conversion/rezoning of portions of the area from low density residential to higher density residential, industrial, and commercial land uses. Existing wells on sites that are redeveloped will be sealed before construction begins in accordance with codes required by the Minnesota Department of Health. Municipal water service may be made available to residences and businesses currently served by private wells. City of Inver Grove Heights codes allow property owners to retain private wells after connecting to the municipal water supply, but no cross-connection between the municipal water system and other water supplies is permitted (City of Inver Grove Heights Ordinance 705.25).

With respect to b and c, below, if the area requires new water supply wells, specific information about that appropriation and its potential impacts on groundwater levels should be given; if groundwater levels would be affected, any impacts resulting on other resources should be addressed. With respect to possible individual appropriations by future projects, a general assessment of the likely need for such should be indicated, and if there is potential for major appropriations or environmental issues resulting from individual appropriations, a more detailed

assessment of those should be included along with a discussion of mitigation for potential problems.

b. Will the project require an appropriation of ground or surface water (including dewatering)? **X** *Yes* __ *No*

If yes, indicate the source, quantity, duration, purpose of the appropriation, and DNR water appropriation permit number of any existing appropriation. Discuss the impact of the appropriation on ground water levels.

The City of Inver Grove Heights currently operates six municipal supply wells with a total ground-water appropriation of 1250 million gallons per year (MGY) in 2003. The DNR water appropriations permit number for Inver Grove Heights is 806052. Two wells are located east of the project area along 75th Street. The other four wells are located further to the east, three wells in South Valley Park and one just east of North Valley Park. Raw water is pumped from the wells to the water treatment facility located just east of the AUAR area at the intersection of Babcock Trail and 75th Street.

Five of the six wells are completed in the Jordan Sandstone portion of the Prairie du Chien Jordan aquifer system and have capacities of 1200 gallons per minute (gpm). One well is completed in the Mount Simon-Hinckley aquifer and has a capacity of 1000 gpm. While each well may yield at least 1000 gpm, the use of each well is not constant. The average daily discharge for each well is considerably less than the well capacity. A total of 1116 million gallons were pumped from the wells in 2003. The water demand rarely requires that all wells be activated simultaneously. Therefore, the wells are used on a rotation schedule.

The project area will be served by expanding the existing municipal water supply system. Development of the project area will require additional appropriation of ground water for municipal water supply. The City's capital improvement plan calls for an additional four wells to meet the ultimate system demand. An expansion of the water treatment plant is also planned. The ultimate projected municipal water system demand is 2139 MGY (*Water Supply Plan, Inver Grove Heights, Minnesota*, 1996, prepared by Bonestroo Rosene Anderlik & Assoc.). Additional water appropriations permit requests will be staged with development to stay ahead of demand.

Analysis of proposed land uses in the AUAR area has revealed that the projected total maximum day water demand will be approximately 1.3 million gallons per day greater than previously projected. Therefore, a fifth additional well will likely be required to meet the ultimate system demand. The number of new wells required will depend on the capacities of the future wells. The ultimate projected municipal water system demand is estimated to be 2295 MGY (2005 estimate), including the fifth additional well proposed for the system. Additional water appropriations permit requests will be staged with development to stay ahead of demand.

New wells will be completed in the Jordan Sandstone portion of the Prairie du Chien-Jordan aquifer system. The City is currently seeking sites for at least two new wells. The most likely location for the new wells is the Inverwood Golf Course, located along the eastern boundary of the AUAR area. Each new well is expected to have a capacity of 1200 gpm.

The effect of pumping generally results in a temporary lowering of groundwater levels in the aquifer while the wells are operating. The performance of the City's current wells indicates that the aquifer is highly permeable and able to yield the additional water. Therefore, while the City's current wells will experience a gradual increase in pumping and additional wells will be constructed, the aquifer is expected to be able to accommodate the additional withdrawals.

In recent aquifer-pumping tests of Wells 7 and 8, located along 75th Street east of the AUAR area, the water level in Well 8 dropped 38 feet after pumping the well at 1400 gpm over an 8-hour period. Drawdown due to pumping Well 8 reached an equilibrium level after approximately four hours. Interference drawdown of 9 feet was measured at a distance of approximately 1300 feet from Well 8 at Well 7. Well 7 was pumped at a rate of 1300 gpm for a period of 24 hours. Maximum drawdown in Well 7 was approximately 32 ft, and interference drawdown in Well 8 was approximately 10 ft.

Pumping tests, borehole flow-meter logs, and other data collected in the Twin Cities and southeastern Minnesota have demonstrated that the lower part of the Prairie du Chien Group (Oneota Formation) acts as a regional semi-confining layer between the upper part of the Prairie du Chien Group (Shakopee Formation) and the Jordan Sandstone. Ground-water extraction in one part of the aquifer system, either the Prairie du Chien Group or the Jordan Sandstone, is expected to influence hydraulic heads in the formation not being pumped, but to a much lesser degree than the pumped part of the aquifer system.

Most water wells in Inver Grove Heights and surrounding areas are completed in the Prairie du Chien Group portion of the Prairie du Chien-Jordan aquifer system, in the unconsolidated Quaternary aquifers, or in the St. Peter Sandstone. It is unlikely that pumping from the current or proposed City wells will have a detrimental impact on domestic or non-community wells in or around the project area. New municipal wells will be constructed at a sufficient distance to prevent excessive interference between the municipal wells. Adequate well spacing will also limit the potential cumulative drawdown that could occur at the locations of other existing wells.

The Inverwood Golf Course operates irrigation wells completed at a depth of 422 ft. A geologic log is not available, but, given the well location and depth, the well is likely completed in the Jordan Sandstone. The DNR considers potential well interference problems before issuing water appropriation permits. The City of Inver Grove Heights will work with the golf course to locate new wells at a sufficient distance from the existing wells to avoid interference with operation of the existing wells.

Hundley, Steven J. (1983) *Soil Survey of Dakota County, Minnesota*. U. S. Department of Agriculture Soil Conservation Service.

Meyer, G. N. and Lusardi, B. A.. (2000) *Surficial Geology of the St. Paul 30 x 60 minute Quadrangle, Minnesota*, Minnesota, Geological Survey M-Series Map M-106. Arc/Info export files and pdf file.

Minnesota Geological Survey (1990) *Geologic Atlas of Dakaota County, Minnesota*, N. H. Balaban and Howard C. Hobbs eds., University of Minnesota, St. Paul.

Minnesota Geological Survey (2000) *Bedrock Geology and Structure of the Seven-County Twin Cities Metropolitan Area, Minnesota*, Arc/Info export files.

Table 13.1 Existing Well Locations

Unique No.	Address	Well Use[1]	Depth Completed	Aquifer[2]	Notes
00100994	5690 ROBERT TR S	DO	395	OPDC	
00100994	5772 ROBERT TR S	DO	395	OPDC	
00101043	1286 70TH ST E	DO	252	OPDC	
00104132	6736 ARGENTA TR W	DO	260	OPDC	
00104188	8305 ANGUS AVE E	DO	275	QBAA	
00104312	1155 82ND ST E	DO	155	QUUU	
00107145	4 HIGH RD	DO	291	OPDC	
00107303	8329 ALTA AVE E	DO	178	QUUU	
00107303	8375 ALTA AVE E	DO	178	QUUU	
00124323	1224 70TH ST W	DO	255	QBAA	
00124349	6780 W. ARGENTA TR.	DO	300	OPDC	
00124349	6780 ARGENTA TR W	DO	300	OPDC	
00127186	1714 80TH ST E	DO	272	OPDC	
00127187	1407 80TH ST E	DO	276	OPDC	
00127188	7660 ARGENTA TR W	DO	291	OPDC	
00127189	6710 ARGENTA TR W	DO	271	OPDC	
00127189	6714 ARGENTA TR W	DO	271	OPDC	
00127196	8569 ALVERNA	DO	295	QBUA	
00127591	6970 ARGENTA TR W	DO	302	QBAA	
00129164	8475 ANN MARIE TR	DO	239	QBAA	
00129251	1126 70TH ST E	DO	260	OPDC	
00136461	7010 ANGUS AVE E	DO	295	MTPL	
00136504	8485 ANNALISA PATH	DO	212	QBAA	
00141811	1181 80TH ST E	PN	261	OPDC	Clover Leaf Motel well
00146831	8350 ANNALISA PATH	DO	303	OPDC	
00159489	7376 COURTHOUSE BLVD E	DO	175	QBAA	
00171835	8505 ANGUS AVE E	DO	249	QBUA	
00171835	8480 ANNALISA PATH	DO	249	QBUA	
00177070	11 HIGH RD	DO	317	OSTP	
00179705	1932 COURTHOUSE BLVD W	DO	125	QBAA	
00182815	7834 ALBERTA WAY W	DO	292	OPDC	
00182969	7840 ALBERTA WAY W	DO	308	OPDC	
00185277	8315 ANNALISA PATH	DO	243	QWTA	
00185937	1878 70TH ST W	DO	217	QWTA	
00185980	6930 ATHENA WAY	DO	300	OPDC	
00185983	15 HIGH RD	DO	290	OPDC	
00186044	7940 ALBERTA WAY W	DO	175	QWTA	
00188208	2000 70TH ST W	DO	276	OPDC	
00190477	1162 82ND ST E	DO	241	OPDC	
00190477	1186 82ND ST E	DO	241	OPDC	
00194093	8240 ANGUS AVE E	DO	280	OPDC	
00194197	7160 ROBERT TR S	PN	215	OSTP	
00198282	7830 ALBERTA WAY W	DO	278	QWTA	
00198297	1715 70TH ST E	DO	280	OPDC	

Unique No.	Address	Well Use[1]	Depth Completed	Aquifer[2]	Notes
00198328	6800 ATHENA WAY	DO	280	OPDC	
00198339	8141 COURTHOUSE BLVD CT E	DO	300	OPDC	
00198340	8185 COURTHOUSE BLVD CT	DO	275	QBAA	
00198345	7929 ARGENTA TRL W	DO	260	QBAA	
00198350	7120 ALLEN WAY	DO	280	OPDC	
00207279	280 SMITH AVE N	DO	294	OPDC	
00208361	6570 ROBERT TR S	DO	290	OPDC	
00208366	1472 60TH ST W	DO	175	QUUU	
00208367	6854 ARGENTA TR W	DO	285	OPDC	
00208367	6770 ARGENTA TR	DO	285	OPDC	
00208368	7115 ALTA AVE E	DO	300	OPDC	
00208368	7075 ANGUS AVE E	DO	300	OPDC	
00208378	8195 BABCOCK TR E	DO	275	OPDC	
00208379	8373 ALTA AVE E	DO	140	QUUU	
235590	MNDOT 35E/494 PARCEL 14		177	QUUU	Status unknown
00247444	5830 ROBERT TR S	DO	273	OSTP	Well is inactive
00401105	6797 ARKANSAS AVE W	DO	306	OPDC	
00404811	17 HIGH RD	DO	300	OPDC	
00404813	6785 ARLENE AVE	DO	320	OPDC	
00405088	1845 77TH ST W	DO	317	OPDC	
00408263	1466 70TH ST W	DO	280	OPDC	
00408269	501 ROLLING HILLS CIR	DO	325	OPDC	
00410991	1225 80TH ST E	DO	250	OPDC	
00412467	6875 ATHENA WAY	DO	320	OPDC	
00412468	1805 BUR OAK DR	DO	320	OPDC	
00412470	7020 ROBERT TR S	PN	195	QWTA	Gas station
00412482	6980 ARKANSAS AVE W	DO	123	QWTA	
00416002	6640 ARLENE AVE	DO	320	MTPL	
00416015	500 ROLLING HILLS CIR	DO	173	QWTA	
00416018	6855 ARLENE AVE	DO	300	OPDC	
00416023	6680 ARLENE AVE	DO	253	QBAA	
00416049	6705 ARLENE AVE	DO	358	OPDC	
00417573	8561 ALVERNO AVE W	DO	345	QBAA	
00418617	6785 ATHENA WAY	DO	300	OPDC	
00418625	8265 BABCOCK TR	PN	280	OPDC	Inver Hills Assembly of God Church
00418626	1795 70TH ST E	DO	260	MTPL	
00418641	6790 ATHENA WAY	DO	320	OPDC	
00418646	7920 ALBERTA WAY W	DO	340	OPDC	
00418655	6605 ARLENE AVE	DO	320	MTPL	
00418660	6600 ARLENE AVE	DO	280	OPDC	
00418661	6860 ATHENA WAY	DO	280	OPDC	
00418663	8505 ANGUS AVE E	DO	280	QBAA	
00418664	6985 ARLENE AVE	DO	300	MTPL	
00418669	6910 ATHENA WAY	DO	320	MTPL	
00424909	6980 ARLENE AVE	DO	300	MTPL	

Unique No.	Address	Well Use[1]	Depth Completed	Aquifer[2]	Notes
00425219	8285 ANNALISA PATH	DO	280	OPDC	
00425266	7 HIGH RD	DO	300	OSTP	
00426353	6565 ARLENE AVE	DO	300	OPDC	
00426363	6890 ATHENA WAY	DO	320	OPDC	
00426377	8715 ALVERNO	DO	380	OPDC	
00426386	7080 ALLEN WAY	DO	240	OPDC	
00426908	1206 60TH ST W	DO	275	OSTP	
00426923	6810 ARLENE AVE	DO	310	OPDC	
00427037	8011 COURTHOUSE BLVD E	DO	212		
00427141	6525 ARLENE AVE	DO	335	OPDC	
00429860	1225 80TH ST E	DO	280	OPDC	
00429893	8345 ANNALISA PATH	DO	300	OPDC	
00429894	6830 ATHENA WAY	DO	300	OPDC	
00435200	6925 ARLENE AVE	DO	290	OPDC	
00435236	5580 ROBERT TR S	DO	360	OPDC	
00437855	6560 ARLENE AVE	DO	260	OPDC	
00437888	8480 ANNALISA PATH	DO	340	OPDC	
00437918	6805 ATHENA WAY	DO	300	OPDC	
00437920	6655 ARLENE AVE	DO	340	OPDC	
00441920	8410 ANNALISA PATH	DO	307	OPDC	
00443613	8665 ALVERNO AVE	DO	231	QBAA	
00443885	1215 82ND ST E	DO	162	QBAA	
00443922	6261 ARGENTA TR W	DO	250	OPDC	
00451545	6710 ARLENE AVE	DO	320	OPDC	
00451625	6815 ROBERT TR S	DO	252	OPDC	
00457160	8001 COURTHOUSE BLVD	DO	162		
00457166	1304 COURTHOUSE BLVD E	DO	147	QBUA	
00457178	8003 COURTHOUSE BLVD	DO	216		
00460111	7085 ALLEN WAY	DO	230		
00460145	1620 80TH ST E	DO	215		
00460149	6835 ATHENA WAY	DO	315		
00463545	INVERWOOD GOLF COURSE	IR	422	OPCJ?	DNR permit no. 926022
00466761	8355 ANGUS AVE?				
00474305	1234 70TH AVE	DO	282		
00474317	8450 ALTA AVE	DO	200		
00479100	1597 80TH ST E	PN	280	OPDC?	Inverwood Golf Course
00479118	1872 70TH ST W	DO	245		
00481504	1285 70TH ST W	DO	312	OPDC?	
00481510	7350 COURT HOUSE BL	DO	200		
00494802	1202 70TH ST W	DO	333		
00498421	1735 70TH ST W	DO	240		
00498428	7161 ROBERT TR S	DO	240		
00498434	8215 ANGUS AVE E	DO	300		
00498439	1597 80TH ST E	PN	280	OPDC?	Inverwood Golf Course comfort station
00506634	6190 ROBERT TR S	DO	340		

Unique No.	Address	Well Use[1]	Depth Completed	Aquifer[2]	Notes
00506652	8100 ADELBERT AVE E	DO	210		
00524113	5830 ROBERT TR S	DO	280		
00524250	1954 COURTHOUSE BLVD W	DO	236		
00526974	1125 80TH ST E	DO	280		
00534326	1180 70TH ST W	DO	320		
00546339	6680 ARLENE AVE	DO	295		
00554745	7250 ARGENTA TR	DO	260		
00558267	8136 ADELBERT AV	DO	208		
00562261	8308 ALVERNO AVE W	DO	257		
00569783	1225 80TH ST E	DO	250		
00573827	7465 ROBERT TR S	DO	360		
00585164	6302 SOUTH ROBERT TR	DO	320		
00585173	8670 ALVERNO AV	DO	360		
00589981	6742 ARGENTA TR W	DO	280		
00595063	1086 60TH ST	DO	268		
00597774	7925 ARGENTA TR W	DO	345		
627065	7755 ARGENTA TR	DO	195		
629088	280 SMITH AVE N	DO	240		
636371	8420 ALVERNO AV W	DO	323		
642428	8308 ALVERNO AVE W	DO	330		
642435	6275 ROBERT TR S	DO	300		
00651961	8152 ADELBERT AVE E	DO	222		
664148	1130 70TH ST W	DO	320		
666267	6712 ARGENTA TR	DO	280		
672585	280 SMITH AVE N	DO	365		
675280	6818 ARGENTA TR W	DO	278		
679293	8523 ALVERNO AVE W	DO	390		
686596	8385 ANGUS AVE	DO	320		
686648	280 SMITH AVE N	IR	360	OPDC	DNR permit no. 043087
704963	1603 69TH ST W	DO	267		
W0000010	6818 ARKANSAS AVE W	DO			
W0000203	8480 ANNALISA PATH	DO	220		
W0000232	1597 80TH ST E	DO	160		
W0000360	8201 ANGUS AVE E	DO			
W0000526	6155 ROBERT TR S	DO	280		
W0000526	1086 60 ST W	DO	280		
W0000737	NOT ASSIGNED	DO	350		City of Inver Grove Heights, PIN 20-00800-014-01
W0000737	1526 70TH ST E	DO	350		
W0000760	8290 ANGUS AVE E	DO			
W0000774	6760 ARKANSAS AVE W	DO			
W0000808	7985 ARGENTA TR	DO			
W0000996	1148 60TH ST W	DO			

1 Well use codes: DO – Domestic; IR – irrigation; PN – public supply, non-community, transient. This field is blank where the use is not provided in CWI.

2 Aquifer codes: QBAA – Quaternary artesian, QBUA – buried Quaternary, QUUU – Undifferentiated Quaternary, QWTA – Water Table, OSTP – Saint Peter Sandstone, OPDC – Prairie du Chien, OPCJ – Prairie du Chien-Jordan, MTPL – multiple. This field is blank were geologic and/or well construction information was not provided.

