Preliminary Engineering Report

Long Lake Annexation – Phase 4 | Sanitary Sewer & Watermain Improvements
City of Detroit Lakes, MN
Certification

Long Lake Annexation – Phase 4 | Sanitary Sewer & Watermain Improvements
City of Detroit Lakes, Minnesota
Apex Project Number 15.178.0162

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

______________________________          Jon A. Pratt
Signature              Typed or Printed Name

October 5, 2017            46267
Date              License Number

October 2017
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1.0 Introduction and Background

In 2002 the City entered into an orderly annexation agreement with Detroit Township to begin the annexation of property surrounding Long Lake. The annexation was structured such that areas became annexed over the course of about seven years, beginning with the south/southeast side and concluding with the north and west sides of the lake in 2015. The annexation agreement includes provisions for the City to install sanitary sewer, watermain, and other infrastructure to the annexed areas. The City has completed several infrastructure improvement projects over the last 10 years that have provided this infrastructure to phases 1 and 2 (south and east sides of Long Lake) of the annexation.

The initial phases of infrastructure extensions to the eastern and southern portions of the annexation areas were somewhat straightforward in terms of the layout, sizing, and configuration of the systems. As the City began to plan for further infrastructure extensions around the north and west sides of Long Lake, it became more critical that a broader analysis and planning process be completed to ‘master plan’ the sanitary sewer and watermain to these areas. The infrastructure installed on the north side of the lake would have directed, and potentially, limited impact of what could be done along the west side of the lake in terms of ultimate development. Accordingly, the City commissioned a master planning study in 2016 that evaluated and analyzed existing infrastructure capacities, infrastructure layout and configuration options, demands of current of future development, etc. This study is 90% complete but is not being finalized at this time due to some future land use uncertainties related to a proposed mining operation. However, the master plan has been developed sufficiently to provide the information and guidance needed to confidently proceed with the extension of infrastructure to the northern end of Long Lake. The recommendations contained in the draft master plan are utilized as a basis for many of the recommendations contained in this report.

The City is currently developing plans for the next phase of infrastructure extensions. This next phase will include the north end of Long Lake as illustrated in Figure No. 1 below. As part of the preliminary project development process, the City has held two public input meetings with property owners within this project area. Input from these meetings has been utilized in developing some of the preliminary design recommendations.

Figure 1: Project Location Map

![Project Location Map]
1.1 Purpose and Scope of Report

The Detroit Lakes City Council has authorized Apex Engineering Group to develop the preliminary design and this Preliminary Engineer Report (PER) to provide further information and detail related to the necessary infrastructure improvements such as streets, stormwater, sanitary sewer, and watermain. The City of Detroit Lakes would design, construct (by contracting), and own/operate the required infrastructure.

The scope of this PER (study) will include sanitary sewer, water distribution, stormwater collection and treatment, streets, grading, and multi-use trail. This study will review the existing conditions and project needs, examine improvement options along with recommended improvements, easement needs, project costs, and funding/financing options. The purpose of this study will be to evaluate the improvement needs/options, cost effectiveness, feasibility, and make preliminary design recommendations that can be utilized as a basis and guidelines for the final design process.

1.2 Schedule

The City’s current Capital Improvement Plan (CIP) has scheduled the construction of the Long Lake – Phase 4 improvements for the summer of 2018. This construction schedule is subject to change at the directive of the City Council. However, the present intention is to start construction as soon as possible in the spring of 2018 and substantially complete the project in the fall of 2018. Based on this, the following table outlines the project development schedule.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Date(s)</th>
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<tbody>
<tr>
<td>Master Planning</td>
<td>Winter 2017</td>
</tr>
<tr>
<td>Public Informational Meeting</td>
<td>August 16, 2017</td>
</tr>
<tr>
<td>Complete Preliminary Engineering Report/Design</td>
<td>October 2017</td>
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<tr>
<td>Public Improvement Hearing</td>
<td>November 2017</td>
</tr>
<tr>
<td>Final Design</td>
<td>December 2017 – February 2018</td>
</tr>
<tr>
<td>Approve Plans &amp; Authorize Bidding</td>
<td>March 2018</td>
</tr>
<tr>
<td>Open/Award Bids</td>
<td>April 2018</td>
</tr>
<tr>
<td>Begin Construction</td>
<td>May/June 2018</td>
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<tr>
<td>Construction Substantially Complete</td>
<td>October 2018</td>
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<tr>
<td>Assessment Hearing</td>
<td>November 2018</td>
</tr>
<tr>
<td>Final Construction</td>
<td>Spring 2019</td>
</tr>
</tbody>
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1.3 Related Reports and Plans

Several sources of information were utilized in the development of this report. These include:

- Historical records, as-built drawings and drawings provided by the City of Detroit Lakes
- Visual field investigation and observations
- Discussion with City staff, Pelican River Watershed District, and input from public meeting(s)
2.0 Existing Conditions and Project Needs

The following sections outline the need and purpose of the project along with the conditions of existing infrastructure within or adjacent to the project area. The information contained in the subsequent sections was derived from review of existing record drawings, as-built plans, City utility maps, field investigation, and discussion with City staff. Existing infrastructure is depicted in Exhibit No. 1 (Preliminary Project Layout), located in the Appendix of this report.

2.1 Existing Land Use

This area includes both mild topography with gentle slope and grades and some areas with moderate to significant rolling terrain with substantial elevation change and grades. The central portion of the project area is rolling terrain with areas that have 15 feet of elevation change in relatively short distances. Most of the area slopes towards Long Lake, wetlands, or the TH ditch, and has good drainage.

The project area is predominantly wooded and lawn areas. There are some areas, primarily along TH 10, that are more openly developed, and undeveloped land with grass cover.

Soils in most of the project area are anticipated to include gradual/sandy well-drained soils within hydrologic soil group A or B. However, some isolated low-lying areas will likely be comprised of heavy clays or organic soils. These areas are most likely in some of the low-lying areas adjacent to wetlands. Based on the proximity of Long Lake and wetlands, it is also anticipated that groundwater will be factor in some locations. Generally, groundwater elevations are anticipated to range from 3 to 20 feet below the ground surface. At these elevations, groundwater will impact utility installation in some areas. Soil borings will be required during the design process to further confirm soil types and groundwater elevations.

