P4G REGIONAL NODE STUDY

RURAL MUNICIPALITY OF CORMAN PARK

FINAL REPORT

August 2024

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1.0 Introduction

The P4G Regional Node Study (RNS) project is a joint initiative between the Rural Municipality (RM) of Corman Park and the cities of Warman and Martensville (the Cities), all of which are members of the Saskatoon North Partnership for Growth (P4G). The Project Partners have retained ISL Engineering and Land Services (ISL) to identify the most suitable location for a regional node and create land use and serviceability concepts. This report reflects the results of the various technical analyses conducted by ISL to fulfill this intent, considering the complex drainage and servicing limitations between the Cities while also maximizing connectivity between them. The report also presents additional land uses that will complement and support the regional node, which will facilitate the development of future community services for the benefit of all three P4G Partners.

The study area for the RNS is shown in **Figure 1.1**. It is approximately 20 quarter sections in size and is generally bound by the City of Martensville and Range Road 3053 to the west, Highway 305 and Central Street to the north, the City of Warman and Highway 11 to the east, and the quarter section line that is a half-mile south of Mierau Road (Township Road 384). One of the most significant challenges to development within the study area is drainage, and therefore stormwater serviceability. With the Cities both operating their own separate sets of water and wastewater systems, the recommendation of the regional node location carefully considers water and wastewater serviceability and the trade-offs of tying into one set of systems over the other. Additionally, vehicular and active transportation connectivity for the benefit of all three P4G Partners plays an appropriately weighted role in the recommendation.

Section 2.0 of this report presents a feasibility analysis of the study area, including topography, drainage, water, and wastewater servicing as well as transportation and land use considerations. Through this analysis, the lands within the study area are ranked on a planning unit basis, generally aligning with quarter sections, to reflect their capacity to support the regional node and other future development elsewhere within the study area.