Table 13.2 Probable Well Locations

Address
6515 BABCOCK TR E
6180 ROBERT TR S
6308 ROBERT TR S
6184 ROBERT TR S
6520 ROBERT TR S
1271 70TH ST E
1415 70TH ST E
1184 60TH ST W
6321 ROBERT TR S
6385 ROBERT TR S
6351 ARGENTA TRL W
6480 ARGENTA TR W
6660 ARGENTA TR W
6720 ARGENTA TR W
6689 ARGENTA TR W
6659 ARGENTA TR W
6743 ARGENTA TR W
6912 ARGENTA TR W
6922 ARGENTA TR W
1605 68TH ST W
1633 68TH ST W
1655 68TH ST W
1630 68TH ST W
1654 68TH ST W
1636 69TH ST W
1658 69TH ST W
1600 69TH ST W
1601 70TH ST W
1629 70TH ST W
6963 ARKANSAS AVE W
6921 ARKANSAS AVE W
6863 ARKANSAS AVE W
6889 ROBERT TR S
1165 70TH ST W
7215 ROBERT TR S
1060 72ND CIR
1090 70TH ST W
1100 70TH ST W
1120 70TH ST W
1216 70TH ST W
1210 70TH ST W
1400 70TH ST W

Address
1266 70TH ST W
7455 ROBERT TR S
7475 ROBERT TR S
1230 70TH ST W
7245 ROBERT TR S
1700 70TH ST W
7241 ARGENTA TR W
7278 ARGENTA TR W
7305 ARGENTA TR W
7333 ARGENTA TR W
7475 ARGENTA TR
7482 ARGENTA TR
1644 COURTHOUSE BLVD W
7587 ARGENTA TR
7923 ARGENTA TR W
7890 ALBERTA WAY W
7875 ALBERTA WAY W
7757 ROBERT TR S
7038 ANGUS AVE E
7182 ANGUS AVE E
7248 ANGUS AVE E
7175 ANGUS AVE E
7079 ANGUS AVE E
1418 70TH ST E
7185 ALTA AVE E
7260 ROBERT TR S
7456 ROBERT TR S
7340 ANGUS AVE
1183 80TH ST E
7884 ROBERT TR S
1375 80TH ST E
1401 80TH ST E
1467 80TH ST E
1760 80TH ST E
1850 80TH ST E
1462 80TH ST E
8140 COURTHOUSE BLVD E
8150 COURTHOUSE BLVD E
8115 COURTHOUSE BLVD E
8119 COURTHOUSE BLVD E
8112 ADELBERT AVE E
1227 82ND ST E
1191 82ND ST E
1129 82ND ST E
1204 82ND ST E
1240 82ND ST E
1090 82ND ST E

Address
1102 82ND ST E
8415 ANGUS AVE
8315 ALTA AVE E
8350 ANGUS AVE E
8304 ANNALISA PATH
8380 ANNALISA PATH
8450 ANN MARIE TR E
8482 ANNE MARIE TR
8381 ANNALISA PATH
8380 ANGUS AVE E
8302 ALVERNO AVE W
1565 82ND ST
8334 ARGENTA TR W
HOLY TRINITY SERBIAN ORTHODOX CHURCH
8245 ARGENTA
1712 82ND ST W
8580 ALVERNO AVE W
5722 ROBERT TR S
5900 ROBERT TR S
5910 ROBERT TR S
5904 ROBERT TR S
5898 ROBERT TR S
2 HIGH RD
6 HIGH RD
8 HIGH RD
12 HIGH RD
10 HIGH RD
9 HIGH RD
5 HIGH RD

Mitigation Plan

The Mitigation Plan includes the following protection strategies related to Water Supply:

- The City will require that unsealed, abandoned wells are properly sealed and abandoned to meet codes required by the Minnesota Department of Health.
- The City will work with the golf course to locate the new municipal supply wells at a sufficient distance from the irrigation well to not interfere with operation of the existing well.

AUAR Update: This update did not perform further research on either existing wells or probable wells. The City of Inver Grove Heights has adopted the completed feasibility study of these improvements, called the Northwest Area Water and Sanitary Extensions Feasibility Report, dated May 2005. The City awarded the first phase of these improvements, Northwest Area Utility Improvements Lift Station R-9.1, in July 2007.

- **The City Council approved a consultant contract for the Well Field Development on August 13, 2007.**

Figure 13-1 – Trunk Water Supply

Figure 13-2 – Possible Well Locations

14. Water-Related Land Use Management Districts

Does any part of the project site involve a shoreland zoning district, a delineated 100-year flood plain, or a state and federally designated wild and scenic river land use district?

_X_ Yes ___No

If yes, identify the district and discuss the compatibility of the project with the land use restrictions of the district. Such districts should be delineated on appropriate maps and the land use restrictions applicable in those districts should be described. If any variances or deviations from these restrictions within the AUAR are envisioned, this should be discussed.

The AUAR area does not include any floodplain areas.

The area does include several designated shoreland areas. These areas are delineated on the City's official Zoning Map. The City's Shoreland Ordinance regulates land uses, structures, and other requirements in these areas. The City will enforce the Shoreland Ordinance in the AUAR area, and no variances or deviations from the Shoreland Ordinance are envisioned for development in this area.

AUAR Update: No change to responses relating to water-related land use regulations with this update.

15. Water Surface Use

Will the project change the number or type of watercraft on any water body.
___Yes _X_ No

If yes, indicate the current and projected watercraft usage and discuss any potential overcrowding or conflicts with other users or fish and wildlife resources. This item need only be addressed if the AUAR area would include or adjoin recreational water bodies.

AUAR Update: No change with this update – no change anticipated to the number or type of watercraft on any water body.

16. Erosion and Sedimentation

a. *Describe any steep slopes or highly erodable soils and identify them on the site map. Describe the erosion and sedimentation measures to be used during and after construction of the project.* ***The number of acres to be graded and number of cubic yards of soil to be moved need not be given****; instead, a general*

discussion of the likely earthmoving needs for development of the area should be given, with an emphasis on unusual or problem areas. In discussing mitigation measures, both the standard requirements of local ordinances and any special measures that would be added for AUAR purposes should be included.

Figure 16-1 indicates that scattered areas of slopes between 12-20 percent existing throughout the AUAR area.

The City's Subdivision Ordinance includes provisions for management of disturbance in Protected Areas such as steep slopes.

Mitigation Plan Strategies for Erosion and Sedimentation

- The developer will be required to submit a plan for soil erosion and sediment control during construction and after development as a part of the Preliminary Plat.

- The Mitigation Plan includes provisions in Sections 10 and 17 that require the developer to minimize erosion and sedimentation by identifying and protecting areas of existing native vegetation to minimize soil exposure and resulting erosion and sedimentation during development.

- The City will require the use, management, and enforcement of Best Management Practices (BMP's) to control erosion and sedimentation during and after construction as required by the NPDES construction permit, the City's proposed *Subdivision 37—Northwest Area Planned Unit Development Overlay District* Ordinance, and its new Erosion and Sedimentation Control Ordinance. The new ordinance increases the size of vegetated buffers required in areas of steep slopes, and includes other provisions to minimize erosion.

AUAR Update: No change to response with this update. The City has implemented the following mitigation measures:

- **The City of Inver Grove Heights adopted the Northwest Area Overlay Zoning Ordinance (Section 515.80, Subdivision 39) in May 2007. This ordinance has provisions to identify, avoid and protect steep slopes**
- **The City of Inver Grove Heights adopted the Northwest Area Stormwater Manual, dated May 29, 2007.**

Figure 16.1 – Steep Slopes

17. Water Quality – Surface Water Runoff

It is expected that the AUAR will have a detailed analysis of stormwater issues. A map of the proposed stormwater management system and of the water bodies that will receive stormwater should be provided;
The description of the stormwater system should identify on-site and "regional" detention ponding and also indicate whether the various ponds will be new water bodies or converted existing ponds or wetlands. Where on-site ponds will be used but have not yet been designed, the discussion should indicate the design standards that will be followed.
The following types of water bodies must be given special analysis:
Lakes: within the Twin Cities metro area a nutrient budget analysis must be prepared for any "priority lake" identified by the Metropolitan Council. Outside of the metro area, lakes needing a nutrient budget analysis must be determined by consultation with the MPCA and DNR staffs;
Trout Streams: if storm water discharges will enter or affect a trout stream an evaluation of the impacts on the chemical composition and temperature regime of the stream and the consequent impacts on the trout population (and other species of concern) must be included;

Background

Watershed Setting. The details of the stormwater management system proposed for the Northwest Expansion Area are best described by combining **Items 17a and b** into a single discussion. The Northwest Expansion Area is located within two watershed areas. Figure 17.1 illustrates the watershed divide between the Lower Mississippi River Water Management Organization (LMRWMO) and the Gun Club Lake Water Management Organization (GCLWMO). The approximate acreage of Northwest Expansion Area within the LMRWMO and GCLWMO is 2,650 acres and 760 acres, respectively.

The Northwest Expansion Area within the LMRWMO watershed can be sub-divided into a series of 115 subwatersheds, which are shown on Figure 17.2. Each of these subwatersheds was characterized for water quantity modeling under existing conditions, and was subsequently modeled for developed conditions in detail as part of the City's *Northwest Expansion Area Hydrologic & Hydraulic Analysis (February 2004)*. The Northwest Expansion Area within the GCLWMO watershed can be sub-divided into a series of 53 subwatersheds as delineated and modeled in the city's *2020 Comprehensive Plan*, and also shown on Figure 17.2.

The Northwest Expansion Area does not contain or drain to a MnDNR designated trout stream, or a priority lake as identified by the Met Council. Reference to Figure 17.3, however, shows that a fair number of these natural basins are delineated as wetlands and that three are lakes (Dickman, Hornbeam and Rosenberger).

Discharge from the Study Area. The LMRWMO and the GCLWMO are considered to be tributary to the Mississippi and Minnesota Rivers, respectively. However, the geologic history of the Northwest Expansion Area has resulted in closed basin drainage; that is, runoff discharges to existing natural basins that in most cases do not have outlets or overflows that operate, and thus are landlocked. Under existing conditions, water flows into these basins and leaves through a combination of seepage (infiltration) into the ground and evaporation.

As identified on Figure 17.2, the only stormwater discharge from the Northwest Expansion Area within the LMRWMO watershed under existing conditions occurs at two locations: Basin EP-080a (Rosenberger Lake) and Subwatershed BP-005 (to MnDNR Protected Wetland 241W). Stormwater discharge from the GCLWMO watershed under existing conditions occurs at five locations: Hornbeam Lake (Q-11) to the City of Sunfish Lake and four stormwater management basins (F-25, W-2, W-4 and W-8) to the City of Eagan's stormwater management system.

Alternative Stormwater Management. In the past, the goal of an urban drainage system was to rush water away as fast as possible into a receiving stream or nearby lake or wetland. When it became evident that this was not a sustainable water management practice, the approach changed to the routing of water into detention ponds. Although many of these ponds were designed according to EPA's Nationwide Urban Runoff Program (NURP) criteria based on 1980s studies, they too have some deficiencies in effective treatment and management of runoff.

Recently, communities have begun to employ a variety of strategies to treat runoff water by infiltrating it into the ground as close to its source as possible to mimic the natural hydrology of the system in areas with permeable soils. This not only limits the volume and rate of runoff that occurs, it also eliminates the migration of polluting material that is picked up by runoff as it flows over urban surfaces. Infiltration also replenishes critical ground water supplies that are used as drinking water sources. So called "alternative" runoff management practices merely seek to mimic the way precipitation would behave without human intervention; that is, it attempts to soak water into the ground as if the land's surface did not have impervious surfaces. Caution, however, must always be exercised so that a high concentration of polluting material is not introduced.

In this respect, the stormwater management approach proposed for the Northwest Expansion Area is an alternative to the collect and concentrate approaches from the past. The environmental benefits of this approach include reduced wetland and open space impact, improved water quality, potential regulatory credits (suitable for NPDES Phase II, TMDLs, and watershed/local stormwater planning), reduced runoff and erosion, closer to natural water infiltration/recharge, reduced negative upland habitat impact and enhanced public awareness.

Taking advantage of the good soils and geologic conditions in the Northwest Expansion Area, the City is proposing an approach that minimizes connected impervious surfaces, increases flow path and time over pervious surfaces, and decentralizes treatment (smaller localized BMPs as opposed to large-scale facility development) as a first measure of control. With implementation of these measures as standard practice, collection and further treatment/infiltration of excess water in the numerous existing natural basins may occur. A carefully planned and engineered approach that combines a number of alternative practices with infiltration provides for pretreatment before discharge to wetland basins and preserves the infiltration capacity of the natural basins. This infiltration approach mimics the conditions of the existing landscape rather than simply collecting and disposing of runoff to downstream resources that do not currently receive runoff from the area.

While stormwater conveyance has already been planned for the GCLWMO watershed as outlined in the city's *2020 Comprehensive Plan*, the stormwater management approach outlined in this section of the report is intended to be utilized across the entire Northwest Expansion Area. With implementation of this approach within the GCLWMO watershed, the rates and volumes of runoff previously planned for may be reduced. The city will continue to coordinate with the adjacent cities of Eagan and Sunfish Lake regarding stormwater management for runoff from the Northwest Expansion Area.

Surface Water Modeling Methodology

To adequately predict the impact that development of the Northwest Expansion Area will have on water resources, a tool is needed to incorporate development and infrastructure assumptions. The model used for this exercise is XP-SWMM 2000 (XP Software, Inc.). This model is used to contrast existing conditions with proposed changes associated with development within a watershed. The model looks at the change in land use and land cover, and relates the change to runoff behavior. Runoff predictions can be made for variable frequency events, and routed through the proposed drainage system to the existing natural basins. The model output and routing can then be used to determine areas where flooding or high water will occur, and then can be used to design a system of stormwater management facilities, which could include detention storage, diversion, infiltration or any number of associated BMPs.

Land-Use & Percent Impervious. Existing land use consists mainly of low to medium density residential, forest, tall grass and agriculture. Percent imperviousness for existing conditions is based on Minnesota Land Cover Classification System (MLCCS) GIS data provided by the Dakota County SWCD. Percent imperviousness for developed conditions is based on the upper range of density units/per acre proposed in **Figure 5-5** (Future Land Use) while taking into account preservation of wetlands, critical event floodplains, lakes and other inherently unbuildable areas such as steep slopes.

Runoff Methodology. The Green-Ampt Infiltration methodology within the runoff mode of XP-SWMM was used to simulate the infiltration of rainfall since this method is set up to function with continuous simulations and because this method has physically based parameters that can be predicted using existing data and previous studies. Application of the Green-Ampt equation within XP-SWMM requires definition of three parameters:

1. Initial soil moisture deficit - This parameter is an estimate of the antecedent soil moisture conditions, which affect the initial soil infiltration rate. This parameter becomes important for accurate estimation of infiltration during simulation of a single event or for initial storms of a continuous simulation.

2. Soil capillary suction - This parameter influences the movement of a wetting front through the soil profile. Estimation of this value influences the initial soil infiltration rate (during the early stage of a storm event), but loses impact over time.

3. Saturated hydraulic conductivity - This parameter estimates the rate of water movement through a saturated soil profile and represents the most variable component of the Green-Ampt equation. For this reason, it is also the best parameter to use for infiltration calibration. This is the most significant of the three parameters needed and ultimately drives the saturated infiltration rate. Estimation of this parameter is also (indirectly) responsible for the rate at which the soil moisture content is recovered after a storm event.

Initial values for these three parameters were assigned to each of the three United States Department of Agriculture Soil Conservation Service (USDA SCS) soil texture groups (Loamy Sand, Sandy Loam, and Silty Loam) within the Northwest Expansion Area based on values recommended by XP-SWMM. Unique composite values for these parameters were developed for each subwatershed based on a soil-type weighted average.

Basin Storage. Existing basin stage-storage curves were developed from two-foot topographic mapping. Storage under proposed conditions is maintained as existing, except as discussed below to take into account development grading activities. Shallow depressions that exist in rural areas (primarily occurring in the southwest portion of the Northwest Expansion Area) are assumed to be developed and no longer available for stormwater management under proposed conditions. It is unlikely that all of these basins will be eliminated during the development process. However, to be conservative, it is assumed that these areas will develop to the maximum extent possible with reliance only on local on site BMPs and the remaining natural basins identified on Figure 17.2.

In addition, storage for Basins EP-036a, EP-059c and EP-064 was modified from existing conditions to concentrate storage into a smaller surface area, thereby providing additional developable area. These basins should maintain at least 10.8 ac-ft, 3.4 ac-ft and 7.8 ac-ft of infiltration storage, respectively.

Basin Infiltration Rates. Rating curves were developed to simulate the infiltration capacity of the basins at different depths based on conservative soil infiltration rates assigned by subwatershed type. Previous studies on infiltration processes in similar geologic and topographic settings in the Metro Area have identified a range of infiltration rates between 0.02 and 0.32 inches per hour for less sandy soils and 0.12 and 0.60 inches per hour for sandy soils.

A single infiltration rate is assigned to dry basins, while two infiltration rates are assigned to wet basins. Wet basins are less permeable in the bottom, where water has ponded historically. Soils data supports that higher permeable materials typically surrounds the low permeability materials, forming an outer ring on the side slopes of the basin. A higher infiltration rate is applied to the outer ring, comparable to the infiltration rate applied over a dry basin with similar soil types.

Table 17.1 summarizes the assigned basin infiltration rates applied as a function of depth (for both existing and proposed condition models) for each subwatershed type.

Table 17.1 Natural Basin Infiltration Rates

Subwatershed Type	Depth in the Basin	Infiltration Rate
Type I: Wet basins In less sandy soils	0 to 4 feet	0.07 in/hr
	4+ feet	0.30 in/hr
Type II: Wet basins In sandy soils	0 to 4 feet	0.07 in/hr
	4+ feet	0.50 in/hr
Type III: Dry basins In less sandy soils	Any	0.30 in/hr
Type IV: Dry basins In sandy soils	Any	0.50 in/hr

Evaporation. To account for water budget losses due to evaporation, mean monthly evaporation (inches) was used from the USDA SCS (currently the Natural Resource Conservation Services) Hydrology Guide for Minnesota.

Rainfall Events. During this analysis it became evident that the development of a system that mimics existing conditions (by incorporating infiltration BMPs) requires an evaluation of multiple events. While the system should be designed for the worst case scenario, it should also be designed and managed so that the BMPs will operate effectively for the smaller rainfall events (e.g. the 5-year 24-hour rainfall event) as well as the 100-year 24-hour rainfall event. As a result this analysis looks at a number of rainfall events in evaluating the ability of BMPs to mimic the natural hydrology of the system. Modeled rainfall events fall under two major categories 1) synthetic rainfall curves (SCS Type II) and 2) recorded rainfall.

Synthetic rainfall events modeled for the Northwest Expansion Area include the 1-year 24-hour rainfall event (2.4"), the 5-year 24-hour rainfall event (3.6"), the 100-year 24-hour rainfall event (6.0"), the back-to-back 100-year 24-hour rainfall event (12.0") and the 100-year 10-day rainfall event (10.9"). Shorter duration events represent greater intensities but less rainfall amounts which would not typically be critical in a volume-sensitive system such as this area. Snowmelt is addressed in the next section.

Actual recorded rainfall data was obtained from the Minneapolis-St. Paul Airport and used to run a continuous rainfall simulation for a sub-area of the Northwest Expansion Area from 1982 to 1987. This sub-area bound by 70th Street on the north, Highway 55 of the south, Argenta on the west and Robert Trail on the east is representative of the overall Northwest Expansion Area's existing hydrologic and geomorphic setting and is also representative of the overall proposed land-use plan. The time period of 1982 to 1987 was selected for continuous simulation from the last 30 years of rainfall record since this represents the longest period of above average annual rainfall and contains the largest single event of record (9.15 inches on July 23, 1987), which significantly exceeds the 100-year 10-day snowmelt event with 7.2 inches of rain. Review of the results for proposed conditions for this continuous event demonstrate that all the natural basins recover from the precipitation events and do not continue to have rising water levels through this period. This is significant since back-to-back storms and extended wet periods could be a concern in this type of drainage system. Given the observed recovery of the natural basins in this area, this continuous event was not run for the entire Northwest Expansion Area.