A majority of the project area is comprised of single-family residential housing, especially along the lakeshore of Long Lake. There is also some existing commercial property along TH 10 and a resort in the central portion of the project location. There is a significant amount of undeveloped property scattered throughout the project area. Most of the undeveloped areas (suitable for development) is located along TH 10 and would likely be developed as commercial type property in the future.

Most of the project area has been platted. The existing lakeshore lots range in size from one-half to one-acre lots. There some larger five to 10-acre lots throughout the project area that are both developed and undeveloped. Some of these areas will likely be developed with single or multi-family housing, and other areas along TH 10 will likely be developed as commercial properties. The project area is zoned as either R-2 or B2. Nearly the entire project area lies within the 1,000-foot Shoreland Impact Zone (SIZ) of Long Lake.
2.2 **Sanitary Sewer**

There is no existing sanitary sewer collection system within the project area. Septic systems provide service to existing developed properties. There is an eight (8)-inch PVC sanitary sewer adjacent to the project area along the west side of the airport. This sewer was constructed in 2015 with the intention of providing sewer service to the project area. The terminus of this sewer is approximately 25 feet deep. The existing sanitary sewer location and configuration is illustrated in the project layout plan located in the Appendix of this study.

The existing sanitary sewer discharges to the Brainerd Lift Station (no. 47) located near Long Lake Road. This lift station pumps effluent via a six (6)-inch PVC forcemain directly to the City’s Waste Water Treatment Facility (WWTF) located on Willow Street. Both the collection system and lift station have the capacity to handle the additional volume that would be generated by project area.

The Brainerd Lift Station and forcemain may require upgrades if growth on the west side of Long Lake continues and begins to reach its ultimate buildout. Based on future growth projections, lift station no. 47 should be of sufficient capacity for the next 10 years. At this time, possibly before, the existing pumps will be due for replacement. Prior to any pump replacements at this station, the flows and capacities should be reviewed.

2.3 **Water Distribution**

There is no watermain installed within the project area. Private wells (both deep and sand point) provide service to existing developed properties. There is an existing 12-inch PVC watermain adjacent to the project location along the west side of the airport. This watermain was constructed in 2015 to create a loop in the distribution system from the north end of Longview Drive to the north side of the airport and to provide the ability to extend water service to the project area. The existing watermain location and configuration is illustrated in the project layout plan located in the Appendix of this study.

There are no known deficiencies with the adjacent distribution system, and extension of this system would have the capability to provide adequate service to the project area.

2.4 **Stormwater Collection and Treatment**

There is no current storm sewer system collection or treatment within the project area. Drainage is generally directed over land to Long Lake, wetlands, or the TH 10 ditch system. Portions of the existing roadways have a ditch and culvert system to convey stormwater runoff. However, some areas do not have any defined drainage system. There are no known drainage issues or areas prone to nuisance flooding.

The Pelican River Watershed District does own an easement over the existing wetland between North Long Lake Road and TH 10. They purchased an easement over this area that allowed them to install an outlet/control structure that raises the elevation of the wetland. The wetland ultimately discharges to Long Lake through a ditch. The control structure prevents discharge to
the ditch until the wetland reaches a higher elevation. This has helped to reduce algae blooms in the lake.

2.5 Street
There are several existing streets within the project area that provide access to areas of existing residential housing. The existing streets consist of 22-foot to 24-foot rural section (no curb and gutter) streets with bituminous surfacing. The date of original construction is unknown. There is evidence that portions of the streets have been overlaid, patched, or otherwise repaired in the past.

The condition of the existing street surface varies from location to location. In general, most of the streets have moderate levels of deterioration including transverse thermal cracking, longitudinal cracking, alligator cracking, heaves and other surface deficiencies. Some locations, specifically along the low-lying portions of North Long Lake Road, contain more pronounced and severe deterioration.

3.0 Proposed Improvements
In order to provide municipal water and sanitary sewer service to the project area, it will be necessary to make various infrastructure improvements. The following sections outline the proposed and necessary improvements. The proposed water, sanitary sewer, stormwater, and street improvements are outlined in the preliminary project layout plan located in the Appendix of this study.

3.1 Design Standards
Various design standards, practices, and regulatory guidelines will be utilized for preliminary recommendations and should be applied to the subsequent design of the proposed improvements to the project area. The following summarizes the most applicable regulatory design standards.

Sanitary Sewer: Design will be in accordance with the Minnesota Pollution Control Agency (MPCA) and the Ten States Standards for Wastewater Facilities.

Watermain: Design will be in accordance with the Minnesota Department of Health (MDH), Ten States Standards for Water Works, and general City design practices.

Street: Streets will be designed and constructed in accordance with City standards and typical practices.

Stormwater Treatment: All stormwater treatments will be designed in accordance with the Pelican River Watershed District (PRWD) and Minnesota Pollution Control (MPCA) requirements.

Storm Sewer: Design will be in accordance with MNDOT state aid drainage design manual for a two-year, 24-hour storm event.
In addition to the above regulatory standards, the project will be designed in accordance with recommendations made in the preliminary draft of the Long Lake Sanitary Sewer and Watermain Master Plan. This primarily pertains to the sizing of sanitary sewer mains, forcemains, and lift stations, and watermains. It is important to note that this master plan has not been completed or adopted at the time of this study. The completion of the master plan is pending other factors. However, the master planning has been completed to a level that sufficiently addresses the needs and recommendations of infrastructure through this phase of the Long Lake Annexation.

3.2 Sanitary Sewer

A number of sanitary sewer layout and configuration options were developed and evaluated with the previous master planning and again with this study. The existing sanitary sewer system is located southeast of the project area along the west side of the airport. This sewer was installed at a depth of more than 25 feet below ground surface in anticipation of sewer extension to the Long Lake Lane neighborhood. The intention was to extend this gravity main to provide service to all or most of this development without the need for an additional lift station. After evaluation it was determined that this main did not have sufficient depth to provide service to this development and another lift station would be required in the Long Lake Lane area.