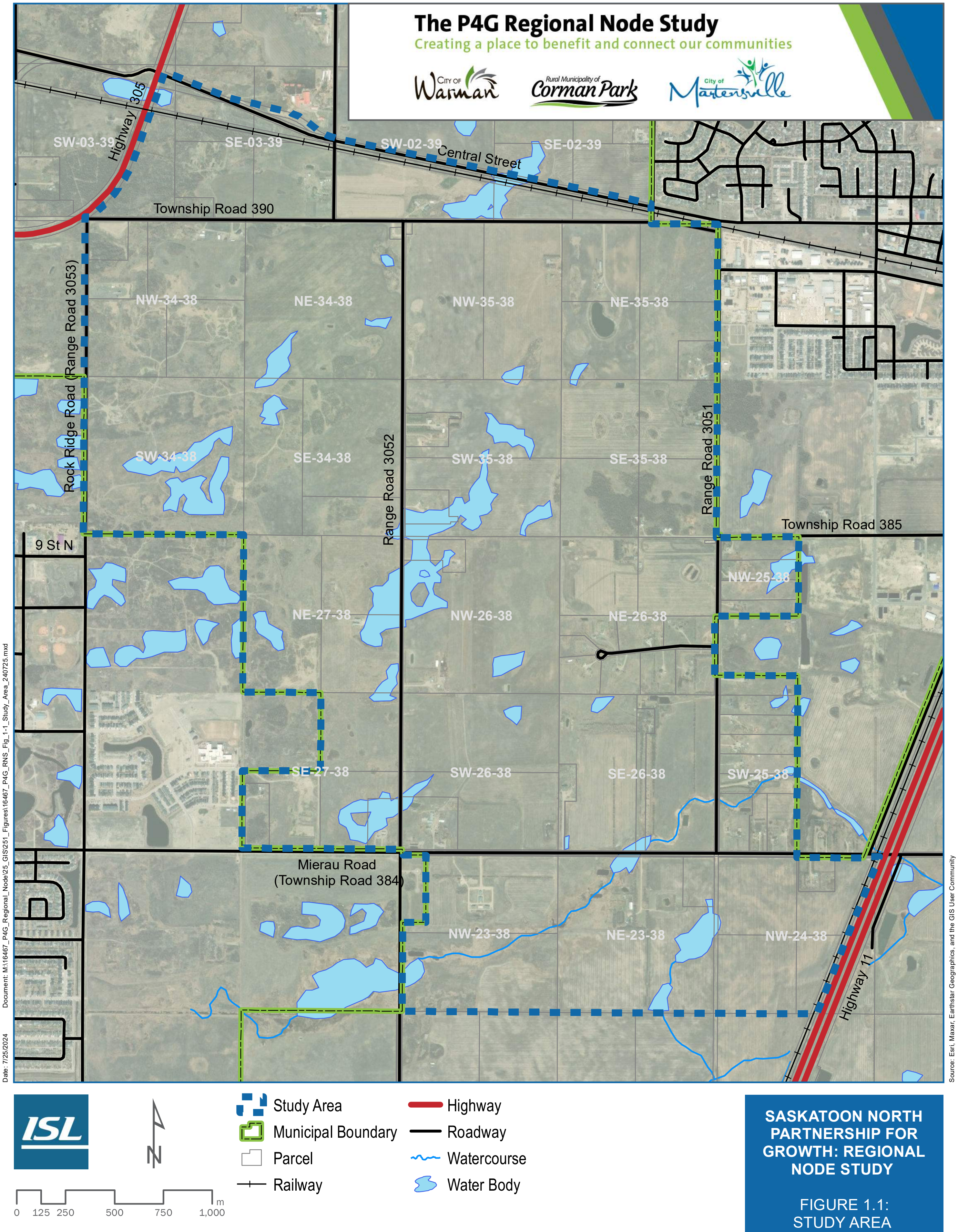
1.1 Project Goals and Scope

The goal of this project is to use a methodical process to select the best location for a regional node within the 1,230-ha study area in which community services beneficial to the surrounding communities can be located. The process should take into consideration a range of infrastructure services, land use and other considerations in a methodical fashion, including but not limited to existing and proposed land use, potential environmental impacts, transportation, stormwater, water and sanitary servicing, and other stakeholder inputs. Also, a key consideration is that the lands within the study area are prone to flooding, so an adequate stormwater servicing concept is to be developed to mitigate flood risk to future developments.

Secondary goals for the project include:

- provide a stormwater servicing plan for the entire study area; and
- provide a conceptual engineering design and cost estimate to service the selected regional node site.

The process is intended to provide unbiased, methodically developed evaluations and recommendations of a favoured location for the regional node to the Project Partners for consideration and approval. Following approval of the favoured regional node location, a conceptual engineering design and cost estimate is to be provided for the development of the regional node.



SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 1.1: STUDY AREA

2.0 Feasibility Analysis of the Study Area

A feasibility analysis was completed for the study area to identify the best areas to develop from the perspective of various servicing needs – stormwater drainage, water, wastewater, and transportation – and land use influences. For the feasibility analysis, the study area has been divided into 23 planning units, shown in **Figure 2.1**.

2.1 Topographical and Drainage Analysis