Snowmelt Runoff Event. The 100-year snowmelt runoff event is simulated by a 7.2 inch, 10-day spring runoff event. During snowmelt simulations, it is often assumed that the ground is frozen solid and that no infiltration occurs. In reality, infiltration occurs to an extent (even on frozen ground). The soils ability to infiltrate under frozen conditions is largely dependent upon the antecedent soil moisture conditions at the time of the initial freeze and the soils texture. If soil moisture is low when freeze occurs, soil pore spaces can be preserved. The most restrictive conditions occur if the soils freeze while saturated, thereby forming a hardpan that does not allow infiltration. In either case, ground conditions are typically thawing over the 10-day simulation period with increasing infiltration rates over the period of the runoff simulation.

In evaluating the worst case scenario for both existing and proposed conditions, the 100-year 10-day runoff/snowmelt event is modeled with no infiltration and no depressional storage (BMPs). This is a very conservative estimate of the volume of runoff being generated for the event and assumes that all of the 7.2 inches of runoff is completely delivered to the system. That is, all of the runoff is routed through the system without infiltration losses.

Identification of Worst-Case Scenario. A number of single larger events were modeled to determine the critical event for each subwatershed in the system. These events include the 100-year 24-hour rainfall event (6.0"), the 100-year 10-day rainfall event (10.9") and the 100-year 10-day runoff/snowmelt event (7.2"), and the back-to-back 100-year 24-hour rainfall events (12.0").

Comparison of high water levels indicates that the critical event for the majority of the subwatersheds under existing and proposed conditions is the 100-year snowmelt runoff event (7.2 inches in 10 days). In some cases where the 100-year 24-hour high water level is equal to or slightly above the high water level for the 10-day runoff event, the difference is not considered to be significant enough to clearly demonstrate that the critical event is not the 10-day snowmelt event. Larger differences between these events are due to the inability of existing small culverts to handle the quick delivery of runoff produced by the 24-hour event. Conversely, the culverts are capable of handling the slow delivery of water in the 10-day event. Therefore, overall the system is "volume driven" and the critical flooding event is in almost all cases the 100-year 10-day snowmelt/runoff event.

Proposed Conditions Best Management Practices. After identifying the worst case scenario, the proposed conditions model was modified to evaluate the effect of infiltration BMPs on the critical high water level for the basins. This scenario evaluated the construction of infiltration BMPs for volume control. By making some generalizations about the size and capacity of the BMPs a simplified method for simulating the impact these practices would have on runoff was developed. It was assumed that a raingarden with the following maximum dimensions could be constructed to handle the runoff generated by two single family residential lots:

Length = 50 feet
Width = 10 feet
Storage Depth (at the surface) = 1 to 1.5 feet
Storage Depth (subsurface) = 4 feet

Figure 17.4 illustrates the concept design configuration for the raingardens. The construction of the perforated pipe is important since it serves as an observation well for future monitoring efforts as well as a conduit for runoff during frozen ground conditions. This design is based upon preliminary research results being developed by Dr. Kenneth Potter at the University of Wisconsin – Madison, who is generating optimal design configurations for raingardens. This design configuration is also based upon a size that will be non-intrusive yet effective given the development setting. The trench may be constructed to the specifications identified above or it may be split into multiple practices provided the overall storage volume and infiltration capacity is being maintained.

Of the four parameters identified above, storage depth at the surface and below the surface are the least flexible and should not be changed. Restricting the maximum ponding depth above ground to 1–1.5 feet reduces the time that there will be standing water in the raingarden, provides a suitable habitat for the vegetation, and allows for wet-dry cycling of the soils. Restricting the storage depth underground ensures that the storage volume will be available within a reasonable time period allowing for back-to-back rainfall events.

Given this design configuration, the amount of depressional storage to be incorporated in the model was determined (Table 17.2). This depressional storage (defined as a depth in inches) is effectively retained in the subwatershed simulating the storage capacity of the raingardens by reducing the total volume of runoff generated for the given event.

Note that the depressional storage identified in Table 17.2 for single events was applied based on land-use intensity for the following land-use categories: low density residential (less than 30% impervious) and medium to high density residential (>30% impervious). This is a low or conservative estimate of the volume control that could be achieved in the system while also providing more volume control for land-uses with more imperviousness. This amounts to an overall land dedication for raingardens of about 2 to 3%. The proposed design configuration would allow for a reasonable land dedication that would fit the overall objectives of Northwest Expansion Area as proposed in **Figure 5-5** Future Land Use.

Table 17.2. Depressional Storage Values

Rainfall Event	**Depressional Storage due to Best Management Practices (BMPs)** [inches]	
	Low Density Residential (≤ 30% Impervious)	**Medium to High Density Residential/Light Industrial/Commercial** (>30% Impervious)
1-year, 5-year and 100-year 24-hour rainfall events	0.8	1.2
100-year 10-day rainfall event	2.6	3.9

The higher depressional storage associated with the 100-year, 10-day event is due to the fact that the infiltration rate in the raingardens occurs for the complete duration of the event (10-days) instead of only one day.

Stormwater Management Approach

There are three essential elements of the stormwater management approach proposed for the Northwest Expansion Area including: 1) smart land-use planning that promotes open space and limits imperviousness, 2) management of small storm event runoff via alternative BMPs, and 3) preservation of the numerous natural basins for management of large storm events.

Smart Land-Use Planning. Smart land-use planning that integrates hydrologic function into site design and conserves natural resources and open space is critical to the success of the proposed stormwater management approach. This provides an ecologically friendly means to self-mitigate the impact that development brings to the water cycle. Development which provides diverse housing styles, minimizes impervious surface coverage, incorporates natural features as integral elements, and promotes cluster development or concentration of building pads to preserve open space will minimize runoff volume from the site and maximize the ability to infiltrate stormwater runoff in local BMPs and existing natural basin. Other specific benefits of this approach are:

Preservation of open space;
Minimization of land disturbance;
Protection of natural systems and processes, and incorporation of natural site elements into the hydrologic design;
Customization of infrastructure to each site rather than uniform design;
Decentralization of runoff collection;
Management of surface water at its source; and

Groundwater / aquifer recharge.

Many of these smart land-use planning elements are proposed in the *Draft Subd. 37. Northwest Area Planned Unit Development Overlay District* (Hoisington Koegler Group Inc. January 11, 2005) which, upon adoption will guide development. Of special note, this draft ordinance currently specifies a minimum of 20% of the buildable development area shall be preserved as additional natural area/open space.

Development can also be designed to minimize or eliminate curbs, gutters, wide roadways, and the inlets/outlets and pipes that must accompany all of these features. Rather, this approach is flexible in its application from use on a lot-by-lot basis to entire portions of a community.

Alternative Best Management Practices. Alternative stormwater management practices provide measures for the City to reduce the overall volume of water draining to existing natural basins. Alternative management techniques typically do not use single-event designs (ex. 100-year frequency) like traditional systems that handle big events while disregarding routine/frequent events. This approach means that routine small events will not be "over-drained" as they would be in a traditional big conveyance system.

The best potential for these practices is infiltration of water close to the location where the precipitation deposits it, mimicking the pre-development runoff condition. The list of practices included under the term "alternative" is extensive. Applications of special interest to the Northwest Expansion Area because of its need to reduce volume flowing to the existing natural basins should focus on infiltration. Infiltration practices could include but are not limited to raingardens, vegetated swales, parking lot bioretention, infiltration trenches/basins and green roofs.

Disconnection of impervious surfaces is a simple, but commonly overlooked, BMP that can be used to reduce the amount runoff volume discharged from a site. These methods can be incorporated into development design at the time of construction, or retro-fit into runoff improvement programs associated with re-development of existing areas. Examples of typical methods that can be used to disconnect impervious areas include:

- routing roof leaders to a vegetated area or a rain barrel;
- minimizing paved surfaces through such methods as using narrow streets in residential areas, limiting commercial parking space, joint or shared parking, and locating businesses and residences close to the street to minimize driveway length;
- using permeable pavement or paving blocks for low traffic and overflow parking areas;
- amending soil and/or loosening it after compaction to encourage infiltration; and
- using vegetated swales or raingardens to accept runoff rather than pipes.

Modeling the post-development condition, BMPs were idealized as raingardens capable of fully retaining the 1– to 2-year event volume and limiting the 5-year event post development runoff volume to the existing condition volume. As development occurs it will be necessary to ensure that adequate onsite infiltration is provided and site-specific characteristics should be assessed to determine the most appropriate type and location of BMPs. To this end, the city has proposed a companion document or stormwater design manual for the *Draft Subd. 37. Northwest Area Planned Unit Development Overlay District*. The stormwater design manual would be developed to provide guidance in the selection, design and construction of site specific, alternative stormwater management BMPs and is intended to be comprehensive manual which not only

summarizes the requirements and design recommendations for the Northwest Expansion Area, but also details operation and maintenance requirements and specifications.

It must always be kept in mind that these alternative BMPs are as well engineered as the more structural practices utilized in the water management system. Although concrete and conduit are not dominant features, the systems do have structure to them and have been sized to perform a specific function. Simply installing and ignoring them will result in their demise over a relatively short period of time. If, however, they are installed properly, monitored for effectiveness and properly maintained, these alternative systems will provide decades of low maintenance service.

Preservation of Existing Natural Basins. Although the land-use planning and alternative stormwater management BMPs try to match the natural hydrologic function as close to normal as possible, it is important to keep in mind that storm and melt events sometimes occur in excess of the ability of any management practice to manage. Therefore, runoff will also be linked to the existing natural basins. Currently these areas function in most cases as infiltration basins without outlets under normal water levels. These basins would continue to function in this manner in post-development conditions. This will allow for routine treatment of small and moderate events, but also provides the added protection for large-scale flooding events. In addition to the preservation of the basin itself, emergency overflows to downstream basin (as identified on Figure 17.2) must be preserved during development.

Surface Water Modeling Results

A comparison of the HWLs for each rainfall event (Table 17.3) indicates that the stormwater management approach in most cases reduces or maintains the runoff volume from proposed conditions as compared to the existing conditions runoff for the 1-year 24-hour rainfall event.

INSERT TABLE 17.3

The proposed stormwater management approach is also in most cases capable of retaining most of the increased runoff generated for the 5-year 24-hour rainfall event. This positive effect is even more pronounced in the case of the 100-year 24-hour rainfall event and in most cases the infiltration capacity of the downstream existing basin is capable of handling the increased runoff with little to no increase in HWL. In the case of the 100-year 10-day runoff event (worst-case scenario), the alternative stormwater BMPs are conservatively assumed ineffective and HWLs remain unchanged except as a result of storage losses due to development.

As previously mentioned, stormwater discharges from the LMRWMO watershed are at two locations including: the Rosenberger Lake (EP-080a) and MnDNR Wetland 241W (BP-005). Table 17.4 compares peak discharge rates and volumes of runoff discharged from the Northwest Expansion Area under existing and proposed conditions.

Table 17.4 Discharge from the LMRWMO watershed.

Event	**Land-Use**	**Basin BP-005**		**Basin EP-080a**	
		Peak Rate (cfs)	**Total Volume (acre-feet)**	**Peak Rate (cfs)**	**Total Volume (acre-feet)**
1-Year 24-hour rainfall	Existing	0	0	0.9	4.1
	Proposed	0	0	0.2	1.1
	Change	0	0	-0.7	-3.0
5-year 24-hour rainfall	Existing	0	0	3.5	12.3
	Proposed	0	0	1.9	7.4
	Change	0.0	0.0	-1.6	-4.9
100-year 24-hour Rainfall	Existing	6.5	4.0	8.7	35.4
	Proposed	5.4	3.5	8.7	32.9
	Change	-1.1	-0.5	0.0	-2.5
10-day snowmelt (Worst-case Scenario)	Existing	15.8	27.3	8.8	116.8
	Proposed	15.8	27.3	8.8	122.1
	Change	0.0	0.0	0.0	5.3

As can be seen from this table the proposed stormwater management approach maintains or reduces the amount of discharge from the Northwest Expansion Area except in the case of Rosenberger Lake under the worst-case scenario. This is due to the development of smaller depressions in subwatersheds tributary to this basin. The increased volume is not expected to be problematic given the infrequency of this event and given that the increased volume of water translates to less than a 0.1-foot increase in surface water elevation.

The finalized modeling results indicate that implementation of the proposed alternative stormwater management plan and preliminary land use concept would allow the Northwest Quadrant to be developed as a closed system. As long as proper sequencing of construction and system monitoring is conducted, the cost of implementation and maintenance may be similar to conventional systems at the local scale. The City is planning for the additional maintenance that may be needed to maintain the functioning of the proposed system. At the regional scale, given that a conventional system would need a large outlet project, this proposed self-contained stormwater management system should be much more cost effective.

Water Quality Assessment. Existing and proposed storm bounce for the 100-yr 24-hour event was compared for the wetlands within the Northwest Expansion Area per the Natural Resource Inventory (NRI) Report (Bonestroo, October 2003, Page 4-15) recommended wetland management standards. Figure 17.3 identifies wetlands by management class. In this report, wetlands in the Northwest Expansion Area are assigned management classifications based on the susceptibility to adverse impact due to increased stormwater bounce ranging from 1 (high susceptibility to stormwater bounce) to 4 (low susceptibility to stormwater bounce). The management classifications are based on the Site Management Classification Flow Chart on page 4-11 of the NRI. This report also provides recommended buffer widths and phosphorus pretreatment requirements based on the wetland classifications. Table 17.5 summarizes the recommended wetland management standards as proposed in the report.

Table 17.5 Recommended Wetland Management Standards.

Management Classification	Buffer Strip (feet)		Structural Setback from Edge of Buffer (feet)	Stormwater Phosphorous Pretreatment Requirement	Stormwater Quantity Requirement
	Slopes <15%	Slopes >15%			
Manage 1	60	90	10	Limit loadings to 2X predevelopment loadings	Storm Bounce - Maintain HWL at or below existing conditions for 100-year storm
Manage 2	30	45	10	Limit concentration to 150 parts per billion (ppb)	Storm Bounce - Maintain HWL at or below existing conditions plus 0.5 feet for 100-year storm
Manage 3	20	30	10	Limit concentration to predevelopment concentrations (200 ppb)	no requirement
Manage 4	15	20	10	No Requirement - Enhancement recommended	no requirement

Of all the wetlands delineated in the Northwest Expansion Area, only three would realize a storm bounce that exceeds the recommended bounce criteria according to the model. These wetlands are within Subwatersheds EP-073a, EP-071 and SP-23. In order to prevent this undesired bounce, a higher stormwater management standard (or additional stormwater management storage) is required within these subwatersheds upstream of the existing wetlands.

Additional Storage Requirements. The additional volume necessary for compliance with the proposed wetland storm bounce criteria and necessary in areas that high water levels would compromise developable land is identified in Table 17.6. This table also identifies other new basins previously planned for in the *Pilot Study Area H&H* (EOR, 2002). Alternatives to new basins that could be investigated include diversion of runoff to adjacent basins with excess storage.

Table 17.6. Additional Storage Requirements

Basin	**Volume [ac-ft]**	**Comment**
EP-073a	8.7	Additional storage necessary for compliance with wetland storm bounce criteria.
EP-071	10.6	Additional storage necessary for compliance with wetland storm bounce criteria.
EP-104	12.0	Enhancement of the existing basin to include an additional 12 ac-ft of storage, thereby reducing the floodplain footprint.
SP-9	0.9	Previously planned for in the *Pilot Study Area H&H*. Basin SP-24 and SP-21 could accommodate this storage volume.
SP-23	0.5	Additional storage necessary for compliance with wetland storm bounce criteria.
SP-25	4.0	Previously planned for in the *Pilot Study Area H&H*.
SP-28	0.5	Previously planned for in the *Pilot Study Area H&H*. Basin SP-24 and SP-21 could accommodate this storage volume.
SP-36	3.9	Previously planned for in the *Pilot Study Area H&H*.
SP-48	13.8	Previously planned for in the *Pilot Study Area H&H*.

Table 17.7 compares the existing and proposed 100-yr, 24-hour storm bounce for all wetlands within the LMRWMO watershed, after the incorporation this additional stormwater management storage.

Table 17.7 Wetland Storm Bounce Assessment

Basin ID Proposed Conditions	Starting Water Level [feet]	Existing HWL 100-year 24-hr Rainfall event (6.0") [feet]	Proposed HWL 100-year 24-hr Rainfall event (6.0") [feet]	Difference in Bounce Between Existing and Proposed [feet]	NRI Management Classification
EP-018	935	935.5	935.5	0.0	1
EP-031b	901	901.7	901.6	-0.1	1
EP-071	831	844.9	845.1	0.2	1
EP-073a	840	842.3	842.4	0.1	1
EP-076	893	893.5	893.5	0.0	1
EP-080a	801	802.4	802.2	-0.1	1
EP-080b	901	903.0	903.0	0.0	1
SP-23	863	866.6	866.6	0.0	1
BP-032	891	895.5	895.4	-0.1	2
BP-049a	925	927.6	927.5	0.0	2
EP-010b	898	904.7	904.5	-0.1	2
EP-013	851	858.2	858.6	0.3	2
EP-016b	901	906.2	906.1	0.0	2
EP-016c	907	910.7	910.7	0.0	2
EP-027c	888	890.7	890.7	0.0	2
EP-027e	941	944.9	943.9	-1.0	2
EP-027f	849	851.2	851.3	0.1	2
EP-039	847	852.4	852.1	-0.3	2
EP-058a	877	881.8	881.8	0.0	2
EP-060b	897	902.4	902.6	0.1	2
EP-078	807	809.2	809.0	-0.1	2
EP-079a	807	809.3	809.0	-0.3	2
BP-036	923	931.1	931.1	0.0	3
BP-048b	925	927.9	927.9	0.0	3
EP-045	879	881.9	881.8	0.0	3
EP-059a	899	902.2	902.4	0.2	3
EP-074a	825	828.5	828.8	0.3	3
EP-074b	837	841.5	841.5	0.0	3
EP-102a	901	908.0	907.9	-0.1	3
EP-104	891	897.6	894.0	-3.6	3
QP-5	923	926.1	926.4	0.3	3
SP-26	915	919.2	919.2	0.0	3
SP-10	935	939.1	938.7	-0.4	3
SP-29	957	959.1	959.7	0.6	3
SP-12	835	841.8	844.0	2.2	3
SP-32	923	928.1	927.7	-0.4	3
BP-038a	853	892.5	892.0	-0.5	4
BP-049b	943	945.4	945.4	0.0	4
EP-005d	953	955.8	955.8	0.0	4
EP-009	889	899.0	898.6	-0.3	4
EP-011	883	889.8	892.1	2.3	4
EP-016a	903	904.7	904.6	-0.1	4
EP-025b	897	900.0	900.2	0.2	4
EP-027a	847	853.6	855.3	1.7	4
EP-031a	875	881.0	881.2	0.2	4
EP-034	849	859.2	860.6	1.3	4
EP-035b	853	857.7	857.6	-0.1	4
EP-036a	861	866.1	867.7	1.5	4

EP-038a	867	872.0	871.7	-0.3	4
EP-044	885	890.5	890.4	-0.1	4
EP-106	859	864.9	865.0	0.2	4
EP-107a	855	858.4	858.4	0.0	4

Mitigation Approach

The stormwater management approach laid-out earlier in this section describes an approach driven by the need to protect and preserve the infiltration capacity of the existing natural basins within the Northwest Expansion Area. These basins, identified in Figure 17.2, are the backbone of the proposed stormwater management system and provide the means to prevent degradation of downstream resources. This approach provides a preliminary framework to allow the City and developers to proceed with some knowledge of the design specifics that will be needed. The City will assure that the developers will design and build the final local drainage and stormwater management system within this overall framework. Tools to accomplish this include but are not limited to adoption of the *Draft Subd. 37. Northwest Area Planned Unit Development Overlay District* and development and implementation of the accompanying stormwater design manual to provide guidance in the selection, design and construction of site specific, alternative stormwater management BMPs and operation and maintenance requirements.