Once it was determined a lift station was needed, careful consideration was given to siting one lift station in a location that would provide service to the entire project area (Long Lake Lane, Highway 10, and North Long Lake Road areas). Several configurations and layouts were reviewed, however, all of them resulted in significant constructability concerns including excessive sanitary sewer depths (30'+) in some locations, and installation of gravity sanitary sewer across several private properties, through wetland areas, and along Long Lake-sides of homes. Additionally, these sewers would be difficult to access with maintenance equipment in some locations. After further review with City staff, providing service with one single lift station was not considered to be viable.

It was ultimately determined that two lift stations would be needed in the project area in order to provide adequate service depth, avoid excessively deep sewer, maintain good constructability, and provide reasonable access for future maintenance. This is a relatively small project area and service area for two lift stations (approximately 125 acres). However, there are offsetting benefits and cost savings to justify this approach. The associated gravity collection system can be constructed at a much more shallow depth and with substantially less dewatering. These factors result in significant construction cost savings. Also, the gravity collection will generally be installed within existing ROW corridors, minimizing permanent easement acquisitions and impacts to private properties.

The recommended sanitary sewer layout is illustrated in the preliminary project layout plan located in the Appendix of this report. The proposed sanitary sewer will consist of eight (8)-inch PVC mains, four (4)-inch PVC service laterals (six (6) inch to commercial properties), and precast
concrete manholes. Clean-out assemblies will be installed on each service lateral at or near the edge of the property line. The collection system will discharge to one of the two lift stations that will be installed with the project improvements.

It should be noted that some properties in the project will require further sanitary sewer extension to provide service to the property. Foltz Buildings is within the service area of the lift station but will not have direct access to a sewer main. A sewer main would need to be extended east from the TH 10/Long Lake Lane intersection to provide service to this property. However, the property may ultimately need to be purchased by the airport for air spacing needs. Accordingly, it has been determined that waiting for the development of the long term plans of this property are in the City’s best interest prior to investing in a sewer extension to the property.

There are also some large undeveloped parcels of property that would have access to sewer (and water) around the perimeter or edge of the property. However, additional sewer (and watermain) extensions may be needed ‘into’ the property, depending on how the properties are ultimately developed. This could include extension of mains that are owned/operated by the City or extension of long-service laterals. An example of this is situation is Lakecrest Resort. Municipal sewer and water will be installed along the northern edge of the property in the TH 10 ditch. This will provide good access to sewer and water for the northern portion of the property. However, the existing resort buildings are located on the southern portion of the property, a substantial distance from TH 10. Service to the developed portion of the property could be provided by long service laterals installed by the property owner. Conversely, City-owned sewer (and water) could be extended into the property. This would be a substantial cost and one that should likely be assigned to the property (via a special assessment). This option could restrict the future subdivision or development of the property if/when this occurs. For purposes of this report it is assumed that service to the developed portion of the resort will be completed by long service laterals installed by the property owner. Further discussion with owners of Lakecrest Resort, and similar properties will take place during final design, to provide additional clarity to these types of situations.

3.2.1 **Sewer Service Connections**

As stated in the preceding sections, service laterals will be extended to the edge of adjacent properties (edge of ROW). It will be the responsibility of the property owner to install the remaining portion of the service lateral from the clean-out located at the edge of the property to the structure or existing septic system.

The collection system will be designed in a manner that provides the ability for gravity service connection to most of the adjacent homes. However, there are cases and factors that will prevent the ability to provide a gravity connection to all adjacent properties. Some of the adjacent homes sit well below the street elevation on lots that slope to Long Lake. It is not practical to construct a collection system with adequate depth to provide gravity service to these type of properties. It would require sewer
main depths in excess of 25 feet. At this depth, the trench for the service line connection to the home or existing septic would be extremely wide and result in substantial tree loss, impacts to homes or other structures, and result in significant cost.

There are other cases where the sewer main may have adequate depth to provide a gravity connection, but other factors such as lot size/space, building locations, septic locations, etc., that would make a gravity connection difficult or impractical.

In cases where gravity service cannot be extended to the existing home or septic (due to depth or other impracticality), the property will need to install an individual grinder pump. These are typically installed near the location where sewer exits the structure or near the existing septic system. These units are available in self-contained systems that contain a storage tank, progressive cavity pump, electrical components, and alarm/monitoring system. Figure 2 illustrates the configuration of these units.

**Figure 2: Grinder Pump Station**

Sewer from the home is discharged to the lower tank and then pumped through a small (+/- 2-inch) forcemain to the sewer service/cleanout located at the edge of the property. Because the discharge from these units is pressurized and does not rely on a gravity/graded pipe, the discharge forcemain can be installed at a much shallower depth. Typical the discharges are installed around eight feet deep to provide protection from freezing/frost. This results in far less impact to the property, trees, and structures compared to a deeper, open-cut trench for a gravity service line.
These systems have been installed in conjunction with City annexation and sewer projects in the past. They appear to provide reliable service and a good solution in cases where gravity service cannot be reasonably provided to a property. Historically, the City has provided these units to property owners (involved in annexation projects) where gravity sewer service is not possible. Further discussion is needed to determine if these units will also be provided to properties that can be serviced by gravity but have some level of impracticality (or just properties that physically cannot be serviced by gravity due to sewer main depth).

3.2.2 Lift Stations

Two lift stations will be installed as part of the sewer improvements. Lift Station A will be located along the west side of Long Lake Lane and Lift Station B will be located along the north side of North Long Lake Road. Lift Station B will discharge to the gravity sewer that discharges to Lift Station A. Ultimately, all effluent collected from the project area is discharged to the existing gravity collection system along the west side of the airport. This system discharges to the Brainerd Lift Station and is pumped to the Wastewater Treatment Facility.