The Opimihaw Creek bisects the southern portion of the study area as shown on **Figure 2.1**. Martensville and areas upstream of Martensville contribute stormwater runoff to Opimihaw Creek, with the creek routing east across the south part of the study area, then further to the east, eventually routing south into the South Saskatchewan River.

2.1.1 Existing Conditions

History of Flooding

Lands within the regional node study area have been prone to flooding historically and it is recognized that the frequency and magnitude of flood events have been increasing. As a result, flood risk and adequate stormwater/flood management have been identified as one of the key factors in this study in the determination of the best location for the regional node.

Provincial Requirements

As a means of protecting downstream natural receiving systems from erosion or flooding, the provincial government requires that all developments discharge stormwater runoff at rates that do not exceed predevelopment conditions for events up to and including a 1:100-year design event. Since developments tend to involve significantly more hard surface areas and are designed to have more effective drainage than predevelopment areas, runoff volumes through a season and peak runoff rates during large events can increase multiple times higher than predevelopment levels. As a result, developments must implement stormwater management practices to control site discharges to meet provincial requirements.

Background Reports

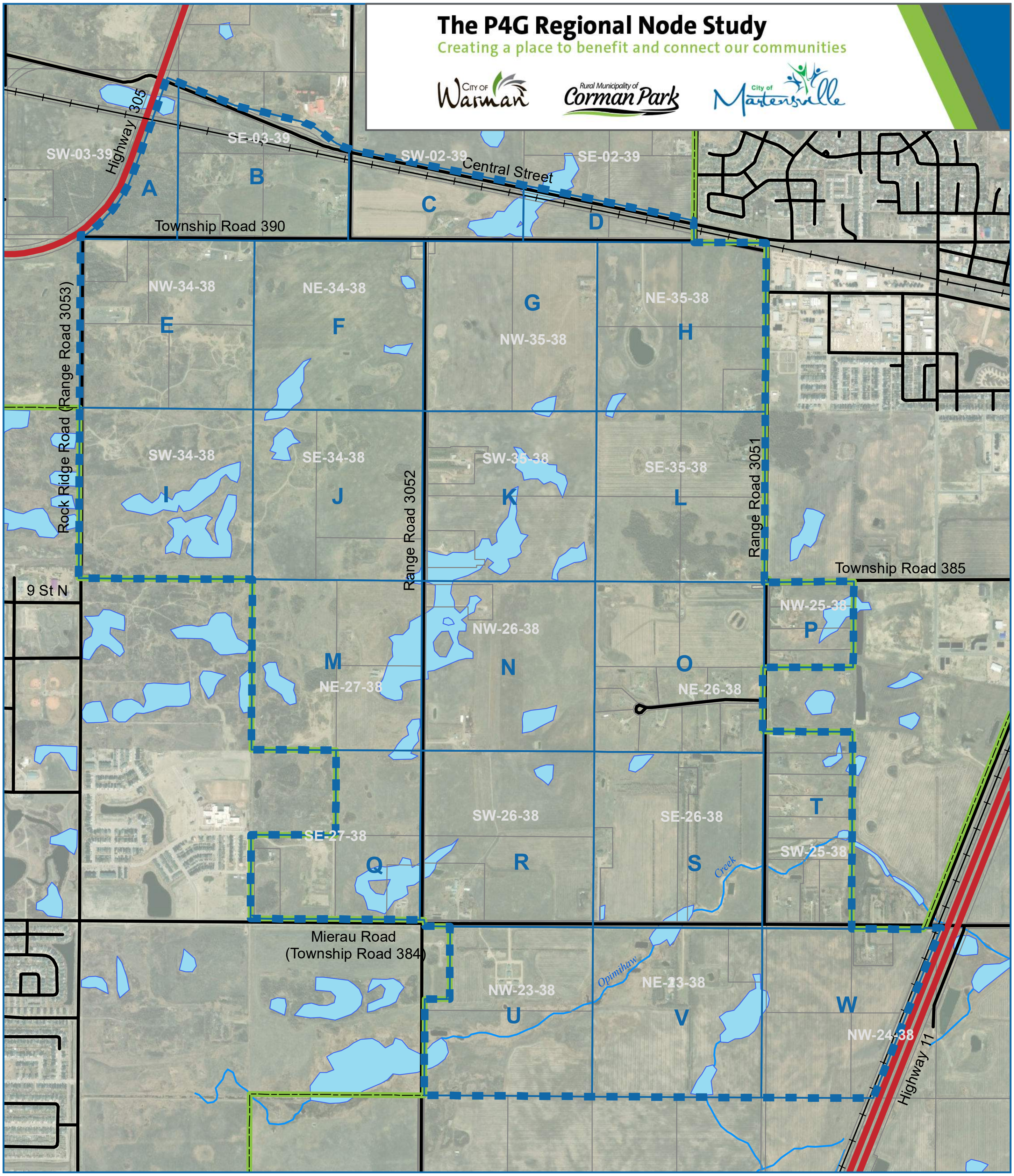
The *North Corman Park Flood Control Study* (Golder Associates, 2012), completed for the Opimihaw Creek Watershed Association (OCWA), identified that the regional node study area is located within the Opimihaw Creek catchment that it is prone to flooding, and it concluded that conveyance upgrades would be the best solution to the local flooding. The study identified that the area is prone to flooding due to a lack of grade and insufficient conveyance capacities, and during larger events an underlying clay layer blocks the downward movement of water causing the water table to rise to the surface, increasing flood risk.