Prior to adoption of the final zoning and subdivision ordinances for the area, the City will conduct public hearings, gather more information and seek input from the community, the landowners and potential developers. As a result of this investigative process, the ordinances as adopted may vary from the draft ordinance, and the City may also adopt alternate means to achieve the proposed mitigation. However, the goals and objectives relating to mitigation and the desired quality of development will remain substantially similar to those envisioned by the draft ordinance.

In addition, the City of Inver Grove Heights acquired a Phase II National Pollutant Discharge Elimination System (NPDES) permit in 2003. This federal permit is administrated by the Minnesota Pollution Control Agency (MPCA). The City also adopted a Storm Water Pollution Prevention Program (SWPPP). The SWPPP includes controls including but not limited to:

- Public education and outreach;
- Public participation and involvement;
- Illicit discharge, detection and elimination;
- Construction site runoff control;
- Post-construction site runoff control; and
- Pollution prevention/good housekeeping.

Wetlands in the Northwest Expansion Area are proposed to be regulated for stormwater discharge. Mitigation of runoff to wetlands that realize an increase in stormwater bounce in excess of the proposed wetland management class standard is proposed. Wetland storm bounce can be mitigated through a higher infiltration BMP standard for the contributing subwatershed or diversion of runoff to basins with excess storage can be considered.

As discussed previously in the water quality assessment section of question 17, initial modeling showed that only three basins within the Northwest Expansion Area require stormwater bounce mitigation in order to comply with the proposed wetland storm bounce standard. It should be noted that the smart land-use planning, infiltration BMPs, and preservation of existing natural basins assumed in the future runoff condition modeling is not considered mitigation, but are integral parts of the expected development.

Departure from this proposed stormwater management approach could result in additional wetland bounce and increased need for mitigation of runoff. Developers will be responsible for coordinating with the city to ensure that the final drainage and runoff management system is designed and constructed in accordance to the plan and its accompanying regulatory tools.

Wetlands in GCLWMO that potentially need to be mitigated for stormwater bounce should be identified through Hydrologic &Hydraulic modeling. This could be completed on a site-by-site basis, or a comprehensive effort that includes the entire area. As development impacts other high quality wetlands, the mitigation approach should be the same. Combinations of conventional and alternative stormwater systems can be used to mitigate excessive stormwater bounce, with an emphasis on, and priority given to alternative infiltration methods.

Many alternative practices are installed because, once established, they may require less maintenance than traditional facilities. This does not mean, however, that alternative approaches can be installed and subsequently ignored. The City is planning to develop a maintenance program for storm water facilities in the Northwest Expansion Area, and train City personnel or others charged with maintenance about the function and operational design of the particular practice so that they know what to look for in performance.

Formally establishing a City controlled O&M program is essential to effectively implementing alternative stormwater management. The following steps are adapted from EPA's recommended steps to establish such a program:

1. Establish a regulatory framework (ordinance or regulations) within which to formalize a cooperative agreement with a homeowner, developer or any other entity, including the City, that will be maintaining an alternative system;
2. Incorporate maintenance into design and construction specifications, including pre-treatment;
3. Identify the mechanism for stable, long-term funding (even if it is the homeowner);
4. Formalize a regular inspection schedule, criteria for departing from the schedule (ex. after a large event or when a problem is evident) and keep a log of inspections;
5. Define triggers for action (ex. 5" of sediment accumulation will trigger action to clean a forebay);
6. Prevent sediment, debris and litter from moving into and accumulating in the system;
7. Make provisions for monitoring (visual or actual sampling) of treatment criteria;
8. Develop a training and education program, possibly with a certification element;
9. If water is not draining down after 4 to 6 days, remove accumulated fine sediments until coarse soils are exposed and replant with raingarden vegetation; and
10. Develop an informational booklet for homeowners on need and role of infiltration raingardens in neighborhoods

AUAR Update Comment #17-1:No change to the stormwater plan is anticipated due to the change in landuse. The hydrologic modeling completed for the AUAR used maximum impervious surface cover to account for different development densities. Question #6 of the AUAR defines maximum impervious surface coverage for both commercial and industrial as 70%.

AUAR Update Comment #17-2: At this time many of the stormwater recommendations set forth in the original document have passed into city ordinance under Section 39 of the Inver Grove Heights Northwest Area Overlay Zoning Ordinance. The stormwater ordinance requires the preservation of ponding and infiltration areas though the open space regulation. Stormwater manual adopted May 29, 2007.

- **The City of Inver Grove Heights adopted the Hydrologic & Hydraulic modeling study for the Gun Club Lake Watershed in 2007.**

Figure 17-1 – Watershed Setting

Figure 17 -2 – Watershed Boundary Map

Figure 17-3 – Wetland Management Classification

18. Water Quality – Wastewaters

a. *Describe sources, quantities, and composition (except for normal domestic sewage) of all sanitary and industrial wastewaters produced or treated at the site.*

Land uses within the AUAR study area are guided to be a combination of residential, commercial, industrial/office space, and public/institutional uses. While the majority of the study area is guided to be residential, the proposed land use is summarized as follows (does not include natural areas, parks and open space):

Land Use	Area (acres)	Updated AUAR Area (acres)
Low Density Residential (LDR)	820	820
Low/Mid Density Residential (LMD)	743	747
Medium Density Residential (MDR)	343	334
High Density Residential (HDR)	65	65
Mixed Use (Residential/Commercial) (MU)	69	69
Commercial (Comm.)	59	59
Office / Industrial (I/O)	306	264
Public/Institutional (P/I)	11	11
Office/ Industrial / Commercial (O/I/C)	0	47

The estimated sewer flows for the non-residential land uses are as follows:

Land Use	Area (AC)	Average Flow (Gal/AC/Day)	Total Average Flow (MGD)
Comm.	58	1200	0.007
I/O	306	1200	0.367
P/I	11	1200	0.013
		Total	0.387 MGD

Updated AUAR Land Uses

Land Use	Area (AC)	Average Flow (Gal/AC/Day)	Total Average Flow (MGD)
Comm.	**59**	**1200**	**0.0708**
I/O	**264**	**1200**	**0.3168**
P/I	**11**	**1200**	**0.0132**
O/I/C	**47**	**1200**	**0.0564**
		Total	**0.457 MGD**

AUAR Update: Note error in the original calculation of sewer flow for the commercial land. The original calculation was for 0.007 MGD, when it is actually 0.0708 MGD. The original sewer flow for non-residential land uses should have been 0.451 MGD compared to the Updated AUAR sewer flow for non-residential land uses of 0.457 MGD. This represents a 0.006 MPGD increase.

The estimated overall sewer flow rate (1200 Gal/AC/Day) was estimated for this analysis to accommodate the need for flexibility in planning for services for this area. The Comprehensive Plan includes a range of proposed densities for each land use area. City staff identified a likely density at which each land use type is likely to develop for use in the AUAR analysis (discussed in Section 6). Most areas are unlikely to develop at the highest densities allowed in the Comprehensive Plan due to the physical constraints of the area, and city requirements for dedication of open space. However, it is possible that some areas may develop at the maximum allowed in the Comprehensive Plan. Therefore, a conservative flow rate estimate was used in this analysis, rather than the MCES standard sewer flow rate for planning purposes, which is 800 Gal/AC/Day.

If a sewer flow rate of 1200 Gal/AC/Day is used for the AUAR area rather than 800 Gal/Ac/Day, the increased sewer rate requires a larger pipe size in only 1400 feet of the total proposed alignment, and increases the estimated infrastructure costs for the area by just $3000. This nominal increase in pipe size and cost provides the desired flexibility in the development of this area that may be needed based on the Comprehensive Plan.

b. *Describe any waste treatment methods to be used and give estimates of composition after treatment, or if the project involves on-site sewage systems, discuss the suitability of the site conditions for such systems. Identify receiving waters (including ground water) and estimate the impact of the discharge on the quality of the receiving waters. (If discharge may affect a lake consult "EAW Guidelines" about whether a nutrient budget analysis is needed.)*

In accordance with the City of Inver Grove Heights Comprehensive Plan, dated July 1998, all areas within the AUAR study area will be served by sanitary sewer extended from existing City trunk sewer systems connected to the MCES regional systems. The attached drawings identify preliminary alignments to serve the AUAR study area with sanitary sewer.

Natural Resource Areas and Infiltration Areas—Mitigation Plan Recommendations

Sanitary sewer and water system alignments are designed to avoid impacts to the regional infiltration areas identified in the City's Surface Water Management Plan. It is important to avoid disturbance and construction activities within these areas to preserve their function to infiltrate stormwater. Impacts to small, local infiltration areas have been avoided where possible as well. If sanitary sewer infrastructure must be constructed in or near these local basins, impacts will be limited to the smallest possible area, and to the sides of the basins, to preserve the infiltration capacity of the bottom areas of the basins.

The proposed alignments have also been routed to avoid impacts to the high quality natural resource areas identified in the City's Natural Resource Inventory and Management Plan (the areas identified as Manage 1 and Manage 2 areas). Where Manage 3 and Manage 4 areas cannot be avoided, construction practices will minimize impacts to the Manage 3 and Manage 4 areas, and restore these areas as needed. These recommendations are consistent with the City's Natural Resources Inventory and Management Plan.

Trench excavation during the installation of both sanitary sewer and watermain will result in some impacts to the surrounding areas. Trench widths will only be as wide as they need to be to comply with the current safety regulations, and where necessary, trenches will be further minimized through the use of mechanical trench stabilization techniques. It is anticipated that trenchless construction techniques will be utilized to install utilities in areas of valuable natural resources. The installation of watermain generally requires minimal trench widths as the pipes are proposed to be installed with 7.5' of cover. Sanitary sewer installation will require additional trench width and depth due to the rolling topography of the Northwest Area. Trench depths as deep as 50 feet may be encountered, but these areas are anticipated to be limited and located away from areas containing natural resources in an effort to avoid impacts.

The recommendations to avoid impacts to natural resource areas and storm water infiltration areas are included in the Mitigation Plan.

c. *If wastes will be discharged into a sewer system or pretreatment system, identify the system and discuss the ability of the system to accept the volume and composition of the wastes. Identify any improvements, which will be necessary.*

The City of Inver Grove Heights will construct sanitary sewer improvements to serve the AUAR study area in general accordance with the 2020 Comprehensive Plan for the City. The sewer flows from this area to the MCES interceptor systems and eventually to the MCES Metropolitan Wastewater Treatment Facility, which has capacity available to serve this area. The sewer system that will provide service to this area is a 24" reinforced concrete sewer with a capacity of approximately 9.25 MGD, more than suitable to handle the 6.44 MGD design flows.

AUAR Update: With the exception of a minor increase in non-residential wastewater flow of 0.006 MGD, and an anticipated reduction in wastewater flow due to a reduction in the total number of dwelling units, wastewater does not change with this update.

The City of Inver Grove Heights has adopted the completed a feasibility study of these improvements, called the Northwest Area Water and Sanitary Extensions Feasibility Report, dated May 2005. The City awarded the first phase of these improvements, Northwest Area Utility Improvements Lift Station R-9.1, in July 2007.

Figure 18-1 – Sanitary Sewer System

19. Geologic Hazards and Soil Conditions

Approximate depth (in feet) to ground water: __0__ minimum _20__ average
To bedrock: _110___ minimum __250__ average
Describe any of the following geologic site hazards to ground water and also identify them on the site map: sinkholes, shallow limestone formations or karst conditions. Describe measures to avoid or minimize environmental problems due to any of these hazards.

Information from the *Geologic Atlas of Dakota County* (Minnesota Geological Survey, 1990), *Bedrock Geology and Structure of the Twin Cities Metropolitan Area* (Minnesota Geological Survey, 2000), U. S. Geological Survey 71/2 minute quadrangles, and well logs from the County Well Index (CWI) were used to determine depth to bedrock and depth to groundwater. A map of bedrock geologic units (MGS, 2000) is provided as **Figure 19-1**. A map of depth to bedrock (MGS, 1990) is provided as **Figure 19-2**.

A buried bedrock valley is mapped in the project area with branches entering from the northwest and northeast, converging and exiting along the southern boundary of the project area. The upper bedrock units (Decorah Fm., Platteville Fm., Glenwood Fm., and St. Peter Sandstone) have been completely eroded across most of the project area. The bedrock valley is eroded completely through the Prairie du Chien Group and into the underlying Jordan Sandstone in the southern part of the project area.

Based on the data presented in the geologic atlas, the minimum depth to bedrock within the project area is greater than 100 ft. Minimum depth to bedrock occurs where surficial depressions overlie relatively higher areas of St. Peter Sandstone. Bedrock is generally within 250 ft of the surface where the St. Peter Sandstone is present. Depth to bedrock is generally greater than 200 ft where the Prairie du Chien Group is the uppermost bedrock unit.

No sinkholes, shallow limestone formations, or karst conditions are present within the project area. Karst conditions are known to exist in the Prairie du Chien Group in southeastern Minnesota, but geologic hazards related to karst such as sinkholes occur where the Prairie du Chien Group is shallowly buried and the water table occurs within the carbonate bedrock unit. The Platteville Formation limestone is likely the uppermost bedrock unit in a small area along the northeast boundary of the project area. The Platteville Formation is thin in this area, however, and is buried by a minimum of 150 ft of unconsolidated sediments.

Plate 5 of the Geologic Atlas of Dakota County maps the water table elevation in the project area to be between approximately 775 and 900 ft (25 ft contour intervals) with the lowest water-table elevations occurring along the southern border of the project area. Few wells are open across or completed near the water table where it occurs in the till and other moraine deposits. Most water wells in the area are completed in buried Quaternary or bedrock aquifers, and water levels in those wells do not signify the position of the water table. The water table is expected to occur at or near the surface under most surface water bodies. The water table map provided in the geologic atlas is based on surface water elevations, topography and measurements made in a few selected shallow wells. More detailed information on the configuration of the water table is not available.

A perched water table occurs in some areas, and some ponds form water-table mounds in which the water table slopes away from the pond in all directions. Ground water is assumed to occur at or near the surface beneath and near surface water bodies. Ground-water flow patterns are complex around some ponds and wetlands, with shallow ground-water flowing into and out of the water body and the water body also recharging water into deeper aquifers. Some ponds and wetlands may be perched above an unsaturated zone overlying the lower, regional water table. In general, hydraulic head decreases with depth below the water table. The glacial till in which the water table occurs across most of the project area is not typically used for water supply.

The depth to ground water varies greatly across the AUAR area. Surface elevation within the project area ranges from approximately 800 ft to 990 feet. According to the geologic atlas, the water table elevation in the project area ranges from approximately 775 ft to 900 ft. As described above, ground water occurs at or near the surface beneath and near ponds and wetlands. Poorly drained depressions and drainage ways on the site become seasonally saturated to a depth at or near the surface. In upland areas, the water table is generally greater than 20 ft below the land surface.

AUAR Update: No changes to existing geologic hazards and soil conditions with this update.

Figure 19-1 – Depth to Bedrock

Figure 19-2 – Bedrock Geology

b. Describe the soils on the site, giving SCS classifications, if known. Discuss soil granularity and potential for groundwater contamination from wastes or chemicals spread or spilled onto the soils. Discuss any mitigation measures to prevent such contamination.

Soils in the area are related to the glacial and post-glacial parent materials in which they formed. A soils map of the AUAR area is provided on **Figure 19-3.** Surficial geology is mapped on Plate 3 of the geologic atlas and in *Surficial Geology of the St Paul 30 X 60 Minute Quadrangle* (Meyer and Lusardi, 2000). A map of the surficial geology derived from Minnesota Geological Survey data is provided as **Figure 19-4**. The project area is located on the St. Croix Moraine, a geomorphic feature of hummocky terrain marking the stable terminus of the Superior Lobe glacier during Late Wisconsinan time. Late Wisconsinan glacial, fluvial and lacustrine sediments of Superior provenance belong to the Cromwell Formation. The moraine overlies older glaciofluvial outwash deposits, also derived from the Superior Lobe. The buried outwash overlies Superior Lobe till from an earlier glacial advance. Erosional remnants of Pre-Late Wisconsinan till and outwash deposits overlie bedrock in some areas.

The moraine is composed primarily of sandy loam-textured till. Till is unsorted sediment deposited by glacial ice. The moraine also includes stratified ice-contact and lake sediments. Ice-contact deposits consist of stratified sand, gravelly sand and cobbly gravel, deposited by melt water flowing at or behind the ice margin, interbedded with unsorted sandy to loamy mudflow deposits and silty lake sediments.

Glacial melt water from the later Grantsburg Sublobe of the Des Moines Lobe cut through the St. Croix Moraine in the southwest corner of the project area. The melt water deposited sand and gravelly sand outwash of the New Ulm Formation. The outwash consists of a mixture of Des Moines Lobe sediments and reworked Superior Lobe sediments. Much of this area was covered by a thin mantle of loess (wind blown silt and fine sand with some clay associated with glacial margins).

Soils are mapped in the *Soil Survey of Dakota County, Minnesota* (Hundley, 1983). A map of surficial soil texture is provided in **Figure 19-3**. Soils formed in the moraine belong to the Kingsley-Mahtomedi association of gently sloping to very steep, well drained and excessively drained soils. Soils in this association vary in texture from loamy sand to silty loam. Soils formed on the outwash plain belong to the Waukegan-Wadena-Hawick association of level to very steep, well drained and excessively drained soils formed in silty and loamy sediments over sandy sediments.

Most soils throughout the AUAR area are moderately permeable to moderately rapidly permeable. Soils formed in outwash and other sandy sediments are generally moderately permeable in the upper part and moderately rapid to rapidly permeable in the lower part. In most areas, there is not a near surface, laterally consistent low permeability layer restricting vertical infiltration to ground water, and the ground water is susceptible to contamination from wastes or chemicals spread or spilled on the surface. The time of travel to the water table for contaminants will vary from hours to years depending on the properties of the contaminant and site-specific conditions. Ground water is most susceptible beneath and near ponds and wetlands where the water table is near the surface.

Shallow ground water near the water table is not generally used for water supply. Deeper aquifers are less sensitive to pollution than the water table system. A map of the sensitivity of the Prairie du Chien-Jordan aquifer system to pollution is provided in Plate 7 of the Geologic Atlas of Dakota County (MGS, 1990) and is duplicated for the AUAR area in **Figure 19-5**. The sensitivity ratings

are based on a matrix of factors including the presence of bedrock confining layers and the composition and thickness of material overlying bedrock. Estimated travel times for conservative water-borne contaminants to reach the Prairie du Chien-Jordan aquifer are as follows: High – weeks to years, High-Moderate – years to a decade, Moderate – several years to decades, Low-Moderate – several decades, Low – several decades to a century.

The Quaternary aquifers are generally more susceptible to pollution because they occur at shallower depth and above bedrock confining units, where bedrock confining units are present. Sensitivity of the buried Quaternary aquifer(s) varies from high to moderate depending on thickness and composition of overlying deposits. In general, for the buried Quaternary aquifer(s), areas mapped as having Low-Moderate or Moderate sensitivity in **Figure 19-5** will have Moderate to High-Moderate sensitivity, and areas mapped as having High-Moderate sensitivity will have High sensitivity.

AUAR Update: No changes to existing soils with this update.