The capacity of the downstream collection system and lift stations were analyzed as part of the master planning study for this area. It was concluded that the downstream system has adequate capacity to handle the full build out of this project area. Future improvements to the downstream system may be required if development on the west side of Long Lake reaches its ultimate development.

Design criteria for lift stations and forcemains shall be in accordance with Ten State Standards, recommendations from the Hydraulic Institute (HI), general industry.
standards, and preferred practices and design requirements of the City. The lift stations will hydraulically be designed to accommodate future loads created by further expansion of the municipal sewer system around the west side of Long Lake. This criteria is established in the Long Lake Master plan (still in draft form).

The City of Detroit Lakes primarily utilizes submersible-style lift stations. This style of lift station is well suited for small to medium sized pump stations. Separated valve vaults housing check and isolation valves are recommended in conjunction with these style lift stations for ease of access and maintenance, however, the City has elected not to utilize separated valve vaults; rather buried isolation valves and vertical ball check valves within the wet well. This type of design (no valve vault) will be utilized for these stations.

The wet wells will be of precast concrete construction and sized to accommodate a minimum of two pumps. Generally, this results in a minimum wet well diameter of six feet. The required storage volume of wet wells must be sized for the ultimate anticipated flow of the incoming sewer. Proper storage reduces excessive cycling of the pumps, which should generally be limited to roughly six to eight starts per hour. Additionally, the effective volume per 10 State Standards shall be based on the design of the average daily flow and a fill time not to exceed 30 minutes.

Pumps will be sized to meet the following guidelines and criteria:

- The pumps shall be sized such that the firm capacity is met with one pump out of service.
- Discharge piping within the lift station and forcemain shall be a minimum of four inches in diameter.
- To reduce risk of sedimentation within piping, the velocity within the vertical discharge pipes shall be a minimum of 3.5 feet per second, and the velocity within horizontal discharge piping and forcemain should be a minimum of 2.0 feet per second.
- The maximum velocities within the lift station and forcemains shall be 12 feet per second and eight feet per second, respectively, to avoid excessive head loss.

### 3.3 Water Distribution

The City’s municipal water system will be extended throughout the project area. Watermain will be extended from the existing 12-inch water transmission line along the west side of the airport. The watermain will generally be installed within the existing ROW corridors and along the south side of TH 10 as illustrated in the preliminary project layout plan. The water distribution improvements will generally consist of six (6)-inch and 12-inch PVC mains, one (1)-inch High Density Polyethylene (HDPE) laterals, isolation gate valves, and hydrants. Hydrants will be spaced approximately every 300 – 400 feet throughout the developed project area for purposes of fire protection and watermain flushing. Spacing may be increased in undeveloped
or watermain looping areas. Larger service laterals will be installed to existing or potential commercial properties. Service laterals will be extended to the edge of the ROW (edge of property). It will be the property owners’ responsibility to complete the connection of these service laterals to the structures plumbing system or well discharge line.

3.3.1 Looping Considerations
The proposed configuration of the water system includes the extension of a 12-inch water transmission line through Long Lake Lane, west along the TH 10 ditch and to the intersection of North Long Lake Road and West Long Lake Road. This provides the ability to extend a higher capacity watermain around the west side of Long Lake at such time that municipal utilities are extended to that area. The proposed layout also eliminates dead-end watermains at the western edge of the project area. These can be problematic and require routine (or constant) flushing due to a lack of demand, until the area is more fully developed. The looped configuration also provides redundancy and flexibility for future maintenance operations and better access to the watermains for undeveloped property.

A portion of the watermain will be considered looping and result in additional non-assessable cost (paid by the water utility). Alternatively, the 12-inch transmission line could be routed along North Long Lake Road. This would reduce the amount of required watermain and project costs. However, it would not offer the benefits of a looped system as described above.

The City has also expressed a desire to construct a watermain loop between Long Lake Lane and the existing watermain at the northwest corner of the airport. This would provide additional system redundancy and direct access to water service at the Foltz Building property. If this loop is constructed it is recommended that it consist of a 12-inch pipe. This would then function as the primary transmission main and allow the watermain loop through the Long Lake Lane area to be reduced to an 8-inch main. For purposes of this report the 12-inch watermain loop (Long Lake Lane to airport) has been included in the project costs as ‘Watermain Looping/Transmission’, which is a City cost. This option will be evaluated further in the final design.

3.3.2 Anticipated Pressure and Fire Flow
Water-modeling software was utilized during the master planning process to evaluate various sizes and configurations of watermain for this area and the area on the west side of Long Lake. Both current and future demands of the areas were input into the model to aid in determining the adequacy and configuration of the water distribution system in this area. This analysis determined that a 12-inch transmission main would provide the best solution for current and future demands.

Based on the analysis in the master planning study the proposed water distribution system, upon completion of the proposed improvements, will provide fire flows in the area of +/- 1,000 GPM. This is generally considered adequate for residential areas. It is
however lower than desirable for commercial areas, if the area along TH 10 continues
to develop with commercial properties. System pressures during normal system demand
are predicted to be in the range of 40 to 50 PSI in the project area, depending on
location. This pressure is mostly a function of elevation. Areas of higher elevation will
experience pressures on the lower end of this range while areas in lower elevations will
see the high end of this range. Generally, pressures in this range are considered low but
above the acceptable limit of 40 PSI. Some existing homes that are currently operating
with a well and pressure tank may notice a decrease in pressure. This can be mitigated
by the installation of a booster pump in the individual plumbing system.

As the area continues to develop (specifically the west side of Long Lake) additional
steps, such as booster station(s) or elevated storage will be required. However, the
short to mid-term needs will be met with the proposed 12-inch watermain.

3.4 Street & Surface Improvements

The existing streets within the project area vary in condition. Most are showing signs of
moderate to significant deterioration and warrant improvement or replacement based on these
conditions. Regardless of their current condition, the streets within the project area will need to
be removed to facilitate the installation of the underground utilities (sanitary sewer and
watermain).