The follow-up study, the *North Corman Park Flood Control Study Phase Two* (Klohn Crippen Berger, 2013), developed conceptual designs of six conveyance system upgrades, estimated to cost $49.1 million. It is also recommended to maintain existing wetland habitats.

Topography

Topography of the study area and lands downstream to the south is shown on **Figure 2.2**. In general, the study area lands slope to the southeast, with a moderate drop from an elevation of about 515 m in the northwest to about 504 m in the southeast, for a total drop across the study area of about 11 m. Some of the more distinct rural drainage courses are shown on **Figure 2.2** showing how the study area lands tend to drain to the southeast, contributing to Opimihaw Creek.

It can be observed on **Figure 2.2** that it is only within the furthest downstream reaches of Opimihaw Creek, generally south of Township Road 381, where there starts to become a more defined channel. A defined channel is not visible on **Figure 2.2** for the upstream reaches. Further south of Township Road 381, where the creek crosses Township Road 380 (Penner Road), the creek becomes much more entrenched within a clearly defined valley.



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Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ISL

N

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

- Study Area
- Planning Unit
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
- Watercourse
- Water Body

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.1: FEASIBILITY PLANNING UNITS

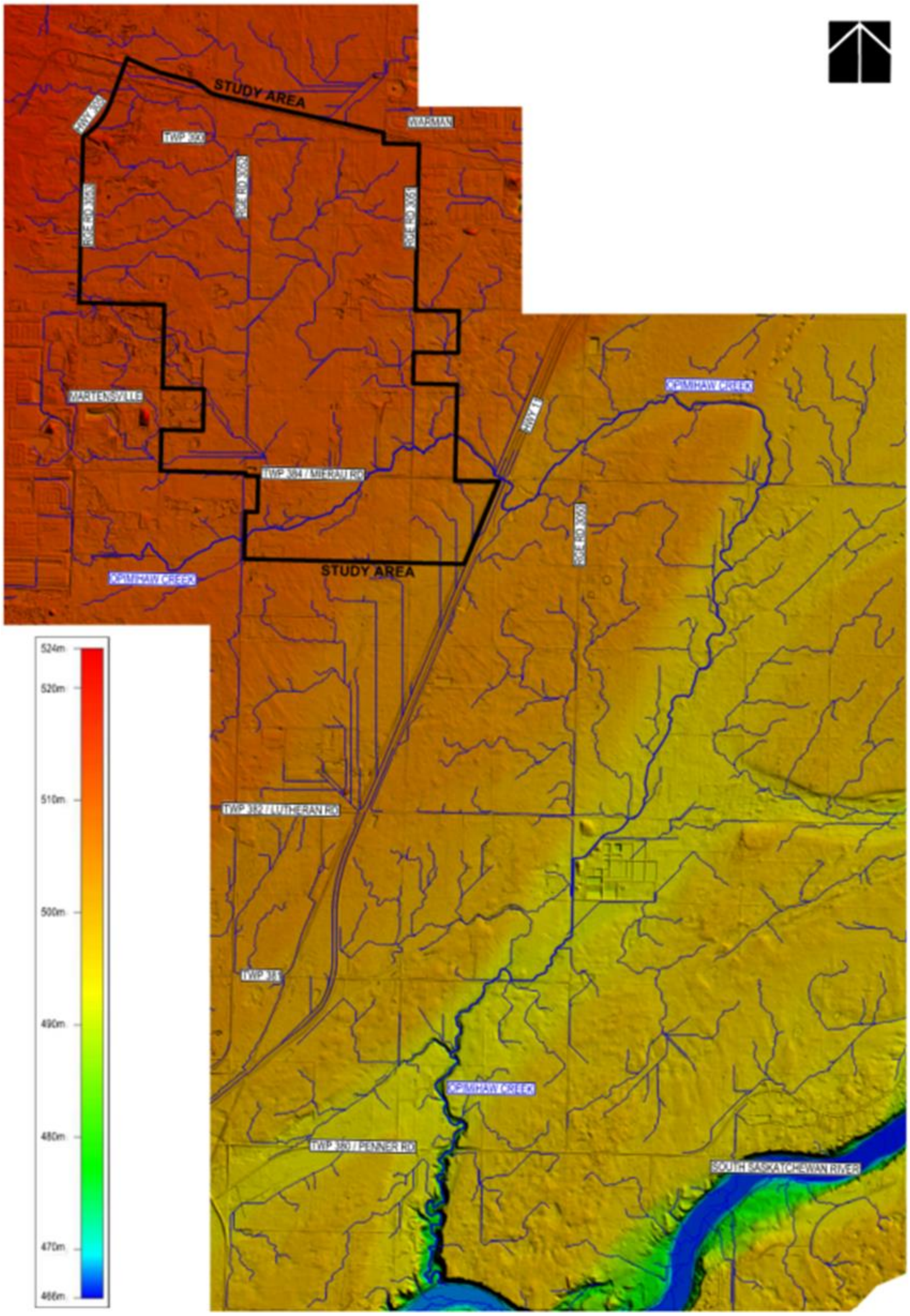


Figure 2.2: Site Topography

In general, there are very few adjacent areas that contribute runoff to the study area:

- lands to the north generally drain east towards Warman, away from the study area;
- lands to the east drain to the east, away from the study area;
- lands to the west drain south into Martensville, then into Opimihaw Creek; and
- lands to the south drain through Opimihaw Creek.

Upon further, more detailed investigation, if drainage from any lands external to the study area is found to route through the study area, that drainage should either be:

- controlled within the future stormwater management system proposed for the study area;
- its drainage route be maintained through the study area;
- upstream controls be put in place; or
- that drainage could be rerouted around the study area.

If to be controlled within the study area, the sizing of the receiving SWMF within the study area and its outlet piping may need to be increased to control these additional flows. One such example is the recent rerouting of drainage by construction of a culvert south through the CP rail line that currently routes external drainage south along Thompson Road (RR3051) to Opimihaw Creek.

Opimihaw Creek drains east across the southern portion of the study area. The section of Opimihaw Creek running through the study area has a significant catchment upstream of the study area, including Martensville and lands to the west and northwest of Martensville. Opimihaw Creek then takes a circuitous route east then south, discharging into the South Saskatchewan River just downstream of Saskatoon.

For most of its length, Opimihaw Creek comprises a shallow, low-capacity drainage course. **Figure 2.3** shows a view of Opimihaw Creek near the downstream, southeast corner of the study area. Stormwater servicing concepts that would involve contributing urban runoff to the upstream portions of Opimihaw Creek would have the following hurdles to overcome:

- gravity servicing would be difficult to achieve as municipal storm systems will be deeper than the creek; and
- the conveyance capacity of the creek would be too low to allow urban stormwater management facilities to dewater.

However, downstream reaches of Opimihaw Creek route through a more entrenched, defined creek valley system with increased conveyance capacity. **Figure 2.4** shows a view of Opimihaw Creek from Penner Road (Township Road 380) about 1.6 km upstream of the South Saskatchewan River, where the creek is much more entrenched within a defined valley.

Figure 2.3: Looking Upstream on Opimihaw Creek at Range Road 3050 near Mierau Road

Figure 2.4: Looking Downstream on Opimihaw Creek from Penner Road

2.1.2 Stormwater Servicing Approach

Stormwater Management Versus Conveyance

Conveyance system upgrades were recommended for this area in previous reports. As urbanization occurs and changes to the hydrologic conditions of the contributing areas ensue, a dramatic increase to runoff rates and volumes can result. This can have a significant impact on the size and costs required to provide adequate conveyance and the length of conveyance required, since avoiding erosion or flooding downstream requires conveying large flows down the river to an area that has capacity to assimilate the energy. Most importantly, conveyance is required early in the development process so large costs of conveyance must be upfronted by early developments. In most cases, downstream off-site drainage system financing of significant conveyance works can provide too much burden to development and prevent development from occurring.

A more effective stormwater management solution involves the provision of multiple stormwater management facilities (SWMFs) servicing relatively small development areas, typically about a quarter section. They control runoff from their small contributing areas, discharging at small, controlled rates that can be routed through existing downstream natural drainage courses without erosion or flood risk, or that require some distance of smaller, more affordable downstream conveyance upgrades. Developments serviced by a SWMF are graded to slope towards the SWMF such that all runoff from the developments can route to the SWMF in a manner that is safe and does not cause flooding.

The development of a dual drainage system complete with SWMFs will provide stormwater servicing for the developing area and resolve current flooding problems in the vicinity. As the study area develops, flooding problems will reduce. However, until development proceeds, the flooding problems within the area will persist. Any potential interim flood relief measures should be considered in light of the consequences related to the flooding. For example, the consequences related to flooding of agricultural lands may be considered less than the consequences of flooding developed lands, and as a result, the continued flood risk of agricultural lands until such time as they develop may not warrant the expenditures on any potential interim flood relief measures.