Figure 19-3 - Soils

Figure 19-4 – Surficial Geology

Figure 19-5 – Sensitivity to Aquifer

20. Solid Wastes; Hazardous Wastes; Storage Tanks

a. Describe the types, amounts, and compositions of solid or hazardous wastes to be generated, including animal manure, sludge and ashes. Identify the method and location of disposal. For projects generating municipal solid waste indicate if there will be a source separation plan; list type(s) and how the project will be modified to allow recycling.

A variety of waste is expected to be generated by the proposed development, as it will include residential, commercial, and office, and industrial development.

As is currently the case in Inver Grove Heights, solid waste will be collected weekly by a licensed hauler and disposed of at a licensed landfill. Curbside collection of materials for recycling will also be available in the study area, as will collection of yard waste. Using statistical information collected by Dakota County, and the development scenario proposed for the study area, an estimate of total municipal solid waste generated under existing conditions and at build-out was prepared (see Table 20.1). In addition, volumes of existing and predicted recycling/source separation programs were calculated.

Existing land use in the study area is mainly agricultural, with undeveloped areas, a golf course, and scattered residential neighborhoods. Some commercial/industrial development is also present along the highway corridors. Because the bulk of the property is undeveloped or has been used agriculturally, current waste generation is much less than what will be generated after development. Future land uses designated for the study area include:

		Updated AUAR
• low density residential (2.0 du/ac)	820 acres	820 acres
• low-medium density residential (4.0 du/ac)	743 acres	747 acres
• medium density residential (6.5 du/ac)	343 acres	334 acres
• high density residential (12.0 du/ac)	65 acres	65 acres
• commercial	59 acres	59 acres
• office/industrial	306 acres	264 acres
• mixed use (residential)	46 acres	46 acres
• mixed use (commercial)	23 acres	23 acres
• public/institutional	11 acres	11 acres
• natural areas/open space/golf course	725 acres	724 acres
• office / industrial / commercial	0 acres	47 Acres

For the purposes of calculating waste generation estimates, it is assumed that 1 domestic unit represents 1 household.

As the City of Inver Grove Heights does not track solid waste generation, statistics were derived using information from another city in Dakota County to estimate what could be expec ted after development of the project area.

Persons per household:	2.6 persons/household
Waste generation per household:	1.25 tons/household/year
Residential recycling, curbside:	0.21 tons/household/year
Residential recycling, drop-off:	0.05 tons/household/year

Yard waste, composted:	0.10 tons/household/year
Non-Residential Waste Generation:	33.44 tons/acre/year
Non-Residential Recycling	2.49 tons/acre/year

Calculations were completed using the above statistical information and the development scenario proposed for the study area. Comparisons of current and predicted potential waste generation quantities are presented in the table below. Estimates related to recycling and yard waste composting are presented in the text following the table.

Table 20.1 Solid Waste Generation

Source	Existing Units	Under Existing Land Use	Potential Units	Under Proposed Development Scenario
Residential	300 households (estimated)	375 tons/year	7,715 households (max)	9644 tons/year
Non-Residential	123 acres	4113 tons/year	398 acres	13,309 tons/year
Total Waste Generated		**4488 tons/year**		**22,953 tons/year**

Table 20.1 Updated Solid Waste Generation

Source	Existing Units	Under Existing Land Use	Potential Units	Under Proposed Development Scenario
Residential	**300 households (estimated)**	**375 tons/year**	**7,054 households (max)**	**8,818 tons/year**
Non-Residential	**123 acres**	**4113 tons/year**	**404 acres**	**13,510 tons/year**
Total Waste Generated		**4488 tons/year**		**22,328 tons/year**

AUAR Update: The proposed Development Scenario land uses result in a 625 ton per year reduction in solid waste generation.

Solid waste generated in the City of Inver Grove Heights is collected on a weekly basis. The waste is taken to a landfill licensed to accept such waste for disposal. Materials for recycling and composting are also collected. Collection service will be expanded to service the AUAR study area, after development.

Under current conditions, it is estimated that approximately 63 tons of residential solid waste is recycled via curbside pick-up per year in the study area, and approximately 15 tons is recycled via drop-off sites. After development, it is estimated that approximately 1620 tons/year of residential solid waste would be recycled via curbside pick-up, and 386 tons/year would be recycled via drop-off sites each year. Currently, the amount of recycling in the area associated with the existing non-residential development is estimated to be approximately 306 tons per year. Under proposed conditions, it is estimated to be approximately 991 tons per year.

It is estimated that approximately 0.10 tons of yard waste per household is composted each year. Under current conditions, yard waste composting is estimated to be 30 tons/year for the study area. Under potential development conditions, approximately 772 tons of yard waste from the study area would be composted per year.

AUAR Update:

Estimated Residential Curb-side Recyling	**1,481 tons/year**
Estimated Residential Drop-off Recycling	**353 tons/year**
Estimated Non-Residential Recycling	**1,006 tons/year**

b. Identify any toxic or hazardous materials to be used or present on the project site and identify measures to be used to prevent them from contaminating groundwater. If the use of toxic or hazardous materials will lead to a regulated waste, discharge or emission, discuss any alternatives considered to minimize or eliminate the waste, discharge or emission.

Information obtained from Environmental Data Resources, Incorporated (EDR) January 7, 2005 was used to assess the presence of registered underground and aboveground storage tanks (USTs and ASTs), hazardous waste generators currently existing within the study area, and the potential occurrence of past spills or releases. The EDR report identified numerous sites of potential concern within the study area (see attached map and table).

There were 18 areas of potential concern (30 addresses) identified in the report, corresponding to the numbers on the attached map. In some cases, more than one site is associated with the number. Sites identified included 17 where some type of release has occurred:

- 3 leaking underground storage tank (LUST) sites
- 10 spill sites
- 1 agricultural spill sites
- 1 emergency response notification system site
- 1 leaking aboveground storage tank (LAST) site
- 1 unpermitted dump site (identified in the MN LS database)

Other sites where chemicals and/or petroleum products are used and stored included:

11 small quantity hazardous waste generator (SQG) sites
7 underground storage tank (UST) sites
1 aboveground storage tank (AST) site

Numerous additional sites of potential concern have also been identified near the study area.

Information has been requested from the Dakota County Environmental Management Office regarding sites of potential concern identified in Dakota County records. The County indicated that due to the large size of the AUAR area, the County could not provide this data, but has provided a link that the City can use to access this data as needed. The County's database is a "snapshot" in time, and site may change over the course of development in the AUAR area. Given the size and changing nature of the database, it is recommended that the City work with potential developers to access the County's database as development is proposed, to identify whether the development area includes a site of known contamination, hazardous waste storage, or other areas of potential concern. If problem areas are identified, a Phase I investigation could be initiated, and the site issues addressed prior to construction.

It should also be noted that disposals and releases could occur between the time of final AUAR approval and actual development plans for the site. In light of this reality, it seems prudent to revisit the issue of potential contamination during the site development process. Typically, a Phase I environmental site assessment (Phase I ESA) would be required by a lender in conjunction with a property transaction where some type of financial assistance (i.e.; loan) is being sought. The Phase I ESA would presumably identify any potential site contamination concerns that exist at that time, allowing the issue to be resolved prior to construction.

Due to the past and current agricultural use of property within the study area, a variety of pesticides have likely been used and stored within the study area. Small storage tanks for petroleum products are also likely to have been, or remain present at farmsteads within the study area. If contamination is discovered during the course of development, the developer or other responsible party will be required to address the situation in accordance with Minnesota Pollution Control Agency rules.

The temporary and potential future use of hazardous materials and petroleum products within the study area is addressed below in part c.

c. *Indicate the number, location, size, and use of any above or below ground tanks to be used for storage of petroleum products or other materials (except water). Describe any emergency response containment plans.*

During construction activities, it is likely that portable storage tanks of fuel for construction vehicles and machinery may be temporarily located in various areas of the study area. For the purpose of minimizing impact due to potential spills, the re-fueling of vehicles and machinery will be conducted away from surface waters, wetlands, and other sensitive areas.

Approximately 296.1 acres of commercial and office/industrial development are proposed within the study area. In addition, 63.1 acres of mixed use development are also proposed. A variety of businesses would be permitted under these land use designations and could include those types that use and store various amounts of chemicals or petroleum products; in addition, some may utilize aboveground or belowground tank systems. At this time, it is not known if or where these businesses would be located within the study area. Any business using or storing chemicals or petroleum products would be subject to local and state rules regulating such activity.

AUAR Update: The updated Development Scenario land uses have a total of 393 acres of commercial, office, industrial, or mixed-use development.

Mitigation Plan Recommendations

1. Past and present land uses have resulted in disposals of solid and hazardous wastes and release of contaminants in the AUAR area that may impact public health and safety and the environment. The City will work with the project developers to identify sites of potential contamination, and to develop a contingency plan in case contaminated soil and/or groundwater are encountered during site development.

2. It should be noted that additional disposals and releases could also occur between the time of final AUAR approval and actual development plans for the site. In light of this reality, the issue of potential cont amination should be addressed during the site development process. Typically, a Phase I environmental site assessment (Phase I ESA) would be required by a lender in conjunction with a property transaction where some type of financial assistance (i.e., loan) is being sought. The Phase I ESA would presumably identify any potential site contamination concerns that exist at that time, allowing the issue to be resolved prior to construction.

AUAR Update: No changes to mitigation strategies are proposed with this update.

21. Traffic

Parking Spaces added: 21,207
Existing Spaces (if project involves expansion): 300
Estimated total Average Daily Traffic (ADT) generated: 91,310
Estimated maximum peak hour traffic generated (if known) and its timing:
P.M. Peak Hour: trips in: 3,583 trips out: 4,168

Parking Spaces added: 23,170
*Estimated total Average Daily Traffic (ADT) generated: **102,181***
Estimated maximum peak hour traffic generated (if known) and its timing:
*P.M. Peak Hour: trips in: **3,975** trips out: **4,463***

For each affected road indicate the ADT and the directional distribution of traffic with and without the project. Provide an estimate of the impact on traffic congestion on the affected roads and describe any traffic improvements, which will be necessary. If the project is within the Twin cities Metropolitan Area, discuss its impact on the regional transportation system.

Introduction

The proposed development of the land uses assumed for this AUAR will increase the traffic volumes on roadways within the city. A traffic impact analysis of the assumed development has been conducted in order to identify whether roadway and/or other transportation improvements will need to be undertaken. The analysis was performed at a planning level and attempts to identify the traffic related impacts of the potential development. Identified impacts are then evaluated to determine what mitigation efforts need to be enacted so that transportation service can be provided at an acceptable level.

The project area is shown in Figure 21-1. The roadways and intersections for analysis were determined in conjunction with the City of Inver Grove Heights staff.

There were four major roadways analyzed as part of this review.

- County Road 26 (70th Street) – east-west "A" Minor Arterial
- County Road 63 (Argenta Trail) – north-south Community Collector Road
- Trunk Highway 3 (South Robert Trail) – north-south "A" Minor Arterial
- County Road 73 (Babcock Trail) – north-south Community Collector Road

In addition to examining the corridors as a whole, the following intersections were also examined:

- CR 63 and CR 26
- TH 3 and CR 26
- CR 73 and CR 26
- TH 55 and TH 3 interchange ramps
- TH 55 and CR 63 proposed future interchange ramps

These intersections were analyzed for traffic volumes and approach geometry, both existing and proposed. The analysis also assumed an interchange at CR 63 and Interstate 494 would be constructed and in-place for the future condition. Traffic volumes are presented at this potential intersection of Interstate 494 and CR 63 without an attempt to determine lane geometry.

Insert Fig 1. Location Map

Existing Conditions

The most recent daily traffic volume information for the primary roadways in the project area was obtained from 2003 MnDOT Average Annual Daily Traffic (AADT) maps. As a part of this study, turning movement counts were taken during the morning and afternoon peak traffic periods on Tuesday, November 9, 2004 at the following intersections:

- CR 26 and CR 63
- CR 26 and TH 3
- CR 26 and CR 73
- TH 3 and TH 55 eastbound and westbound ramp terminals

Currently, all four subject roads are two-lane roads, and their intersections are controlled with a four-way stop condition. The intersection at CR 26 and CR 63 has a single lane for all movements of traffic. The intersection of TH 3 and CR 26 has a single lane for all movements in addition to a designated right turn lane for the northbound and southbound directions. The intersection of CR 73 and CR 26 has designated left turn lanes as well as one through lane and one through/right turn lane in the eastbound and westbound directions. The existing lane configurations with the existing traffic volumes are shown in Figure 21-2.

The daily capacity of any individual roadway is based upon many factors. These factors may include the number of lanes provided, number of access points per mile, number of signalized intersections per mile, percentage of truck traffic, and the physical grade of the roadway. However, for planning purposes, a generalized average daily traffic (ADT) threshold for the roadways is used. Table 21.1 shows the generalized ADT volume thresholds for a roadway type and number of lanes in terms of level of service. Level of Service (LOS) is a quality measure describing operational conditions within a traffic stream, generally in terms of service measures such as speed, freedom to maneuver, traffic interruptions, and comfort. A LOS A represents the best result with little or no delay. A LOS F represents the worst result with excessive delay and queues. A LOS D is usually the lowest accepted by most agencies within the Metro area.

Table 21.1 Generalized Average Daily Traffic Volume Thresholds

Facility Type	Number of Lanes	Maximum ADT Volume at Level of Service[1]				
		A	B	C	D[2]	E
Principal Arterial	5	11,400	18,200	29,100	32,600	36,300
	4	7,600	12,100	19,400	23,300	27,600
	3	4,900	7,900	12,700	17,000	21,100
	2	3,100	5,000	8,000	12,000	15,900
Minor Arterial	4/5	8,500	13,600	17,000	25,200	28,600
	3	4,300	6,900	11,100	14,800	18,500
	2	2,700	4,300	6,900	10,300	13,700
Collector	5	9,000	14,400	23,100	25,900	28,600
	4	6,100	9,800	15,700	19,100	22,500
	3	3,700	5,900	9,400	12,500	15,700
	2	2,200	3,600	5,800	8,800	11,700

[1] ADT Volumes above the LOS E maximum threshold would be considered LOS F.
[2] LOS D is usually the lowest acceptable LOS allowed by most agencies within the metro area.

Source: Florida DOT, MnDOT

Based on the information presented in both Table 21-1 and Figure 21-2, the LOS for each roadway can be determined. All roadways are currently operating acceptably with CR 26 at a LOS C between CR 63 and TH 3 and east of CR 73. CR 26 is operating at a LOS D between TH 3 and CR 73 and west of CR 63. North of CR 26, CR 63 is operating at a LOS A, while between CR 26 and TH 55 it is operating at a LOS B. South of TH 55, CR 63 is operating at a LOS D. TH 3 has a LOS D north of CR 26, a LOS C between CR 26 and TH 55, and a LOS D south of TH 55. CR 73 operates at a LOS B and C north and south of CR 26, respectively.

The a.m. and p.m. peak hour volumes of each intersection were analyzed using the Synchro/SimTraffic software package, which uses the methodology presented in the Highway Capacity Manual. These results are also presented in terms of Level of Service (LOS). Figure 21-3 shows the existing LOS for each movement and the overall intersection. More detailed LOS results and queue analyses are provided in the appendix. Generally, the intersections within this project area are performing adequately. The lone exception is the intersection of TH 3 and CR 26, which currently has individual movements at a LOS E or LOS F and an overall intersection LOS E during the PM peak hour. This suggests some improvements are needed today.

Insert Fig 2. Existing Geometry and Volumes

Insert Fig 3. Existing Conditions Level of Service

Assumed Land Use

To begin analyzing the project area, it was necessary to project the trips that would be generated as a result of the land use assumptions. The determination of the trip generation characteristics of the development begins with assumptions concerning the expected land use and densities of the development. Information provided by the City of Inver Grove Heights identified the land use characteristics of the area. The project area was broken down into nine transportation analysis zones (TAZ), shown in Figure 21-4. Land uses and densities of each development were assumed for each TAZ. Table 21.2 shows the land use and size of each land use within each TAZ.

TABLE 21.2 Land Use Types and Sizes Per Zone

TAZ	Land Use Type	Size	
1	Medium Density Residential	545	DU
	Office	338,680	SF
2	High Density Residential	687	DU
	Medium Density Residential	320	DU
	Low/Mid Density Residential	352	DU
	Low Density Residential	168	DU
	Mixed Use - Residential	260	DU
	Mixed Use - Commercial	94,745	SF
	Office	892,980	SF
3	High Density Residential	96	DU
	Medium Density Residential	493	DU
	Low/Mid Density Residential	624	DU
	Low Density Residential	48	DU
	Mixed Use - Residential	290	DU
	Mixed Use - Commercial	105,635	SF
	Park	58	AC
4	Low/Mid Density Residential	271	DU
	Commercial	660,240	SF
5	Medium Density Residential	166	DU
	Low/Mid Density Residential	282	DU
	Low Density Residential	163	DU
	Commercial	714,495	SF
	Office	203,100	SF
	Industrial	18.7	AC
5 Updated	**Medium Density Residential**	**114**	**DU**
	Low/Mid Density Residential	**298**	**DU**
	Low Density Residential	**163**	**DU**
	Commercial	**1,164,905**	**SF**
	Office	**95,600**	**SF**
	Industrial	**8.8**	**AC**

TAZ	Land Use Type	Size	
6	Medium Density Residential	29	DU
	Low/Mid Density Residential	388	DU
	Low Density Residential	220	DU
	Mixed Use – Residential	135	DU
	Mixed Use – Commercial	49,005	SF
	Commercial	50,095	SF
	Industrial	40	AC
	Public/Institution – Church	24	AC
7	Low/Mid Density Residential	39	DU
	Low Density Residential	213	DU
8	Medium Density Residential	371	DU
	Low/Mid Density Residential	674	DU
	Low Density Residential	256	DU
9	Industrial	48	AC

AC = Acres
DU = Dwelling Units
SF = Square Feet of Gross Building Area

Note: Only the proposed future land uses are Shown. Existing developments are not included in this summary.

Figure 21-4. Traffic Analysis Zones

Using the land use and density information, the projected trip generation was determined using the Institute of Transportation Engineers (ITE) report titled Trip Generation, 7th Edition, 2003. This industry standard document provides average rates of land uses based upon studies completed across the nation. Table 21.3 below provides the estimated 2025 trip generation for each land use.

Table 21.3 Estimated 2025 Vehicle Trips

Estimated 2025 Vehicle Trips*					
TAZ	AM Peak Hour		PM Peak Hour		Daily
	Entering	Exiting	Entering	Exiting	(2-Way)
1	503	262	276	512	6,923
2	1,467	978	1,144	1,687	26,951
3	247	748	880	580	16,647
4	333	410	960	1,103	31,852
5	795	603	1,274	1,636	40,096
6	438	505	648	652	13,742
7	47	142	160	94	2,412
8	202	659	721	411	11,074
9	299	61	77	272	2,486
Subtotal*	**4,331**	**4,366**	**6,139**	**6,947**	**152,183**
New Vehicle Trips	**2,598**	**2,620**	**3,683**	**4,168**	**91,310**

AUAR Update:
Table 21.3A below provides the updated estimated 2025 trip generation for each land use.

Estimated 2025 Vehicle Trips*					
TAZ	AM Peak Hour		PM Peak Hour		Daily
	Entering	Exiting	Entering	Exiting	(2-Way)
1	503	262	276	512	6,923
2	1,467	978	1,144	1,687	26,951
3	247	748	880	580	16,647
4	333	410	960	1,103	31,852
5 Updated	**778**	**705**	**1,760**	**2,128**	**58,214**
6	438	505	648	652	13,742
7	47	142	160	94	2,412
8	202	659	721	411	11,074
9	299	61	77	272	2,486
Subtotal*	**4,314**	**4,470**	**6,626**	**7,439**	**170,301**
New Vehicle Trips	**2,587**	**2,682**	**3,975**	**4,463**	**102,181**

* Trip generation before deductions for pass-by, multi-use, and diverted trips. This is not the expected new traffic on the roadway system.