The streets within the project will generally be replaced with 28-foot wide rural section street
(no curb and gutter) with bituminous surface. This section is similar to the configuration of
other low volume/local access streets constructed in previous phases of the Long Lake
improvements (Longview Drive, Longview Lane, etc.). West Long Lake Road is a collector street
with additional traffic volume that is anticipated to increase over time. Accordingly, this street
will be built to a 32-foot width to provide for additional shoulder area. The low volume streets
will be built to a five (5)-ton design standard. West Long Lake Road will be constructed to a 10-
ton design standard due to the potential for heavier loads and higher traffic volume.

The proposed street section is slightly (+/- four feet) wider than the existing streets, in an effort
to provide some shoulder space for pedestrians. It should be noted that this is not enough
width to provide designated pedestrian/bike lanes or on-street parking. The minimum width for
a dedicated pedestrian/bike lane is four feet. This would require the road to be 32 feet wide.
Based on public input it was more favorable to keep the streets as close to their current width as
possible to limit impacts to adjacent properties, provide adequate space for ditching/drainage,
and limit impact to trees. Given the nature of the street service (local access) and low traffic
volumes, the 28-foot width is adequate for the projected use. If the City plans to dedicate
bike/pedestrian lanes in this area, the street width should be increased to at least 32 feet.

Based on anticipated subgrade soils, significant subgrade corrections are anticipated to be
necessary except in isolated areas. There may be a few low-lying or areas adjacent to wetlands
where subgrade correction will be necessary. Soil borings and geotechnical recommendations
will need to be completed during the final design process to further confirm subgrade conditions as well as groundwater elevations.

3.4.1 **Grading & Alignments**

The proposed streets will be graded such that they closely match the existing street grades/elevation and follow the general topography of the area. Vertical alignment changes will generally be minor (less than one foot). Minor filling and excavation may be required in some locations to achieve the desired alignments, grades, and drainage. The most noticeable grade changes will occur in the ditch areas along the streets. Ditches/swales will be needed to properly capture, convey, and/or treat stormwater runoff in accordance with current PRWD requirements. This will result in more pronounced ditches along the streets in many locations, compared to the current conditions. The ditches will be designed to hold water for treatment/infiltration purposes, and not to convey runoff as ditches were traditionally designed for.

It is typical/general practice to align streets within the center of a Right-of-Way (ROW). Some of the existing streets, most notably Long Lake Lane, are offset within the ROW. Streets will generally be shifted closer to the center of the ROW when possible and when a shift does not create adverse impacts to an adjacent property. In some cases, this shift would result in significant tree removal, grading conflicts, or other undesirable impacts. In these cases, the proposed street will be left closer to the existing alignment.

3.4.2 **Long Lake Lane/TH 10 Intersection**

The northern end of Long Lake Lane alignment currently has a substantial jog to the east where it intersects TH 10. The jog creates two sharp 90-degree corners and an undesirable alignment. It is preferable to remove this jog and create straight alignment with Long Lake Lane. This will require the TH 10 access to be shifted approximately 180 feet to the west and reconstruction of left/right turn lanes on TH 10. The existing access would be removed and vacated. This would result in the need for a new access to Wold’s RV from Long Lake Lane.

The shift of this access would require a permit/approval from MnDOT due to access control requirements on TH 10. It is uncertain at this time if MnDOT will grant this approval. Also the new access alignment would add a fair amount of cost to the project. It is recommended that the City pursue this option and consider shifting this access as described. However, it is not an absolute requirement. The approach and street alignment could remain as is if the shift becomes impractical to accomplish. For purposes of this study, it is assumed that the access will be shifted west as suggested.

3.4.3 **Pedestrian Facilities & Multi-Use Trail**

There has been brief discussion and suggestion during the initial project development that a multi-use trail should be extended from Long Lake Lane to Airport Park. This would provide pedestrian/bike access from the Long Lake Lane neighborhood to Long Lake Park.
There are currently no other trails within the vicinity to connect this trail to that would create larger trail system. However, the City’s long range multi-use trail plan does include the construction of a multi-use trail from Dunton Locks County Park to Long Lake Park and potentially to TH 10. This is part of an effort to bring an extension of the Heartland Trail through Detroit Lakes and to Moorhead. The multi-use trail proposed with this project could potentially be part of this system at some point in the future.

The potential multi-use trail is shown on the preliminary project layout plan in the Appendix of this study. It should be noted that a trail constructed in this location would see very limited use at this time. Use would be primarily limited to the Long Lake Lane neighborhood. It would not connect to any other trail system or other public destination that would generate broader use. Also, there is currently no plan of how the trail would extend further north to TH 10 or other adjacent residential areas such as North Long Lake Road.

If the City determines that this project will include the construction of a multi-use trail to Long Lake Park, it is suggested that concept be developed further to determine if/how the trail could be extended to TH 10 or to other residential areas. Alternately, the trail could be constructed at some future date when there has been more multi-use trail development in this area. For purposes of this report, the multi-use trail is considered an optional improvement.

### 3.5 Stormwater Collection and Treatment

Stormwater runoff from the project area, specifically the reconstructed street corridors, will need to be collected and treated in accordance with PRWD regulations. Watershed regulations require compliance with their current rules upon reconstruction of a street, as proposed with this project. There is no storm sewer or stormwater treatment within any of the proposed project area. Implementation of storm water collection and treatment in these situation (existing developed areas) can be challenging. To some degree this is made more difficult by the use of rural section streets, as proposed with these improvements.

The ultimate extent, type, and details of the stormwater treatment and collection cannot be accurately determined within the scope of this preliminary study. These elements require significant calculation, survey, modeling, consultation with regulatory agencies, and are closely connected to the street/site grading that is generally completed as part of the final design process. The preliminary recommendations are based on several assumptions, engineering judgement, and past experience with similar situations. Accordingly, the recommendations contained in the following paragraphs are considered preliminary but are sufficient for purposes of this study.

The proposed streets will generally include the construction of rural section roadways that will include shallow ditches and swales to collect and convey stormwater. These will be graded along the streets to capture and hold stormwater that is directed to or created by the streets.
The proposed grading design will attempt to maintain current drainage patterns to the extent possible. These ditches will be designed to hold and infiltrate stormwater. There may be areas where ditches are not practical, and concrete curb and gutter will be required to convey runoff to a ditch or other area.