In addition to controlling flood waters, a strong benefit to this approach is that it can be staged, with relatively low upfront costs. SWMFs are constructed at moderate costs to service the initial developments, and a levy paid for the share of any future downstream off-site conveyance upgrade requirements. The SWMFs can be operated by the municipality for some time without a gravity outlet until enough levy money is collected to construct the downstream outlet. This involves regular pond level monitoring with occasional pump-out of excess water to ensure design live storage is available to accommodate a large event.

The regional node and the overall study area must be developed in a manner that stormwater runoff is managed and flood risk is minimized. As urbanization changes the hydrologic characteristics of the lands, significantly increased runoff will occur from developed areas. SWMFs can:

- control urban runoff, releasing at small, controlled rates to prevent downstream erosion or flooding;
- provide treatment of urban runoff that contains contaminants not found in runoff from undeveloped areas; and
- contain spilled materials.

Flooding from surrounding areas can also impact developments, so flood proofing the future developments, whether in the regional node or elsewhere within the study area, from external areas will also be important.

Major/Minor Drainage Servicing

The stormwater management systems for the study area are expected to be developed based on the standard municipal urban dual-drainage approach in which there will be major and minor drainage systems. This approach is gravity based – it does not include pumping of stormwater runoff. If the decision is made to develop the area with a rural drainage system comprising ditches and culverts, the rural system can be designed to direct development runoff to the SWMF in the same manner as an urban system.

The minor drainage system will consist of roadway gutters directing runoff to catch basins, which in-turn will direct runoff to storm sewers. The minor drainage system will be sized to convey runoff from all storm events up to a 1:5 year flood event without surface ponding. Since this system is designed to meet its design goals almost all the time, and since the design goals are no surface ponding during common events and the more frequent flood events, the minor drainage system is also considered a “convenience” drainage system.

The major drainage system will consist of linear infrastructure designed to convey large runoff flows within their rights-of-way, including roadways, lanes, public utility corridors, etc. Also included in the major drainage system are SWMFs, designed to store runoff and release it at small, controlled rates designed to protect downstream drainage systems from flooding or erosion. The conveyance components of the major drainage system are sized to convey runoff in excess of the capacity of the minor drainage system, up to the 1:100-year design event. Both the major and minor conveyance systems are designed to route runoff by gravity to a SWMF.

Water Quality Treatment

Stormwater runoff from urbanized areas contains contaminants that can be deleterious to downstream natural environments. As a result, water quality treatment measures are recommended to be designed into urban stormwater management systems.

Stormwater quality treatment approaches have developed significantly over recent decades and may be considered within categories referred to as stormwater best management practices (BMPs), as well as stormwater low impact development (LID) measures. As the study area develops, it is expected that various measures from these categories will be employed to achieve water quality treatment goals. However, at a minimum, a good degree of stormwater quality treatment will be achieved through the following two system components to be a part of the water quantity controls within the system:

- catch basins; and
- SWMFs in the form of wet lakes or constructed wetlands.

Basic catch basin designs are effective at controlling the movement of solid materials through the drainage system within their traps. Maintenance crews can regularly inspect the catch basins and remove any materials collected.

Wet lake or constructed wetland types of SWMFs offer superior stormwater quality treatment through the processes of settlement and plant absorption. As there tend to be more plantings within constructed wetlands, those facilities can provide superior water quality treatment to standard wet lakes. However, probably the most important water quality treatment feature of these facilities includes the submerged outlet design where a pipe located well below pond normal water levels routes to an outlet structure. This design results in the full containment of any floatable materials within the SWMF, eliminating the risk that those materials may be flushed downstream.

SWMF Spacing

Due to the general nature of greenfield land development and the nature of land ownership, lands tend to develop out on a quarter section basis. Also, due to the desire by municipalities to limit the number of SWMFs to own and operate, stormwater management planning tends to result in approximately one SWMF per quarter section. As a result, the stormwater servicing concept for this planning level project will include approximately one SWMF per quarter section where topography, existing developments or other constraints allow. In other areas, SWMFs will be generally located to service areas similar in scale to a quarter section, to the extent practicable. This discretization is intended as an approximation of how the lands may eventually develop and is intended for planning purposes only. While it will establish a good guideline for future developments, actual developments should be expected to vary somewhat.

Standardized SWMF Design Concept

For planning purposes, a standardized SWMF design concept was developed to be approximately located to service each quarter section. A constructed wetland concept was assumed, as shown in **Figure 2.5**.