Only the totals of 'New Vehicle Trips' shown in Table 21.3 represent new traffic on the roadway system in the study area. These trips are established by reducing the total development trip generation to account for the following factors:

- Pass-By – Pass-by trips account for trips that are already on the road but see something that sparks their interest and decide to stop. They would already be on the road and are not considered a new trip despite the new decision to stop.
- Multi-Use – Multi-use trips account for those that make multiple stops within the project area. An example of this behavior is a driver that makes several stops at various stores in different locations.
- Internal – Some of the trips generated do not use the primary roadways for their trip purpose.
- Other Modes – Other modes of transportation include the use of transit systems, bicyclists, pedestrians, and multi-modal transportation.

The total volume of new trips on the area roadways is estimated at approximately 91,310 following application of the reduction factors.

AUAR Update:
The total volume of new daily trips on the area roadways is estimated at approximately 102,181 following application of the reduction factors.

With the new traffic determined, these volumes were then distributed to the study area roadway system based upon knowledge of the area, the existing flow of traffic, and input from the City. Traffic distribution was adjusted to reflect new roadways and connections within the study area, including a proposed new interchange at I-494 and CR 63. Some trips generated were diverted onto the 'ring roads' surrounding a mixed-use commercial area in TAZ 2, 3, and 6. The 'ring road' surrounding the mixed land use area in TAZ 6 is currently available, while the 'ring roads' in TAZ 2 and 3 are proposed. The traffic flowing in this area was adjusted to reflect drivers using those roads to avoid the main intersection of TH 3 and CR 26. The City has also proposed the completion of a collector roadway connecting the City of Eagan to CR 73. This new east-west roadway would be established at approximately 65th Avenue. This new collector roadway would be expected act as a reliever to CR 26 and an alternate route across the northern portion of the study area. Another future connection would extend Yankee Doodle Road north through the new TH 55/CR 63 interchange and then east to an eventual intersection with TH 3. These roadways were all considered in the distribution of the projected development volumes. Figure 21-5 shows the projected development a.m. and p.m. peak hour volumes for the subject intersections.

AUAR Update:
Figure 21-5A shows the updated project development a.m. and p.m. peak hour volumes for the subject intersections.

With projected development volumes determined, the existing traffic was then increased to account for the following factors:

- Background Growth – Daily trips that increase as the population in this regional area increases.
- New Interchanges – As better access becomes available to drivers, their driving behavior and choices would change as well. For instance, motorists will likely shift from TH 3 to CR 63 if a new interchange at I-494 and CR 63 is built.
- New Traffic – With the addition of a new interchange, drivers from regions outside the project area may change their driving patterns and enter/exit the project area to use the new interchange.

A new interchange was assumed at the juncture of I-494 and CR 63. While projected traffic volumes were determined for this new interchange, an interchange design, including the necessary approach lanes, was not examined. It is assumed that if a new interchange is determined for this location, the design will be established at that time. The interchange that drivers are currently using to access I-494 is by way of TH 3. This non-standard interchange may cause confusion to some drivers, causing them to change their routes to a simpler, more common intersection, if available. The trips associated with the new interchange were adjusted to account for both existing trips and new trips generated by the new intersection. The projected 2025 volumes are the combination of the development volumes added to the existing volumes with some additional changes.

The projected Average Daily Traffic (ADT) was determined in the same manner as the peak hour volumes. New daily trips generated by the proposed development were distributed to the roadway system assuming the new roadway discussed earlier. The existing volumes were increased to account for background growth and traffic shifts of existing traffic were determined based upon the new roadways. The sum of the existing traffic, background growth and traffic shifts, and the new development traffic is the 2025 projected traffic. The projected ADT volumes are shown in Figure 21-6 along with the turning movement volumes at the study intersections.

AUAR Update:
The updated projected ADT volumes are shown in Figure 21-6A along with the turning movement volumes at the study intersections.

Among regional roadways, the highest impacts of the proposed development will be to I-494 and TH 55 due to their proximity to the project location. However, no significant increase in congestion levels are anticipated due to the additional vehicle trips added to the regional roadway system. The 2003 AADT on I-494 is 83,000 according to MnDOT traffic volumes. The proposed development would increase traffic on I-494 west of CR 63 by approximately 15,550 vehicles. East of CR 63 traffic would be increased by less than 4,600 vehicles. The 2003 AADT on TH 55 is 19,000 and 18,100 east of TH 3 and west of CR 63, respectively. Trunk Highway 55 west of CR 63 can expect to see an increase in traffic of less than 5,600 vehicles. East of TH 3, the highway can expect to see an increase in traffic of less than 2,500 vehicles. The TH 55 and I-494 corridors currently operate at satisfactory levels and are expected to continue to operate at satisfactory levels even after full development of the project area.

Insert Fig 5. Projected Development Volumes

Insert Fig 6. 2025 Geometry and Volumes

Mitigation Plan

The corridors and intersections were re-examined with the projected traffic to determine infrastructure improvements that may be needed to maintain adequate traffic operations. Based on this analysis, it is recommended that the four primary roads be improved to accommodate future growth. Projected ADT volumes on CR 63 suggest a five- or six-lane roadway may be needed from the assumed I-494 interchange to the proposed TH 55 interchange. The exact number of lanes will depend upon the number and type of access provided along the corridor. South of TH 55, CR 63 is recommended to provide four-lanes for through traffic. TH 3 should also be widened to provide four-lanes along its entire length in the study area. The projected daily traffic volumes on CR 73 are at the edge of a LOS D for a two-lane collector roadway and may need to provide three-lanes depending upon the number and type of access. If proper access control is maintained, it is likely that CR 73 could provide satisfactory traffic operations as a two-lane roadway. CR 26 is recommended to provide four-lanes for through traffic, except between CR 63 and TH 3. In that section, projected ADT volumes suggest a five- or six-lane roadway will be required, depending upon the number and type of access along that roadway section. Table 21.4 shows the recommended number of lanes based on 2025 ADT volumes.

Table 21-4 2025 Lane Recommendations

Road	Segment	2003 AADT Volume[A]	2025 ADT Volume	Number of Lanes	
				Existing	Recommended
CR 63 (Argenta Trail)	North of CR 26, South of I-494	2,150	29,575	2	5/6[B]
	South of CR 26, North of TH 55	3,400	26,700	2	5/6[B]
	South of TH 55	6,500	20,950	2	4
TH 3 (S. Robert Trail)	North of CR 26	8,200	21,250	2	4
	South of CR 26	6,700	19,925	2	4
	South of TH 55	7,600	18,650	2	4
CR 73 (Babcock Trail)	North of CR 26	2,450	8,850	2	2/3[B]
	South of CR 26	2,220	9,200	2	2/3[B]
CR 26 (70th Street)	West of CR 63	6,000	20,850	2	4
	East of CR 63, West of TH 3	5,700	30,225	2	5/6[B]
	West of TH 3, East of CR 73	7,200	25,175	2 or 4	4
	East of CR 73	10,000	17,700	4	4

[A] – Annual Average Daily Traffic from MnDOT flow maps
[B] – Number of lanes will depend on number and type of roadway access points.
* Number of lanes will depend on number and type of roadway access points.

Table 21.4-A shows the recommended number of lanes based on the new 2025 ADT volumes.

Table 21-4 2025 Lane Recommendations

Road	Segment	2003 AADT Volume[A]	2025 ADT Volume	Number of Lanes	
				Existing	Recommended
CR 63 (Argenta Trail)	North of CR 26, South of I-494	2,150	**30,300**	2	5/6[B]
	South of CR 26, North of TH 55	3,400	**28,500**	2	5/6[B]
	South of TH 55	6,500	**21,500**	2	4
TH 3 (S. Robert Trail)	North of CR 26	8,200	**23,500**	2	4
	South of CR 26	6,700	**21,825**	2	4
	South of TH 55	7,600	**19,350**	2	4
CR 73 (Babcock Trail)	North of CR 26	2,450	**9,450**	2	2/3[B]
	South of CR 26	2,220	**9,950**	2	2/3[B]
CR 26 (70th Street)	West of CR 63	6,000	**21,950**	2	4
	East of CR 63, West of TH 3	5,700	**31,725**	2	5/6[B]
	West of TH 3, East of CR 73	7,200	**26,475**	2 or 4	4
	East of CR 73	10,000	**18,300**	4	4

[A] – Annual Average Daily Traffic from MnDOT flow maps
[B] – Number of lanes will depend on number and type of roadway access points.
* Number of lanes will depend on number and type of roadway access points.

Analyses of the 2025 a.m. and p.m. peak hour projections at the study intersections determined recommendations for the lane geometry. Based upon those analyses, the following lane geometry at each intersection is recommended:

AUAR Update:
All of the previously recommended geometry and traffic control is sufficient with the new intersection turning movement volumes. All approaches and intersections operate at LOS D or better.

Intersection of CR 26 and CR 63

- Signalized intersection.
- Potential for dual left turns in the southbound and westbound directions. For the purposes of this analysis, a third westbound through lane on CR 26 was assumed to terminate at this intersection as a westbound left turn lane.

- Single left turn lane in northbound and eastbound directions.
- Single right turn lane in all directions. For the purposes of this analysis, the northbound right turn lane was assumed to provide a free movement into a third westbound through lane on CR 26.
- Two through lanes for the eastbound and westbound approaches.
- Three through lanes for the northbound and southbound approaches.

Intersection of CR 26 and TH 3

- Signalized intersection.
- Potential for dual left turn lanes in the eastbound and westbound directions. For the purposes of this analysis, a third eastbound through lane on CR 26 was assumed to terminate at this intersection as an eastbound left turn lane.
- Single left turn lanes in northbound and southbound directions.
- Designated right turn lanes in all four directions. For the purposes of this analysis, the southbound right turn lane was assumed to provide a free movement into a third eastbound through lane on CR 26.
- Two through lanes for all four approaches.

Intersection of CR 26 and CR 73

- Signalized intersection.
- Single left turn lane in all four directions.
- Designated right turn lane in all four directions.
- Two through lanes in eastbound and westbound directions.
- One through lane for the northbound and southbound approaches.

Intersection of TH 3 and TH 55 Westbound

- Signalized intersection.
- Two through lanes in northbound and southbound directions.
- Single left turn lane in northbound direction.
- Single right turn lane for the southbound approach.
- Two approach lanes for the westbound movement on the exit ramp.

Intersection of TH 3 and TH 55 Eastbound

- Signalized intersection.
- Two through lanes in northbound and southbound directions.
- Single left turn lane in southbound direction.
- Single right turn lane for the northbound approach.
- Two approach lanes for the eastbound movement on the exit ramp.

Intersection of CR 63 and TH 55 Westbound

- Signalized intersection.
- Two through lanes in northbound and southbound directions.
- Single left turn lane in northbound direction.
- Single right turn lane in southbound direction. For the purposes of this analysis, a third southbound through lane on CR 63 was assumed to terminate at this intersection as this southbound right turn lane.
- Two approach lanes for the eastbound approach on the exit ramp.

- A third northbound through lane on CR 63 was not needed at this intersection, but was assumed to be provided at some point to the north of this intersection.

Intersection of CR 63 and TH 55 Eastbound

- Signalized intersection.
- Two through lanes in northbound and southbound directions.
- Single left turn lane in northbound direction.
- Single right turn lane in southbound direction.
- Two approach lanes for the eastbound approach on the exit ramp.

A pictorial representation of the proposed geometry for the project area is shown along with the 2025 projected volumes in Figure 21-6. Although this report recommends signalized intersections, a Signal Justification Report will need to be completed for each intersection prior to the installation of any signal system.

AUAR Update:
Figure 21-6A shows a pictorial representation of the proposed geometry and traffic control along with the updated 2025 volumes. The geometry and traffic control remains unchanged from Figure 21-6. An Intersection Control Evaluation (ICE) must now be performed prior to installing new forms of traffic control.

A summary of the LOS for each intersection with the recommended lane geometry and projected a.m. and p.m. peak hour volumes is shown in Figure 21-7. More detailed LOS results and queue analyses are provided in the appendix. As shown, each intersection is expected to provide acceptable traffic operations with a LOS D or better. Most individual movements also operate at a LOS D or better with four exceptions. During the p.m. peak hour, the left turn movement for the westbound, eastbound, and northbound approaches at the intersection of CR 63 and CR 26 are expected to operate at a LOS E. Similarly, the left turn movement for the eastbound approach on CR 26 at TH 3 is expected to operate at a LOS E during the p.m. peak hour. While these results are not desirable, it is likely the effect of a longer cycle length necessary to provide enough green time for other directions. Given the overall acceptable level of service for each intersection, additional capacity in the form of more approach lanes would not be cost effective. Thus, these movements will likely experience some added delay during the p.m. peak hour. At other times, these left turn movements are expected to provide satisfactory traffic operations.

AUAR Update:
The updated LOS summary can be found in Figure 21-7A. The only change to intersection level of service is at the CR 26/CR 63 intersection which changed from LOS C to D with updated land uses.

The traffic analysis has been conducted assuming an interchange at I-494 and CR 63. Although projected volumes for a potential interchange are provided, the design and number of lanes was not. If an interchange is approved at this location, the design would be determined at that point.

This potential interchange is discussed in the City of Inver Grove Heights thoroughfare plan and is necessary to help serve the area traffic demands and the traffic generated by future development in the City's northwest area. The interchange proposal will need to undergo an analysis and approval process required by the Metropolitan Council, MnDOT, and the Federal Highway Administration. Since such approvals are complex and time consuming, this process should commence as early as possible. The interchange will help to reduce volumes on adjacent interchanges along I-494. Interchange spacing does not appear to be an issue. Pending approval of an interchange programming and funding of an interchange would need to be accomplished by MnDOT.

AUAR Update:
The City of Inver Grove Heights, City of Eagan and Dakota County, in partnership with FHWA, MnDOT and Metropolitan Council, completed the Dakota County North-South Corridor Travel Demand Study in July, 2007. These agencies will complete a detailed study of the transportation system in the study area, the screening of alternatives and a formal review and documentation within the next two years.

Insert Fig 7. 2025 Level of Service

22. *Vehicle-Related Air Emissions*

Provide an estimate of the effect of the project's traffic generation on air quality, including carbon monoxide levels. Discuss the effect of traffic improvements or other mitigation measures on air quality impacts. (If the project involves 500 or more parking spaces, consult "EAW Guidelines" about whether a detailed air quality analysis is needed).

Carbon monoxide (CO) levels are elevated near roadway intersections due to the emission of this pollutant from the vehicles idling and passing by. The State of Minnesota has ambient CO standards that are designed to protect human health and the environment. The standards are:

- 1-hour average: 30 parts per million (ppm); and
- 8-hour average: 9 ppm.

Concentrations near or above these levels are most likely to occur near intersections that are severely congested (Levels of Service(LOS) D, E or F). BRA evaluated key intersections serving the project area and predicted that the intersection of TH 3 and CR 26 would have an LOS of D during the afternoon peak period. All other intersections would have an LOS of C or better during morning and afternoon peak-hour periods.

This report evaluates the impacts of vehicle carbon monoxide (CO) emissions near the intersection of TH 3 and CR 26 using MPCA procedures. The procedure requires use of U.S. Environmental Protection Agency models to evaluate the impact of traffic on ambient CO levels to compare with the Minnesota CO standards.

Background CO levels

To demonstrate compliance with standards, the modeled impacts of the area vehicle traffic is added to the ambient background CO concentration in the project area. For this analysis, 1-hour and 8-hour background concentrations are conservatively assumed to be 3.0 parts per million (ppm).

Vehicle Emissions

Motor vehicle tailpipe CO emission factors were estimated with the EPA Mobile 6.2 model. Year 2025 CO emission factors used in the modeling are as follows:

- Idle – 81.6 grams per hour
- 35 mph – 12.7 grams per mile

Modeled Vehicle Emission Impacts

The EPA CAL3QHC dispersion model is used to estimate CO concentrations at points near intersections.

Site-Specific Inputs

CAL3QHC model output files are provided in Appendix D. The model outputs provide details of all required site-specific model inputs, including:

- Site and roadway geometry,
- Vehicle emission rates for characteristic speeds along modeled roadways,
- Traffic signal cycle times,
- Traffic signal red light times, and
- Clearance lost time - used default time of 3.0 seconds.

Traffic signal information was provided by Bonestroo and Associates. The analysis uses year 2025 emission rates and traffic levels.

Meteorological Inputs

Meteorological inputs to the CAL3QHC model included the following:

- Wind Speed: 1 meter/second
- Stability Class: D
- Mixing Height: 1000 meters
- Surface Roughness Length: 108 centimeters

180 wind directions, in increments of 2 degrees were input to the model to determine worst-case direction.

Receptors

Three receptors were placed in each quadrant of the intersection, 10 feet from the edge of the nearest travel lane.

Modeled Concentrations

The following table presents the maximum predicted 1-hour and 8-hour CO concentrations at the modeled receptor locations. The eight hour concentrations were calculated using a persistence factor of 0.7.

Table 4-1
Modeled CO Concentrations
TH 3 / CR 26 - PM Rush Hour

	Maximum Concentration (ppm)		
Receptor Quadrant	Background CO	1-hour Average	8-hour Average
SE	3.0	6.3	4.4
NE	3.0	6.2	4.3
NW	3.0	6.4	4.5
SW	3.0	6.0	4.2

All predicted values are within the Minnesota ambient standards. No mitigation for impacts is indicated based on this analysis.

AUAR Update:
Traffic volumes have changed as a result of the project. However, as previously demonstrated, the maximum CO concentrations are well below the Minnesota ambient standards. The recent changes will not adversely impact the CO concentrations as to cause an exceedance of the ambient standards.

23. Stationary Source Air Emissions

Will the project involve any stationary sources of air emissions (such as boilers or exhaust stacks)?
__ Yes _X_ No

Describe the type, sources, quantities and compositions of any emissions from stationary sources of air emissions such as boilers, exhaust stacks or fugitive dust sources. Include any hazardous air pollutants (consult EAW Guidelines for a listing) and any greenhouse gases (such as carbon dioxide, methane, nitrous oxide) and ozone-depleting chemicals (cloro-fluorocarbons, hydrofluorocarbons, perfluorocarbons or sulfur hexafluoride). Also describe any proposed pollution prevention techniques and proposed air pollution control devices. Describe the impacts on air quality.

AUAR Update:
No updated land uses will affect this question.

24. Dust, Odors, Noise

Will the project generate dust, odors, or noise during construction and/or operation?
__X_ Yes ___ No

If yes, describe the sources, characteristics, duration, and quantities or intensity, and any proposed measures to mitigate adverse impacts. Also identify the locations of sensitive receptors in the vicinity and estimate the impacts on these receptors. Discuss potential impacts on human health or quality of life.

Stephen B. Platisha Associates, Inc. (SBP) has conducted a traffic noise study impact study for the proposed development. The modeling analysis used the MNDOT Minnoise computer model and traffic predictions prepared by Bonestroo, Rosene, and Anderlik Associates (BRA). Additionally, SBP conducted noise monitoring at two sites in the project area. The impact assessment is based on existing and 2025 peak-hour traffic levels. A copy of the full study including data appendices is available on request from the City of Inver Grove Heights.