All stormwater runoff will need to be treated in accordance with PRWD (and MPCA) regulations prior to discharge. The preferred option is to utilize the ditches and other available ‘green’ space within the street ROW corridors. This provides an opportunity to treat all or at least a portion of the runoff volume by infiltration. This is a favorable method of treatment by regulatory agencies and is the most cost-effective means of treatment. Infiltration will be utilized to the extent possible though the project corridor for treatment. However, this will result in designing ditches to actually hold water for up to 48 hours after a storm event. This is a factor that is a common source of complaints for adjacent properties. Occasionally it is perceived as a design error or oversight, but it is actually intentional. These misperceptions can be mitigated to a degree through public education of the adjacent properties.

It is unlikely that infiltration within the ditch space will provide enough treatment volume for the entire volume of runoff. The ditches will likely need to be designed with overflow routing to a more centralized treatment basin. This may result in the City having to purchase property or permanent drainage easements that will provide space for additional treatment basins. These will generally be located near low lying areas prior to stormwater discharge locations.

This section outlines the general and preferred approach to the proposed stormwater management. However, details and potentially other options for the stormwater treatment and collection will need to be refined and developed as part of the final design process.

3.6 Lighting & Electrical Distribution

Detroit Lakes Public Utilities (DLP) is in the process of acquiring the electrical service territory from Wild Rice Electric within the project area and around the west side of Long Lake. It is typical for Public Utilities to acquire service areas from other providers in conjunction with annexations around the City. DLP plans to replace the existing electrical distribution system within the project area in conjunction with the proposed sanitary sewer and watermain improvements. These electrical improvements are not included in the scope of this study and will be completed by DLP crews. However, the improvements will be coordinated to the extent necessary to provide to construction coordination and efficiencies.

Public Utilities will also install street lighting to City standards throughout the project area, excluding areas along TH 10. Lights are typically spaced at 300-foot to 500-foot intervals and at intersections. This work will likely be constructed by the electric utility along with the replacement of the existing electrical distribution systems. This work is outside the scope of the study. However, lighting installed by the electric utility is paid for by the City and is included in the project costs for budgetary purposes.
4.0 Other Design and Construction Considerations

4.1 Permits

Various permits from regulatory agencies will be required for the proposed improvements.

**MPCA (Stormwater and Erosion Control):** The MPCA is responsible for administering the National Pollution Discharge Elimination System (NPDES) permits for stormwater construction. This covers both stormwater treatment and erosion/sediment control. A permit application will need to be submitted for the project since it is disturbing more than one acre of land.

**MPCA (Sanitary Sewer Extension Permit):** A permit from the MPCA will be required for the extension of the sanitary sewer.

**MDH:** A permit from the Minnesota Department of Health (MDH) will be required for the water distribution system improvements.

**PRWD:** A permit and plan review/approval by the PRWD is required for construction erosion and sediment control, and for stormwater treatment.

**MnDOT:** A permit from MnDOT will be required for work within the TH 10 ROW associated with the installation of sanitary sewer, watermain, and the potential realignment of the Long Lake Lane and TH 10 access.

**City of Detroit Lakes Land Disturbance:** The City is responsible for administering the National Pollution Discharge Elimination System (NPDES) Small Municipal Separate Storm Sewer Systems (Small MS4) permit. This covers both stormwater treatment and erosion/sediment control. Even though this is a City project, a permit application will need to be submitted and approved by the City for this project.

4.2 Temporary/Permanent Easements & Right-of-Way

Both temporary and permanent easements will be required to facilitate the various utility and street improvements. Permanent easements will be needed for various portions of sewer and water utilities, lift stations, and potentially stormwater treatment. Permanent easement would also be required for the optional multi-use trail if the City chooses to proceed with this aspect of the improvements. The permanent easement locations are illustrated on the preliminary project layout plan located in the Appendix of this study. The exact dimensions and configurations of these easements will need to be finalized in the early part of the final design process. Additional permanent easements may be identified during the final design process.

Temporary easements will be needed at many locations throughout the project corridor. These will be required to provide adequate space for utility trenching and storage of excavated trench material. It may also be necessary to perform minor grading beyond the Right-of-Way (ROW), on private property, to properly tie in or create more gentle slopes to ditch and street grades. Temporary easements may also be required for temporary access roads. These easement...
locations have not yet been identified and will be determined in conjunction with the final street grading design.

4.2.1 **Long Lake Lane ROW**

A majority of the existing streets lie within definable legal ROW’s, meaning they are established by a recorded plat or other legal documentation that provides clear ownership record. This does not appear to be the case for a majority of Long Lake Lane. The portion of this street from TH 10 to the point where the street turns to the east does not appear to be within a dedicated ROW. A ‘perceived’ ROW has been create (for purposes of this preliminary design) based on legal descriptions of the adjacent properties. In other words, there is a corridor that remains between the limits of the adjacent properties based on their legal descriptions. Easement documentation was also identified that matches this corridor. However, it does not appear that this easement was ever recorded.

This situation leaves the status and existence of this ROW somewhat in question. The City may have a roadway or utility easement through this area by prescriptive rights or other legal mechanism. However, this is unclear and should be reviewed, investigated and clarified by an attorney prior to completion of the final design and any construction.

4.3 **Construction Impacts & Considerations**

The construction of the proposed improvements will potentially create various impacts to the properties and residents/business within or adjacent to the project areas. The design and contract documents will ultimately incorporate various provisions and requirements that help mitigate some of these impacts. However, it is impractical or eliminate all impacts and inconveniences associated with a construction project such as this. Some of the anticipated impacts are as follows:

- **Trees** – The existing street corridors are relatively narrow and the ROW’s contain a significant amount of trees, hedges, or other vegetation and landscaping features within the limits of the ROW. The design will attempt to avoid these features to the extent practical. However, there will be a large number of these items that will need to be removed to facilitate the installation of underground utilities, street/ditch grading, and other improvements. Some of these items could potentially be removed and reinstalled or temporarily relocated. Also, some new trees will be planted with the construction restoration to help mitigate some of the tree loss.