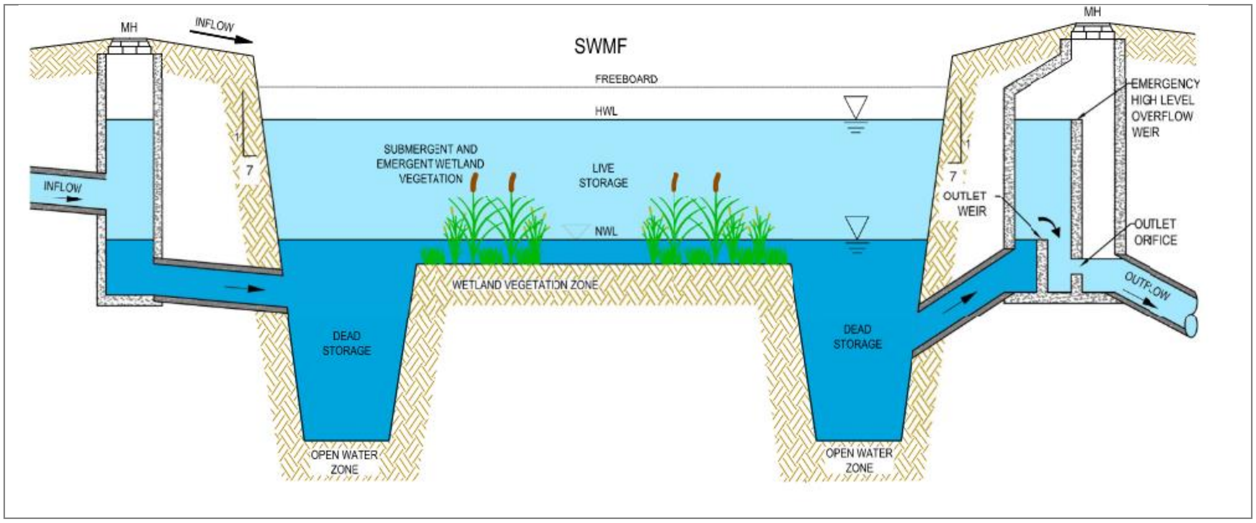


Figure 2.5: Constructed Wetland SWMF Design Concept

The main features of the design concept include:

- a live storage zone, vertically located between pond normal water level (NWL) and high water level (HWL), sized to contain runoff from the 1:100-year design event less discharges that occur during the event;
- a dead storage zone, vertically located below pond NWL with the following features:
  - a deep open water pool at inlet locations to accommodate submerged inlets and collect sediment,
  - a deep open water pool at the outlet to accommodate the submerged outlet design, and
  - most of the area at NWL should be shallow to support the growth of both submergent and emergent wetland vegetation;
- a freeboard zone, vertically located above pond HWL to accommodate storage requirements beyond pond design capacity (events greater than the 1:100 year) – any walk-out basement openings would be set above the freeboard level;
- some distance above freeboard (typically in the order of 0.5 m to 1.0 m) to ensure all surrounding lands can be graded to drain into the facility above freeboard;
- incoming storm sewers, located vertically at or above pond NWL to ensure they contain no standing water ahead of runoff events, and located below frost depths (typically 2.5 m deep);
- an outlet control structure designed with the following key features:
  - a weir set at pond NWL to maintain NWL within the pond, and wide enough to provide good discharge rates at low pond levels to achieve full pond drawdown in a reasonable timeframe following an event to ensure the full live storage capacity is available for the next event,
  - an emergency overflow weir at pond HWL to allow a temporary increase in pond discharge rates for events that exceed pond HWL through surcharging the downstream outlet system, thus minimizing the rise in pond levels, and
  - an orifice set below the outlet weir to not control discharges at low pond levels and sized to control peak discharges at HWL to a maximum rate established to achieve the following pond performance goals
    - reduce the costs of downstream conveyance systems,
    - minimize the risks of downstream flooding or erosion, and
    - sized large enough to ensure post-event pond drawdown within a reasonable timeframe following an event to ensure the full live storage capacity is available for the next event;
- an outlet pipe with its invert set some distance below pond NWL to ensure all or most of its conveyance capacity is accessed for the full range of pond levels above NWL; and
- an emergency overland weir set at freeboard level (not shown on **Figure 2.5**) at those locations where an emergency overland flow route is available, which is intended as an added level of flood protection to any adjacent properties.

For this project the following conservative, standardized dimensions were developed:

- depth from ground surface to pond NWL = 3.0 m based on:
  - live storage zone = 2.0 m,
  - freeboard (Fb) zone = 0.5 m, and
  - depth of Fb below ground = 0.5 m;

- live storage volume = 50,000 m^3 (approximately), conservatively based on:
  - 1:100-yr rain = 90 mm, runoff coefficient = 0.85, area = 65 ha, and very small discharge rate, and
  - an assumed discharge rate of 1.0 L/s/ha
    - will minimize costs of downstream conveyance infrastructure, but will result in extended pond drawdown times (a cost/benefit analysis should be conducted during design to confirm the most cost-effective discharge rate);
    - is less than the required provincial government predevelopment rate estimated at 3.0 L/s/ha, so this will result in a reduction in peak flows within the downstream reaches of Opimihaw Creek during large events;
    - has greater potential to reduce erosion within the downstream portions of Opimihaw Creek from the continuous discharges of low flows through the summer season as the ponds draw down; and
- land area required for SWMF = 5.0 ha, based on:
  - area at NWL = 2.0 ha, with rectangular shape where length = 3 × width,
  - 7:1 side slopes resulting in area at top of cut = 3.6 ha, with length now closer to 2 × width, and
  - some land area surrounding facility to ensure enough land is made available and to provide some park space.

This resulted in about a 5-ha kidney shaped area of land required for each SWMF. This standardized pond design was developed for planning purposes only for use on this study. It can also serve as a general guideline for developers as they plan their developments. However, actual ultimate pond sizes will vary depending on site specific conditions.