Minnesota Noise Standards

Minnesota Rules Chapter 7030 provide the Minnesota standards for noise. These standards describe the limiting levels of sound established on the basis of present knowledge for the preservation of health and welfare. These standards are designed to be consistent with sleep, speech, annoyance, and hearing conservation requirements for receivers within areas grouped according to land use activities. The Minnesota standards are as follows:

	7:00 AM to 10:00 PM		10:00 PM to 7:00 AM	
	L_{10}	L_{50}	L_{10}	L_{50}
NAC-1 (Residential)	65	60	55	50

NAC-2 (Commercial)	70	65	70	65
NAC-3 (Industrial)	80	75	80	75

L_{10} means the sound level which is exceeded for 10 percent of the time for a one-hour period. L_{50} means the sound level which is exceeded 50 percent of the time for a one-hour period. Sound levels are expressed in dBA. A dBA is a unit of sound level expressed in decibels and weighted for the purpose of approximating the human response to sound.

Minnesota Statutes, Section 116.07, Subd. 2a, exempt noise from local and county roads from the requirements of these noise rules unless full control of access to the road has been acquired.

Minnoise Model

The Minnoise model is a modified (modified by the Minnesota Department of Transportation) version of the Federal Highway Administration's Optima/Stamina model that is used to predict noise levels from highway projects and to assist with the development of noise barriers.

Model Assumptions

Noise level predictions were based on the following data and assumptions:

- The noise analysis was completed for the peak afternoon rush hour and peak nighttime traffic noise hour (6:00 am to 7:00 am).
- Traffic data for existing and year 2025 for the study area was generated by BRA and is provided in Appendix A.
- Shielding from natural or man-made barriers was not considered.
- The analysis assumed acoustically soft ground cover between the roadway and all receiver locations (alpha = 0.5).
- Vehicle mix was based on counts conducted during noise monitoring, with 6 percent heavy trucks and 4 percent medium trucks.
- Constant vehicle speeds of 40 mph on CR 63, 45 mph on CR 73, 50 mph on TH 3 and CR 26, and 65 mph on TH 55 and I-494 were assumed.

All noise modeling output files are provided in Appendix B in the full Air and Noise analysis report, available from the City of Inver Grove Heights.

Existing Noise Levels: Noise Modeling Locations

Using the Minnoise computer model and traffic and roadway information provided by BRA, SBP modeled existing noise levels generated by traffic on roadways serving the project area. Noise impacts were estimated for hypothetical receptor locations at various distances from the center of the median of the following roadways:

- Robert Street (TH 3)
- County Road 26
- County Road 63
- County Road 73
- TH 55
- I - 494

Existing Noise Levels - Daytime Modeling Results

The results of the modeling for the daytime existing noise levels are provided in Tables 24-1 through 24-4. The tables show the distance to which State noise standards are exceeded for NAC-1 ("residential") areas and the distance to which the Federal Highway Administration noise abatement criteria are exceeded.

The State daytime standard is based on the suitability of an area for outdoor use. Certain highway expansion projects using federal funds must consider mitigation when the Federal Highway Administration noise abatement criteria are approached.

Existing Noise Levels – Nighttime

Minnesota noise rules define nighttime as the hours between 10:00 p.m. and 7:00 a.m. Peak nighttime traffic noise levels typically occur during the 6:00 a.m. – 7:00 a.m. hour.

The nighttime NAC-1 ("residential") standards (L_{10} = 55 dBA, L_{50} = 50 dBA) are designed to prevent interference with sleep in a building with partially open windows. New residential developments are exempt from this standard if the buildings have year-round climate control and meet minimum construction standards for noise level attenuation.

Table 24-1 shows the approximate distance from the center of the State Highways and I-494 to which nighttime standards are exceeded.

Existing Noise Levels – Noise Monitoring Results

In addition to the modeling of project area noise levels, noise level monitoring was also conducted at locations within the project area to further define existing noise levels. The following table presents the results of monitoring conducted by SBP at two project area locations and the results of monitoring conducted by Mn/DOT in the project area as part of their metro wide monitoring program.

Table 24-2
Noise Monitoring Results

	Date	Time	L_{10}	L_{50}
R1 – TH 3	2/02/05	8:13 am - 9:13 am	61.0	55.0
R2 – TH 55	2/04/05	8:40 am – 9:40 am	76.0	71.0
R3 – TH 55/TH 3	NA	NA	69.0	NA
R4 – I-494	NA	NA	65.0	NA

* Monitoring at locations R3 and R4 was conducted by Mn/DOT. Times and dates were not available. L_{50} was not determined.

Post-Development Noise Levels

Using the Minnoise computer model and traffic and roadway information provided by BRA, SBP estimated post-development noise levels generated by traffic on roadways serving the project area. Noise impacts were estimated for hypothetical receptor locations at various distances from the center of the median of the following roadways:

- Robert Street (TH 3)
- County Road 26

- County Road 63
- County Road 73
- TH 55
- I – 494

Post-development Noise Levels - Daytime Modeling Results

The results of the modeling for the 2025 post-development daytime noise levels are provided in Tables 24-3 through 24-6. The tables show the distance to which State noise standards are exceeded for NAC-1 ("residential") areas and the distance to which the Federal Highway Administration noise abatement criteria are exceeded.

The State daytime NAC-1 standard is based on the suitability of an area for outdoor use. Certain highway expansion projects using federal funds must consider mitigation when the Federal Highway Administration noise abatement criteria are approached.

Table 24-7 shows the distance to which Minnesota NAC-2 ("commercial") standards are exceeded for each roadway.

Post Development Noise Levels – Nighttime

Minnesota noise rules define nighttime as the hours between 10:00 p.m. and 7:00 a.m. Peak nighttime traffic noise levels typically occur during the 6:00 a.m. – 7:00 a.m. hour.

The nighttime NAC-1 ("residential") standards (L_{10} = 55 dBA, L_{50} = 50 dBA) are designed to prevent interference with sleep in a building with partially open windows. New residential developments are exempt from this standard if the buildings have year-round climate control and meet minimum construction standards for noise level attenuation.

Table 24-8 shows the approximate distance from the center of the roadways to which Minnesota nighttime standards are exceeded.

Mitigation Plan Recommendations

The analyses of traffic noise impacts for this proposed development indicate that areas near the project area roadways will have noise levels above State noise standards for residential areas. Any site plan that proposes residential development in the impact areas should conduct a detailed noise study to define any required noise mitigation strategies. Potential mitigation strategies may include one or a combination of the following:

- Buffer Zones
- Noise Barriers
- Strategic Building Placement
- Building Construction Requirements

Buffer Zones

Table 3-1 provides an assessment of the distance from the roadways that State daytime noise standards are exceeded. One potential strategy for mitigating the impact is to buffer the areas between the residences and the roadways with vegetation or a combination of vegetation and noise barriers.

At least 100 feet of dense coniferous vegetation is recommended to provide reduction in noise volumes.

Noise Barriers
Noise barriers (e.g. walls or berms) between the roadways and the residential areas could also be constructed to reduce noise impacts. The effectiveness of barriers depends on the height and extent of the barriers and the specific location of the barriers relative to the roadways and the residential areas.

Strategic Building Placement
Buildings can act as barriers if located to protect areas for outdoor use or to protect residences.

Building Construction Requirements
Specifying noise mitigating construction materials and techniques can reduce the impact of traffic on indoor noise levels.

AUAR Update:
Traffic volumes have changed as a result of the project, and noise levels may change accordingly. However, traffic volume changes would need to change by a factor of two to be perceptible. The traffic volume changes are well below changing by a factor of two, and noise level changes will be less than perceptible levels.

The mitigation measures identified in the AUAR will still apply, and any residential development still needs to conduct a noise mitigation study to consider mitigation measures.

Tables 24-1 and 2

Tables 24-3 and 4

Table 24-5

Tables 24-7 and 8

Tables 24-9 and 10

Table 24-11

Table 24-12

25. Nearby Resources

Are any of the following resources on or in proximity to the site:
a. *archaeological, historical, or architectural resources?*
_X_ Yes __ No

Field work related to archaeological, historical, and architectural resources was preceded by a literature and records search which focused on inventory files maintained at the Minnesota Historical Society as well as references and reports compiled for previous cultural resource investigations in northern Dakota County and adjacent portions of Washington County.

As results of the literature and records search had been negative and as areas of proven archaeological potential -- uplands adjacent to streams and larger lakes -- are rare within the study area, the consultant ARS (Archaeological Research Services) in consultation with SHPO, decided to use a staged approach which would focus the initial field review on areas in a lacustrine setting and then expand survey coverage only if initial results had proven positive.

Many of the inspected uplands have been cultivated for decades and were so again in 1999. Others have been disturbed by recent residential development. In most cases, disturbance appeared to have been deep enough to have brought to the surface a sample of any archaeological evidence present in the soil. Consequently, close-interval visual inspection was often deemed to provide sufficient survey coverage.

Areas that appeared undisturbed or were too vegetated to offer adequate subsoil exposure were shovel tested. Tests were placed at approximate ten meter intervals and measured 35-40 centimeters (cm) in diameter. They were taken out in 10 cm levels down into sterile mineral soil, with soil contents screened onto tarpaulins through quarter-inch hardware cloth. Once soil profiles had been noted, tests were immediately backfilled and the sod replaced.

No area was surveyed without written or verbal approval by the property owner. **Figure 2** shows the parcels where ARS staff was not granted entry for either archaeological survey or the review of historic structures.

It should be noted that an earlier archaeological survey conducted by ARS along T.H. 55 already had covered that segment of the corridor that traverses Section 7, including expanded coverage around the intersections with Argenta Trail and South Robert Trail -- areas that now could be excluded from further review. Results of the corridor survey had proven negative (Harrison 1996).

Results

The study area encompasses all or part of five lakes/lake clusters with a surface area of at least 30 acres. According to the 1993 USGS map, only three are named (**Figure 25**). The others were informally named by ARS staff. Each will be described below along with a discussion of survey coverage. As results proved negative, more detailed survey records will be kept on file by ARS rather than included as appendices.

Robert Trail as well as a smaller access road flank the southern and southeastern shores of **Horseshoe Lake** which otherwise falls entirely outside the survey area. Neither shore segment has any archaeological potential. The southeastern has been completely modified by road construction, the southern is low and marshy.

A few hundred meters to the east, the enclosed basin of **Dickman Lake** is surrounded by a series of knolls. Those around the northern half all support fairly recent homes; those around the southern half are still mostly wooded except for the open, grassy yard of a large private residence.

Two property owners denied access, while the rest were cooperative. No one could remember finding any artifacts even though most appeared to be avid gardeners. ARS conducted a complete visual inspection of all existing disturbances: harvested and fall-cultivated gardens, animal burrows, shoreline bank erosion, graded access roads and areas around boat landings as well as trenches dug for utilities and fairly elaborate watering systems -- subsoil exposure more than equivalent to that provided by standard shovel testing and all of it negative.

On two larger properties that abut the southern third of the lake, ARS staff shovel-tested the narrow crests of wooded ridges that dirctly overlook the water. In addition, they examined a number of windfalls from recent windstorms. Tests were placed at approximate ten meter intervals. Soil profiles were undisturbed and fairly consistent. Again, results were negative.

Two miles further south, the northernmost of the **Marcott Lakes** -- a landlocked chain of five small lakes -- extends into the study area and due north of that are two smaller ponds.

Permission was not granted to survey the properties around the ponds, nor to test the parcels on the narrow isthmus between the ponds and the northern shore of the lake. Instead, ARS staff completed a thorough visual inspection of numerous subsoil exposures on the isthmus (gardens, graded access roads and parking areas, recent construction sites). Similar exposure was abundant on properties east of the lake, all of them very sloping towards the shore and disturbed on the crest due to the need for extensive landscaping for building sites and driveways. Negative results indicated that these areas were totally lacking in archaeological potential.

The only parcel that appeared likely to have attracted historic Native American use was a small peninsula that trends north into Marcott Lake from the southern edge of the AUAR area. In 1999, because its owners were in the process of selling the property, they did not allow any testing. In 2004, ARS was again refused permission to conduct any testing. Construction of a sizeable modern residence would probably have disturbed any historic cultural evidence present on the southern half of the peninsula but the northern half, wooded and largely undisturbed, appears to have considerable archaeological potential.

In western Section 6, west of Argenta Trail, is a cluster of small, isolated lakes named by us the **[3]Argenta Lakes[2]**. As shown on **Figure 25**, access was denied to most of the uplands around them but where field inspections could by accomplished -- visual inspection of numerous deep disturbance around buildings, on cultivated fields and in gardens -- the negative results suggested a total lack of archaeological potential.

Half a mile further north is another unnamed lake by ARS referred to as **[3]Section 6 Lake[2].** It is landlocked, in a long and narrow basin. Only its southeastern half falls within the study area.

The south/southwestern shore of this lake features a long steep northward slope all the way to the lake. Above that, the relatively level crest of the ridge has been disturbed by a couple of building sites as well as by grading and clearing and erosion along the upper edge of the slope. Visual inspection and shovel testing of less disturbed areas proved negative. The north/northeastern shore is even steeper: a wooded, fairly level-crested esker which was tested at five meter intervals wherever the crest was wide enough to have invited historic use. Soil profiles were undisturbed and consistent, with approximately 15-20 cm of dark greyish brown sandy loam over a lighter greyish brown sandy loam mixed with dense gravel and numerous cobbles. All tests proved negative.

REVIEW OF HISTORIC STRUCTURES: METHODOLOGY AND RESULTS

Methodology

In addition to the sources consulted about the general history of Dakota County and Inver Grove Heights (above, Section 2.2.2), a variety of documents were used to identify locations were historic structures would be likely to survive -- mostly 19th and early 20th century plat maps as well as aerial photographs taken in the 1930s - 1950s, and a 1967 USGS topographic quadrangle map for Inver Grove Heights -- all listed in Section 6.0.

In addition, the historic architecture inventory maintained by SHPO was consulted for information about properties listed for the AUAR area and its immediate vicinity. All locations of possible interest were numbered and marked on a topographic map (**Figure 25**).
An effort was then made to visit all of these locations. Where possible, permission was asked to photograph the buildings and an interview conducted with the owner. Where permission was denied, ARS staff described and photographed what could be seen from the nearest public road. In a few cases, even that approach proved fruitless due to distance or the presence of dense woods.

At the time the above-mentioned archaeological survey was conducted by ARS along T.H. 55 through Section 7, a companion survey focused on standing structures was completed by Hess, Roise and Company of Minneapolis. Within that corrridor segment are several historic properties which will only be described briefly below, with reference made to the final report for the T.H. 55 review (Roise 1996).

Results

The locations of reviewed properties are shown in **Figure 25**, referenced by field numbers assigned by ARS staff and supplemented, as appropriate, with the official Minnesota Historical Society (MHS) historic structures inventory file number.

<u>ARS 1 = 6471 Argenta Trail</u>
A 1950s-1960s residence; a large newer-looking shed which may contain a modified older outbuilding; the lower portion of a brick silo.

<u>ARS 2 = 6659-6689 Argenta Trail</u>
A large modern rambler, a large barn which appears well preserved, a modified chicken coop, a granary.

ARS 3 = 6743 Argenta Trail
1 1/2 story older brick residence with a modern addition at the back.

ARS 4 = 6922 Argenta Trail
Modern residence and garage as well as two smaller, remodeled outbuildings. Another early homestead which once stood adjacent to this one, appears to be gone.

ARS 5 = 1165 70th Street West
Permission was not given to access the property which was photographed from South Robert Street. It appears to feature a remodeled older residence, a large gothic-roofed barn with a sagging roof, and a smaller, newer gambrel-roofed outbuilding on cement block foundation.

ARS 6 and 7 = 1200 60th Street West
Part of property once farmed by the Schindeldecker family.
Permission to access and photograph was denied by current owners.
No older buildings left -- a modern home appears to have replaced the original farm residence at ARS 6.

ARS 7a = 6321 South Robert Trail
Also once part of the Schindeldecker farm.
Now occupied by a modern residence and garage but according to the owner, there is an old trash dump to the north of the house.

ARS 8 = 6308 South Robert Trail **MHS: DK-IVG-03**
Older buildings include a residence and a granary from the early 1880s, and a small shed (well house). A modern garage stands at the location of a barn which burned in the mid-1970s.

ARS 9 = 6180 South Robert Street
Formerly part of the Schindeldecker property. Now a modern residence on a heavily landscaped lot.

ARS 10 = 1401 70th Street East
A remodeled farm residence, a dilapidated older barn, a newer gambrel-roof barn, a brick silo and two smaller outbuildings.

ARS 11 = 6925 Athena
Now features a newer residence. No trace of an older farm except for an old farm access road on north side of property.

ARS 12 = 1286 West 70th Street
An older, heavily remodeled residence, a barn with concrete silo, an older outbuilding modified into a garage, a cinder block well house.

ARS 13 = 1694 West 70th Street
All buildings have been removed -- the property is now part of a golf course.

ARS 14a = Babcock Trail -- no address. **MHS DK-IVG-06**
School No.8 -- building in good condition but integrity marred by a garage-style door cut into the southern wall. Also features a small storage shed and a now collapsed outhouse.

ARS 14b = 7301 Babcock Trail
Part of the old Glassing farm, shown on an 1879 plat.
Now a florist business, the property features a heavily remodeled farm residence, a well preserved barn, some smaller out buildings as well as a newer greenhouse and modern shop buildings.

ARS 15 = 1714 West 80th Street
A much remodeled older house, a well preserved barn with brick silo, a small granary, a modern garage and metal shed.

ARS 16. No address
Nothing left of original farm -- now part of a golf course.

ARS 17 = 1407 West 80th Street
Noted as Maple Lake Farm on 1896 plat. Now replaced by a modern residence and garage.

ARS 18 = 1181 West 80th Street **MHS DK-IVG-20 (Cloverleaf Motel and DK-IVG-21 (Older Barn)**
Reviewed for MnDOT and found to be ineligible for the National Register of Historic Places (Nunnally 1993).

ARS 19 = 1462 West 80th Street
Older residence, barn, remnant of silo, wooden outbuilding.

ARS 20 = 7757 South Robert Trail
No access provided -- photographed from South Robert Street. Now a construction business, the property includes an older but remodeled residence as well as four new pole barns.

ARS 21 & 22. No address **MHS DK-IVG-04**
No access granted. From the road, the buildings appear to be completely gone.

ARS 23 = 7215 72nd Circle West
One of the first farms in Section 7 (Andreas 1874) and homesteaded by the Sach family. Still owned by members of that family in 2000 who then used the barn for livestock, the property now has new owners. It includes an older residence, a gambrel-roof barn, a silo and a modern machine shed.

ARS 24 = 7260 South Robert Trail
Brick farm residence, well house and barn foundation observed in 2000 since obliterated after farm was destroyed by fire in 2004.

ARS 25 = 7101 Argenta Trail
Another Sach family farm: residence and garage modern built on location of old farm house. Still extant: a well house with wind mill remnant, a machine shed, a corn crib with attached but dilapidated shed, a granary with metal siding, an out house and a field stone barn foundation.

ARS 26 = 7312 Argenta Trail
Another Sach farm but no longer in the family.
Older residence, well house, small milking shed, fieldstone and concrete foundations for a large barn, a small barn and a silo.

ARS 27 = 7475 Argenta Trail
The former location of a school house, it now features a quonset hut and some modern sheds, which serve as a maintenance area for Inver Grove Sanitation.

ARS 28 = 7482 Argenta Trail
All that remains of the farm is a remodeled brick residence and a barn foundation now reused for a chicken coop.