- **Underground Irrigation Systems** – It is anticipated that some of the adjacent residential properties have underground irrigation systems that extend into the ROW. Legally these systems should not be located within a ROW. However, it has been the City’s practice to restore irrigation systems that are identified and impacted by construction.

- **Dewatering** – The project will likely include some level of groundwater dewatering to facilitate utility installations. This activity has the potential to impact any nearby private
shallower wells. The impact to these wells is mostly unavoidable. However, provisions will be made in the construction sequencing requirements to provide other sources of water supply. This may include temporary service from newly installed watermain or by providing water from a neighboring property containing a deep well that is not impacted by the dewatering.

- **Access** – The project area contains a couple of dead-end streets, Long Lake Lane and the north end of North Long Lake Road. Access to these properties will be difficult (or impossible) during periods of the underground utility installation. Trenching for the underground utilities will consume most or all of the available street/ROW, creating a road block to/from these properties. Temporary access roads will be constructed to provide an alternate access route where possible. If this is not possible, phasing provisions will be incorporated into the construction documents that help minimize or shorten the duration of such impacts.

### 5.0 Opinion of Cost Summary

The following table outlines the cost opinion associated with the recommended improvements contained in this report. There are a number of unknown factors that will continue to be developed in the design phase of this project. Accordingly, the costs will continue to be adjusted as the project develops. The below costs account for Engineering fees, undeveloped design details, construction contingency, permits, minor administrative costs and fees, and geotechnical investigation and testing. These costs are prorated into the various improvement line items. The below table does not include costs associated with financing.

<table>
<thead>
<tr>
<th>Item</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street</td>
<td>856,000</td>
</tr>
<tr>
<td>Storm Sewer</td>
<td>125,000</td>
</tr>
<tr>
<td>Sanitary Sewer</td>
<td>683,000</td>
</tr>
<tr>
<td>Sewer Services</td>
<td>82,000</td>
</tr>
<tr>
<td>Lift Stations &amp; Forcemain</td>
<td>721,000</td>
</tr>
<tr>
<td>Watermain</td>
<td>541,000</td>
</tr>
<tr>
<td>Watermain Looping/Transmission</td>
<td>266,000</td>
</tr>
<tr>
<td>Residential Water Service</td>
<td>101,000</td>
</tr>
<tr>
<td>Commercial Water Service</td>
<td>17,000</td>
</tr>
<tr>
<td>Hydrants</td>
<td>199,000</td>
</tr>
<tr>
<td>Lighting</td>
<td>20,000</td>
</tr>
<tr>
<td><strong>Subtotal - Base Improvements:</strong></td>
<td><strong>$3,611,000</strong></td>
</tr>
<tr>
<td>Multi-Use Trail (Optional)</td>
<td>47,000</td>
</tr>
<tr>
<td><strong>Total Project:</strong></td>
<td><strong>$3,658,000</strong></td>
</tr>
</tbody>
</table>
6.0 Financing

The project costs will be financed by a combination of City funds and special assessments to the adjacent and benefitting properties.

6.1 Assessable Costs

The assessable share will be determined in accordance with the City Special Assessment Policy (Amended October 2016). The following summarizes how the project costs will be allocated, based on the special assessment policy, between the City funds and assessed properties. It is important to note that the City Special Assessment Policy requires interpretation and its application can be somewhat subjective. The policy is used as a guide in addition to standard practices on past similar projects.

**Watermain:** One-hundred (100) percent of the standard watermain costs are assessed against the benefitted properties for new construction. Standard watermain is defined as a six (6)-inch diameter watermain. Oversizing and looping costs for general distribution purposes are assumed by the City.

**Hydrants:** One-hundred (100) percent of the costs associated with hydrant improvements are assumed by the City.

**Sanitary Sewer:** One-hundred (100) percent of the standard sanitary sewer costs are assessed against the benefitted properties for new construction. Standard sanitary sewer is defined as an eight (8)-inch diameter sewer main. Oversizing costs for general collection purposes are assumed by the City.

**Sewer and Water Service Laterals:** One-hundred (100) percent of the costs for sanitary sewer or water service laterals will be assessed to the benefitted properties.

**Sanitary Sewer Lift Station & Forcemain:** One-hundred (100) percent of the costs for a sanitary sewer lift station and associated forcemain will be assessed to benefitting properties within the ultimate service area of the lift station. Assessment of properties within the ultimate service area but beyond the scope of this project (or outside the current cooperate limits) will be deferred until such time that sanitary sewer is extended to the property and and/or annexed into the cooperate limits.

**Street:** Fifty (50) percent of the basic street costs are assessed against the benefitted properties in accordance with the assessment policy. A basic street is considered a 38-foot wide (back-to-back of curb), five (5)-ton, urban section, bituminous street based on the need of adjacent properties of this area. The City assumes the remaining costs.

**Stormwater:** One-hundred (100) percent of the costs associated with stormwater collection and treatment are assumed by the City and paid by the stormwater utility fund.
Lighting: One-hundred (100) percent of the costs associated with lighting are assumed by the City.

In addition to City costs prescribed by the Special Assessment policy the City typically assumes assessable costs to undevelopable property. For purposes of determining assessment rates (described in subsequent sections of this report) it is generally assumed that all of the areas adjacent to the utility corridors are developable and will benefit by the improvements. In reality there are areas adjacent to these corridors that contain wetlands, highway frontage, or other undevelopable areas that will not benefit from the improvements. These areas are included in the assessment rate calculation as assessable footage or area. The assessable costs associated with these areas is not actually assigned/collected and therefore becomes a city cost. This practice tends to keep assessment rates somewhat more comparable between various improvement projects throughout the City.

Table 3 indicates the distribution of project costs between the City (including utility funds) and assessable properties based on the above allocation of costs.