ARS 29 = 7587 Argenta Trail
Old but remodeled residence, well preserved barn, large pole barn, two garages. No longer a residence but used by a construction business for storage.

ARS 30 = 7925 Argenta Trail ***
Older residence with added garage, a rather dilapidated gambrel-roof barn, and a granary remodeled into a second residence. *Too lacking in integrity to meet NRHP criteria.*

ARS 31 = 6570 South Robert Trail
Now used by Lakewinds Nursery. Permission not given to take photographs or inspect buildings. Property an older, resided residence, a Quonset-style barn, a granary, and two wooden outbuildings. May need further documentation.

ARS 32 = 8225 Argenta Trail***
Property is now owned by Riverside Lutheran church. It includes a modern garage and an older farm house with original lap siding but also some altered windows. *Too lacking in integrity to meet NRHP criteria.*

ARS 32a. No address
Unmarked cemetery owned by the church, located south of the ARS 32 residence, in an open, grassy area.

ARS 33 = 8334 Argenta Trail
Shown as the J. Corrigan property in 1874 (Andreas) and 1896 (Union Publishing).
Now a home-based business. Permission to photograph denied.
Older residence has been remodeled and resided with a new addition. Barn, concrete silo and several outbuildings appear to be in fair shape.
Although it appears too lacking in integrity to meet NRHP criteria, it still seems to be of considerable local historic significance. May need further review.

ARS 34 = 1712 West 82nd Street***
Now the CRM Ranch, a horse boarding business. Features an old residence with additions, a gambrel-roof barn with a concrete silo, a milk house and a chicken coop now used for horses as well as five newer buildings added by the present owners. The rural setting is well-preserved.
Although the property appears too lacking in integrity to meet NRHP criteria, it still seems to be of considerable local historic interest.

ARS 35 = 8420 Alverno Avenue West
Older farm house with small addition, granary, slightly remodeled milk house—all of them resided, as well as a well-preserved barn, a metal pole barn and an executive-style new home.
Overall too lacking in integrity to meet NRHP criteria, but the barn is of very considerable interest.

ARS 36 = 7940 Alberta Avenue West
Now a modern residence—no older structures

ARS 37 = 1354 Courthouse Boulevard
The original farm house has been replaced by a modern rambler. Adjacent to it is a second residence which, according to the owner, incorporates an older guest/summer house for the farm, none of it visible on the exterior.

ARS 38 = 8011 Courthouse Boulevard
Features an older house with an addition and a newer porch, a well house with windmill remnants, and a small garage with attached residence. The barn, still standing in 2000, has now collapsed. The property appears to have been staked for development.

ARS 39 = 8152 82nd Street East***
Shown as "Lakeside Farm" on an 1896 plat, the property now includes a wood-frame residence, a gothic-arch barn, a granary (or machine shed) now converted into a garage, and a well house. Since it was photographed in 2000, the farm house has been remodeled with new dormers and a wrap-around porch.

ARS 40 = 8136 Alderbert
Photographed in 2000, the property included two buildings, which appeared to be summer homes: one older house and a cabin, both built with split log siding. One has now been removed, the other one is heavily remodeled.

ARS 41 & 42
Within the T.H. 55/South Robert Trail interchange, are two properties listed by MHS as **DK-IVG-018 (Bridge No. 5820, built in 1940), and DK-IVG-019 (Clover-Leaf Intersection)**. Both are located within the highway corridor and their management is the responsibility of MnDOT.

Mitigation Plan Recommendations

The negative results of the archaeological suggest that the archaeological potential is minimal for small isolated lakes and wetlands in Dakota County. The results also indicate that additional survey further from water would be pointless.

Visual inspection of the farmsteads and schools shown on plats and maps published between 1874 and 1967, proved a few of them to be completely gone but in most cases, there are still older components mixed in with newer construction such as replaced or heavily remodeled residences and modern storage buildings such as garages and pole barns. Only a few retain enough integrity to warrant more intensive evaluation.

- When any of the properties that have been identified as having enough integrity to warrant more intensive evaluation is scheduled for development, federal law, i.e. Section 106 of the National Historic Preservation Act and guidelines issued by the Secretary of the Interior, should be followed. For further detail, refer to individual comments provided above with each of the entries in Section 4.2.

AUAR Update: No further archaeological, historical, or architectural investigation or research was conducted with this update.

Figure 25 – Locations of Inventoried for Historic Structures

b. *prime or unique farmlands?* ___ ***Yes*** ***_X_ No***

AUAR Update: No change to prime or unique farmland with this update.

c. *designated parks, recreation areas, or trails?* ***_X_ Yes*** ___***No***

The Northwest Expansion Area includes a large open space area called Harmon Park, and the Inverwood Hills Golf Course. These uses will remain in place as development occurs in the Northwest Expansion Area.

The land use plan for the area anticipates maintaining large areas of open space and greenway corridors in the Expansion Area as development occurs. The area also has a variety of good and high quality upland and wetland natural resources that the City and its residents would like to protect for the long term. The City and its Northwest Area Task Force have determined that the development plan for the area will use a variety of low-impact development techniques and preservation of existing natural resources and regional basins to manage storm water in the area. The land use plan therefore features relatively large green spaces and corridors to allow for storm water infiltration and collection in the regional basin areas. These plans and strategies to achieve them are discussed in Sections 6, 10 and 17 of this AUAR.

The Task Force for the Natural Resources Inventory and Management Plan identified greenway corridors in the study area. Both Primary and Secondary Greenways are identified on Natural Resource Inventory maps. The Conceptual Greenway corridors that were developed during the NRI are consistent with those developed later during the North Dakota County Greenway Planning project completed by the Dakota County SWCD.

AUAR Update: The City of Inver Grove Heights adopted the Northwest Expansion Area Park System Plan, dated March 29, 2007. This plan identifies potential future park locations and trails throughout the Northwest Area.

d. *scenic views and vistas?* ***_X_ Yes*** ___ ***No***

The rolling topography of the Northwest Expansion Area creates scenic views and vistas in many locations. These vistas include views of woodlands, wetlands, and natural areas. The City's land use plan and Natural Resources Management Plan seek to preserve a large portion of these natural areas as development occurs. The plans place particular emphasis on preserving high quality upland and wetland natural areas (Management Areas 1 and 2, shown on **Figure 10.1**) Preservation of these natural areas should help to preserve the scenic character of the study area as development occurs. Higher-density development is proposed along major roadway corridors, where it will not impact the existing scenic views within the area.

AUAR Update: No change to scenic views and vistas with this update.

e. *other unique resources?* ____ ***Yes*** ***__X__No***

AUAR Update: No change with this update.

f. *If any items are answered* ***Yes****, describe the resource and identify any impacts on the resource due to the project. Describe any measures to be taken to minimize or avoid adverse impacts.*

AUAR Update: No change with this update.

26. *Visual Impacts*

Will the project create adverse visual impacts? (Examples include: glare from intense lights; lights visible in wilderness areas; and large visible plumes from cooling towers or exhaust stacks.) ____ ***Yes*** _**X**__ ***No***

AUAR Update: The updated Development Scenario will not create any adverse visual impacts. The change from Office / Industrial land use to a new land use category Office / Industrial / Commercial will not create an new adverse visual impacts.

27. *Compatibility with Plans*

Is the project subject to an adopted local comprehensive land use plan or any other applicable land use, water, or resource management plan of a local, regional, state or federal agency?
__**X**___***Yes*** ____ ***No***

If yes, identify the applicable plan(s), discuss the compatibility of the project with the provisions of the plan(s), and explain how any conflicts between the project and the plan(s) will be resolved. If no, explain.

The AUAR must include a statement of certification from the RGU that its comprehensive plan complies with the requirements set out at 4410.3610, subpart 1. The AUAR document should discuss the proposed AUAR area development in the context of the comprehensive plan. If this has not been done as a part of the responses to items 6, 9, 19, 22, and others, if must be addressed here; a brief synopsis should b presented here if the material has been presented in detail under other items. Necessary amendments to comprehensive plan elements to allow for any of the development scenarios should be noted. If there are any management plans of any other local, state, or federal agencies applicable to the AUAR area, the document must discuss the compatibility of the plan with the various development scenarios studied, with emphasis on any incompatible elements.

Compatibility with Plans and Land Use Regulations

The City of Inver Grove Heights completed its comprehensive plan consistent with the requirements of the Metropolitan Land Planning Act requirements. This plan was reviewed by the Metropolitan Council and found to be consistent with the *Regional Blueprint* and with the Metropolitan Council's regional systems plans. On June 8, 1998 the City of Inver Grove Heights officially adopted its Comprehensive Plan as official public policy. This plan complies with the requirements set out in Minnesota Rules 4410.3610, subpart 1, which requires local comprehensive plans to address land use, transportation and sanitary sewer systems.

The land use plan for the Northwest Expansion Area has changed in some respects from the land use plan included in the City's Comprehensive Plan, but the overall residential density of approximately 3 units per acre remains the same for the area. The proposed land use plan is therefore consistent with the adopted Comprehensive Plan. The protection of large open space and natural areas to implement the surface water plan has required the shifting of the proposed

location of some residential units from areas to be preserved as open space and storm water management areas, to developable areas, so that there is more medium-density residential use shown on the current plan than in the Comprehensive Plan. The location of proposed Commercial and Industrial land uses is consistent with the Comprehensive Plan.

The response to question 6 provides a detailed description of the AUAR in the context of the City of Inver Grove Heights Comprehensive Plan.

The AUAR and proposed development are generally consistent with the City's Comprehensive Plan, Natural Resource Inventory and Management Plan, Surface Water Management Plan, and related City Ordinances.

AUAR Update: The City of Inver Grove Heights will be updating its Comprehensive Plan in 2008.

The City of Inver Grove Heights is currently processing a Comprehensive Plan Amendment that is consistent with the land use changes proposed in the Northwest Expansion Area AUAR Update and the updated Development Scenario. Land located at the northwest quadrant of TH 55 and TH 3 will change from guided as Industrial Office Park to guided as Community Commercial and Low/ Medium Density Rsidential. This is consistent with the updated Development Scenario. This Comprehensive Plan Amendment will reviewed by the Planning Commission and City Council will occur in August 2007. The Metropolitan Council will review this amendment in September 2007.

Mitigation Plan

The City will be seeking approval of a Comprehensive Plan Amendment from the Metropolitan Council that includes the land use changes proposed for the Northwest Area since the adoption of the City's Comprehensive Plan.

28. *Impact on Infrastructure and Public Services*

Will new or expanded utilities, roads, or other infrastructure, or public services be required to serve the project? ***__X__ Yes ____ No***

If yes, describe the new or additional infrastructure/services needed. (Any infrastructure that is a "connected action" with respect to the project must be assess in this EAW; see "EAW Guidelines" for details.)

This item should first of all summarize information on physical infrastructure presented under other items (such as 6, 18, 19, and 22).

Other major infrastructure or public services not covered under other items should be discussed as well As noted above and in the "EAW Guidelines," the RGU must be careful to include project-associated infrastructure as an explicit part of the AUAR review if it is to be exempt from project-specific review in the future.

The new infrastructure (roads, utilities, etc.) required to serve the project are detailed under the appropriate items in this AUAR. These include Question 13 (Water Use), Question 17 (Water Quality-Surface Water Runoff), Question 18 (Wastewaters), Question 20 (Solid Wastes), and Question 21 (Traffic).

School Districts 196 and 199 serve the AUAR area. Neither district has plans for additional schools within the AUAR area.

The City is currently completing a study of City Hall facility, police and fire service needs for the community that will identify needs for the next 20 years, when the City is likely to be fully-developed. This study is expected to identify needs for expansion of existing facilities, or additional neighborhood facilities in the AUAR area and other areas within the community.

Summary of Infrastructure Proposed for the Northwest Expansion Area

Roadway Network

Based on the new traffic that will be generated by development of the Northwest Expansion Area, four primary roads will need to be improved to accommodate future growth. The Mitigation Plan recommends that CR 63 in the southbound direction be widened to a four-lane roadway from north of I-494 to south of TH 55. TH 3 should also be widened from south of the interchange with TH 55 to the north of the intersection with Interstate 494. CR 73 will require the addition of lanes. CR 26 will need to be widened beginning to the east of CR 73 and continuing to the west of CR 63.

The AUAR analysis indicates that the proposed development will have minimal impact on the regional system, including Interstate 494 and TH55. The analysis assumes a new interchange at I-494 and CR 63, as described in the City's Thoroughfare Plan. The City will need to work with MnDOT and Dakota County regarding timing and funding of improvements to County and State roadways. Local roadway improvements will be phased with development.

Sanitary Sewer System

The estimated sewer flow rate for the Northwest Expansion Area is 1200 gallons per acre per day. All areas within the AUAR study area will be served by sanitary sewer, with the exception of 4 existing neighborhoods, based on the City's Comprehensive Plan (1998). The existing neighborhoods will be served with sanitary sewer only if necessary for health reasons, or if the neighborhoods request this service. The proposed City trunk sewer system will connect to the MCES regional system. Proposed sewer system alignments have been routed to avoid impacts to proposed stormwater infiltration basins and areas of high quality natural resources.

The City will construct sanitary sewer improvements to serve the AUAR area in general accordance with the 2020 Comprehensive Plan for the City. The sewer flows from this area will go to the MCES interceptor systems and Metropolitan Wastewater Treatment Facility, which has capacity available to serve this area.

Municipal Water System

The City of Inver Grove Heights currently operates six municipal supply wells with a total ground-water appropriation of 1250 million gallons per year (MGY) in 2003. The wells are used on a rotation schedule.

The project area will be served by expanding the existing municipal water supply system. Development of the project area will require additional appropriation of ground water for municipal water supply. Five additional wells will likely be required to meet the ultimate system demand. The number of new wells

required will depend on the capacities of the future wells. The ultimate projected municipal water system demand is 2295 MGY.

New wells will be completed in the Jordan Sandstone portion of the Prairie du Chien-Jordan aquifer system. Each new well is expected to have a capacity of 1200 gpm. While the City's current wells will experience a gradual increase in pumping and additional wells will be constructed, the aquifer is expected to be able to accommodate the additional withdrawals, based on recent tests. New wells will be constructed prior to development.

Stormwater System

The City's Surface Water Plan for the Northwest Expansion Area proposes an approach that minimizes connected impervious surfaces, increases flow path and time over pervious surfaces, and decentralizes treatment in local and regional infiltration areas. The approach focuses on a variety of local Best Management Practices, and collection and further treatment/infiltration of excess water in the numerous existing natural basins in the area. The plan includes a number of alternative practices with infiltration to provide for pretreatment before discharge to wetland basins and preserves the infiltration capacity of the natural basins.

The land use plan features relatively large green spaces and corridors to allow for storm water infiltration and collection in the regional basin areas. These areas are located within the low to medium density residential areas and open space areas shown on the land use plan.

29. *Related Developments; Cumulative Impacts*

Minnesota Rule part 4410.1700, subpart 7, item B requires that the RGU consider the "cumulative" potential effects of related or anticipated future projects when determining the need for an environmental impact statement. Identify any past, present or reasonably foreseeable future projects that may interact with the project described in this EAW in such a way as to cause cumulative impacts. Describe the nature of the cumulative impacts and summarize any other available information relevant to determining whether there is a potential for significant environmental effects due to cumulative impacts (or discuss each cumulative impact under appropriate item(s) elsewhere in this form.

This item does not require a response for an AUAR with respect to cumulative impacts of potential developments within the AUAR boundaries, since the entire AUAR process is intended to deal with cumulative impacts from related developments within the AUAR area; it is presumed that the responses to all items on the EAW form encompass the impacts from all anticipated developments within the AUAR area.

However, the questions of this item should be answered with respect to the cumulative impacts of development within the AUAR boundaries compared with past, present and reasonable foreseeable future projects outside of the AUAR area, where such cumulative impacts may be potentially significant.

Much of the area around the Northwest Expansion Area is already developed, including areas in Eagan to the west, Mendota Heights and Sunfish Lake to the north, and portions of Inver Grove Heights to the east. The difficult topography of the Expansion Area has contributed to delay of development in this area, so that it is a relatively large area of "infill" development within this part of the Metro Area. Therefore, cumulative impacts resulting from future projects in the area around the AUAR area are likely to be limited.

The City of Eagan is currently looking at a variety of options for additional development in the area to the west of the AUAR area, near Interstate 494. Depending on the land use options identified for the future of this area, development here could result in traffic impacts that along with development in the AUAR area are significant for regional roadways. The cities of Eagan and Inver Grove Heights have been working together and sharing traffic data from the AUAR study and studies in Eagan, and will use this information to examine potential cumulative impacts on roadways in the area.

The Traffic analysis section notes the need to expand several regional roadways to accommodate the traffic expected from development of the AUAR area. This includes expanding TH 3 to a 4-lane roadway within the project area. Other recent environmental review documents completed for communities in Dakota County (Farmington and Empire Township) have also indicated the need to expand the capacity of TH 3. This route is currently designated for "Preservation" by the Minnesota Department of Transportation. These issues have been discussed with M/DOT staff during other AUAR processes, and the agency is aware of these issues.

The storm water management system proposed for the AUAR area is planned to avoid impacts to adjacent areas, and therefore no cumulative impacts are expected with projects in adjacent areas.

The Comprehensive Plan completed by the City of Inver Grove Heights, which includes proposed development in the AUAR area, addresses the growth planned for the community by the Metropolitan Council, and plans for the infrastructure needed to accommodate this growth, in light of growth expected in surrounding areas. The proposed infrastructure is consistent with the capacity of regional systems to serve this area. The City's Comprehensive Plans, plus the special studies completed for the AUAR area, including the Natural Resources Inventory and Management Plan, sewer and water studies, stormwater studies, traffic management studies, and related plans along with this AUAR have identified the potential impacts of development across the AUAR area, and have prepared strategies and approaches to avoid impacts where possible, and mitigate for other impacts, while maintaining the amount and types of growth proposed in the City's Comprehensive Plan.

AUAR Update: The City of Eagan completed the Northeast Eagan Land Use Study in June 2005. The result of that study was that the current Comprehensive Plan should continue to guide development in the northeast area of Eagan.

Dakota County, along with the City of Eagan, the City of Inver Grove Heights, and with FHWA, Mn/DOT, Met Council , the City of Mendota Heights, and the City of Sunfish Lake have completed the Dakota County North-South Corridor Study: Eagan-Inver Grove Heights Travel Demand Study. The objective of this study was to conduct a travel demand model study to forecast future traffic flow concentrations and patterns as a result of the increased future development identified by local plans in the NE Eagan and NW Inver Grove Heights area. The travel demand model study included forecasting travel demand on all major city, county, and state highways within the study area. Completion: The study was completed in July 2007. Dakota County, the City of Eagan, and the City of Inver Grove Heights are in the process of approval consideration at the Board/Council level.

30. *Other Potential Environmental Impacts*

If the project may cause any adverse environmental impacts, which were not addressed by items 1 to 28, identify them here, along with any proposed mitigation.

None identified.

AUAR Update: This AUAR Update does not introduce any other adverse environmental impact that has not been addressed previously.

31. *Summary of Issues*

List any impacts and issues identified above that may require further investigation before the project is commenced. Discuss any alternatives or mitigative measures that have been or may be considered for these impacts and issues, including those that have been or may be ordered as permit conditions.

The Mitigation Plan that follows identifies the issues that might impact the Annexation Area and the mitigation steps to be taken.

AUAR Update: The AUAR Update has reviewed and updated the Final Mitigation Plan for the Northwest Expansion Area AUAR, dated August 2005. The Final Mitigation Plan Update follows as separate document.

ATTACHMENTS