Table 3: Distribution of Total Project Costs

<table>
<thead>
<tr>
<th>Item</th>
<th>City Share</th>
<th>Assessable</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street</td>
<td>504,000</td>
<td>352,000</td>
<td>856,000</td>
</tr>
<tr>
<td>Storm Sewer</td>
<td>125,000</td>
<td>0</td>
<td>125,000</td>
</tr>
<tr>
<td>Sanitary Sewer</td>
<td>182,000</td>
<td>501,000</td>
<td>683,000</td>
</tr>
<tr>
<td>Sewer Services</td>
<td>0</td>
<td>82,000</td>
<td>82,000</td>
</tr>
<tr>
<td>Lift Stations &amp; Forcemain</td>
<td>181,000</td>
<td>540,000</td>
<td>721,000</td>
</tr>
<tr>
<td>Watermain</td>
<td>214,000</td>
<td>327,000</td>
<td>541,000</td>
</tr>
<tr>
<td>Watermain Looping/Transmission</td>
<td>266,000</td>
<td>266,000</td>
<td>266,000</td>
</tr>
<tr>
<td>Residential Water Service</td>
<td>0</td>
<td>101,000</td>
<td>101,000</td>
</tr>
<tr>
<td>Commercial Water Service</td>
<td>0</td>
<td>17,000</td>
<td>17,000</td>
</tr>
<tr>
<td>Hydrants</td>
<td>199,000</td>
<td>0</td>
<td>199,000</td>
</tr>
<tr>
<td>Lighting</td>
<td>20,000</td>
<td>0</td>
<td>20,000</td>
</tr>
<tr>
<td><strong>Subtotal - Base Improvements:</strong></td>
<td><strong>$1,691,000</strong></td>
<td><strong>$1,920,000</strong></td>
<td><strong>$3,611,000</strong></td>
</tr>
<tr>
<td>Multi-Use Trail (Optional)</td>
<td>47,000</td>
<td>0</td>
<td>47,000</td>
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<tr>
<td><strong>Total Project:</strong></td>
<td><strong>$1,738,000</strong></td>
<td><strong>$1,920,000</strong></td>
<td><strong>$3,658,000</strong></td>
</tr>
</tbody>
</table>

6.2 Allocation of Assessable Costs

The assessable costs, presented in Table 3, will be distributed against the benefited properties in accordance with the City’s Special Assessment Policy, as described in the following section.

Sanitary Sewer and Watermain: The assessable sanitary sewer and watermain costs are divided by the number of assessable units (frontage) to determine the assessment rate. An assessment to the property is equal to the assessment rate multiplied by the assessable unit (frontage) for the property. The assessable unit is considered “frontage” and is determined by the following:
For rectangular interior lots, the “frontage” shall be equal to the dimension of the side of the lot abutting the improvements.

For rectangular corner lots, the “frontage” shall be equal to the dimension of the smaller of the two sides of the lot abutting the streets, whether the improvement is made on the street abutting the short side of the lot, on the street abutting the long side of the lot or both (i.e. the short side of the lot is used to determine the frontage).

An average width/dimension shall be assigned to irregularly shaped lots to determine the frontage.

The assessable unit to be used for water and sewer services is an ‘each’ basis. Each service installed to a property is considered a unit.

**Sanitary Sewer Lift Station & Forcemain:** The assessable lift station and forcemain costs will be assessed on and area (acre) basis. The assessable costs will be divided by the area (acres) of the ultimate service area of the lift station to determine a cost per acre.

**Street:** The assessable street and sidewalk costs are divided by the number of assessable units (frontage) to determine the assessment rate. An assessment to the property is equal to the assessment rate multiplied by the assessable unit (frontage) for the property. The assessable unit is considered “frontage” and is determined by the following:

- For rectangular interior lots, the “frontage” shall be equal to the dimension of the side of the lot abutting the improvements.
- For rectangular corner lots, the “frontage” shall be equal to the dimension of the smaller of the two sides, plus one-half the distance of the larger of the two sides. Provided, however, that where the larger of the two sides exceeds 150 feet, the excess over 150 shall be considered frontage. (i.e. no more than a 75-foot credit will be given to the long side of a lot).
- An average width/dimension shall be assigned to irregularly shaped lots to determine the frontage.
- For lots greater than 150 feet (residential) and 200 feet (commercial) in depth, which abut two parallel streets, the “frontage” for a surface improvement will be calculated independently for each frontage.

Table 4 contains the estimated assessment rates and example/typical assessment based on the cost distribution and allocation of assessable costs described in the preceding sections.
### Table 4: Estimated Special Assessments

<table>
<thead>
<tr>
<th>Item</th>
<th>Assessment Rate/Unit</th>
<th>Assessment Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street</td>
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<td>Front Footage</td>
</tr>
<tr>
<td>Sanitary Sewer</td>
<td>$63.09</td>
<td>Front Footage</td>
</tr>
<tr>
<td>Sewer Service</td>
<td>$1,638.00</td>
<td>Each</td>
</tr>
<tr>
<td>Lift Stations and Forcemain</td>
<td>$5,203.00</td>
<td>Acre</td>
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<tr>
<td>Watermain</td>
<td>$39.43</td>
<td>Front Footage</td>
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<tr>
<td>Residential Water Service</td>
<td>$2,250.00</td>
<td>Each</td>
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<tr>
<td>Commercial Water Service</td>
<td>$3,405.00</td>
<td>Each</td>
</tr>
</tbody>
</table>

#### Estimated Typical Assessments

<table>
<thead>
<tr>
<th>Lot Size</th>
<th>Estimated Assessments</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-Foot / 0.25 Acre Lot</td>
<td>$12,657.25</td>
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<tr>
<td>100-Foot / 0.5 Acre Lot</td>
<td>$21,426.50</td>
</tr>
<tr>
<td>150-Foot / 1.0 Acre Lot</td>
<td>$31,496.50</td>
</tr>
</tbody>
</table>

### Appendix – Index

**Appendix A – Exhibit Drawings**

- Preliminary Project Layout Plan ............................................................... Exhibit 1