SWMF Operations and Maintenance

SWMFs have few regular operation or maintenance requirements beyond maintaining vegetation including grassed portions of the side slopes and cleaning debris. Pond outlets should be inspected occasionally but are not prone to blockages. The public must be kept off pond surfaces during the winter and out of the ponds during summer, which often requires signage and communications.

One consideration is sediment management. Sediment enter SWMFs most often through the storm sewer systems and most frequently during the initial period while development is occurring within the contributing catchment area. During these construction periods, sediment from construction sites can overload the street catch basins and be conveyed through the sewer system eventually depositing on the bottom of the SWMF at the inlets. As a result, SWMFs are designed with sediment traps at all inlet locations. Decades of experience has shown that the SWMF sediment traps can fill during the catchment area development period, and as a result, should be cleaned following completion of all upstream development. History has shown that street catch basins do their intended jobs of collecting sediment through the long-term from developed areas, and SWMF sediment traps have not required cleaning following development of the catchment area.

Stormwater Servicing Approach

The approach that was used on this project was to assign each planning unit (generally a quarter section) within the study area a stormwater ranking from 1 to 10, where 1 = the best place to develop from a stormwater servicing perspective, and 10 the worst. Following a forthcoming workshop in February 2024, the stormwater rankings will be weighed with the rankings for the other criteria considered for each planning unit to get an overall ranking for each planning unit ranging from easiest to most challenging to develop. The recommended location for the regional node will then be based on the overall planning unit rankings.

To develop a stormwater ranking for each planning unit, a stormwater servicing plan needed to be prepared for ultimate development conditions where all lands within the 1,230-ha study area are fully developed.

2.1.3 Ultimate Development Conditions

Stormwater Management Facilities

The proposed SWMFs that will be required for the ultimate development of the entire study area are shown on **Figure 2.6**. These works were developed as presented below.

- Locate all SWMFs and delineate contributing catchment areas:
  - where practicable, one SWMF was located at the lowest point on every quarter section, with its catchment area delineated as that quarter section (an area of about 65 hectares);
  - for all other locations, SWMFs were located in a manner where they could service areas similar to a quarter section in scale – service areas much smaller than a quarter section were considered less favourable, while service areas somewhat larger than a quarter section were considered more reasonable; and
  - stormwater servicing was not provided to Opimihaw Creek as it runs through the study area, as described below.
- Allow Opimihaw Creek to bypass:
  - since there is a large catchment area contributing runoff to Opimihaw Creek upstream of the study area, it was concluded that it would not be reasonable to control those flows as part of development of the study area – flows in Opimihaw Creek should be allowed to continue routing through the study area uncontrolled;
  - as a result, flows within Opimihaw Creek entering the study area are to continue to route through the study area uncontrolled, and runoff from the study area is to be serviced by the urban stormwater management systems and not contribute to Opimihaw Creek within the study area; and
  - lastly, as with any natural drainage course, it was assumed that environmental reserve centered on the creek, approximately 30 m wide, be designated along the portion that routes through the study area to protect its banks and riparian areas, as per the Planning and Development Act.

A total of 18 SWMFs are proposed to service the study area, as shown in **Figure 2.6**. Key proposed pond design data are provided in **Table 2.1.**

Table 2.1: Proposed SWMF Key Design Data

SWMF	Ground Surface Elevation (m)	NWL (m) [1]	Outlet Pipe Invert (m)[2]	Catchment Area (ha)	Peak Outlet Rate (L/s)[3]
S-1	513.5	510.5	510.0	61.8	62
S-2	513.3	510.3	509.8	67.5	67
S-3	512.5	509.5	509.0	68.4	68
S-4	511.5	508.5	508.0	99.0	99
S-5	511.5	508.5	508.0	70.7	71
S-6	512.5	509.5	509.0	64.3	64
S-7	510.5	507.5	507.0	66.4	66
S-8	510.5	507.5	507.0	64.3	64
S-9	510.5	507.5	507.0	65.1	65
S-10	510.5	507.5	507.0	63.4	63
S-11	510.5	507.5	507.0	50.5	50
S-12	509.5	506.5	506.0	64.8	66
S-13	507.5	504.5	504.0	39.1	39
S-14	510.4	507.5	506.9	65.6	66
S-15	508.7	505.7	505.2	81.5	81
S-16	507.3	504.3	503.8	81.7	82
S-17	506.5	503.5	503.0	90.2	90
S-18	503.0	500.0	499.5	67.9	68

Table Footnotes:

1. NWL = Ground Surface – 3.0 m
2. Outlet Pipe Invert = NWL – 0.5 m
3. Peak Outlet Rate = 1.0 L/s/ha × Catchment Area

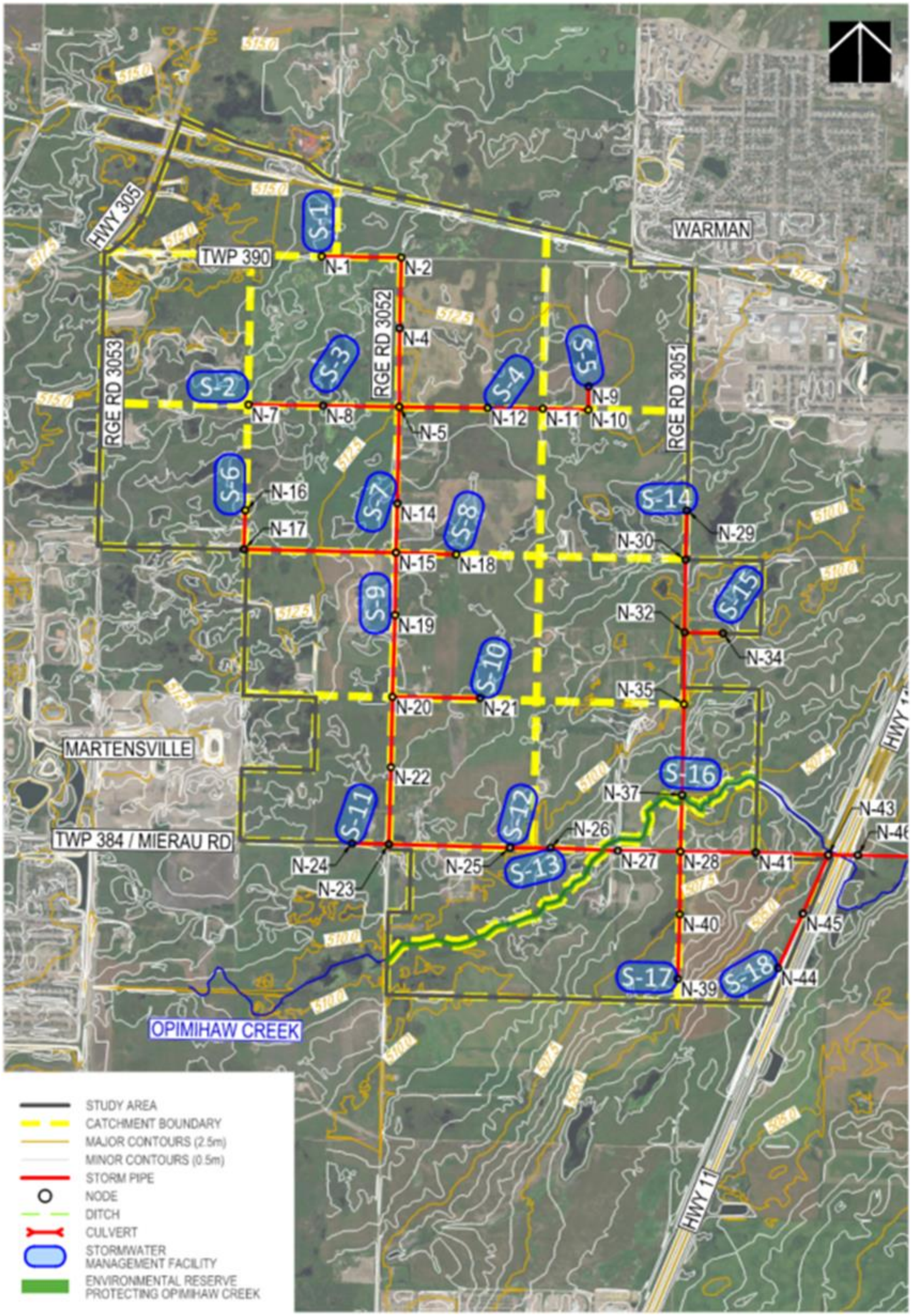


Figure 2.6: On-Site Stormwater Servicing Concept

SWMF Outlet Piping Within Study Area

As shown on **Figure 2.5**, to achieve gravity servicing, SWMF outlet piping needs to be vertically located somewhat below pond NWLs. For this study, pipe inverts located 0.5 m below NWL have been assumed. That means that the upstream ends of the pond outlet pipes must be about 3.5 m below local ground surface elevations. At these depths, open ditches are not practicable solutions. Rather, buried storm sewer piping is recommended.

On-site SWMF outlet piping, shown on **Figure 2.6**, was designed to route discharges from each SWMF downstream through the study area, based on the following design considerations:

- upstream pipe inverts at SWMFs were located 0.5 m below pond NWLs to allow discharges to access full or close to full pipe capacities at all pond levels;
- pipes were vertically located to follow the natural grades and minimize depths for minimized costs;
- a minimum grade of 0.1%, where practicable;
- alignments were located along quarter section boundaries, where it is anticipated arterial roadways will be located, and routes were selected that would be as direct towards the downstream end as practicable to minimize pipe lengths;
- the outlet piping for this planning study were conservatively located such that the ponds would be in parallel (i.e., discharges from each pond would route through a pipe all the way to the study area outlet – no pond would contribute discharges through a downstream pond); and
- opportunities to route upstream pond flows through a downstream pond should be pursued as the area develops as a means of saving costs on the outlet piping.

The SWMF outlet piping is located on **Figure 2.6** and key proposed outlet pipe design data are provided in **Table 2.2**.

Table 2.2: Proposed SWMF Outlet Piping Configuration

From Node	To Node	U/S SWMFs	U/S Invert[1]	D/S Invert	Length (m)	U/S Surface	D/S Surface	U/S Depth (m)	D/S Depth (m)
N-1	N-2	S-1	510.5	510.1	438	513.6	513.3	3.1	3.2
N-2	N-4	S-1	510.0	509.6	390	513.3	512.9	3.3	3.3
N-4	N-5	S-1	509.5	509.1	434	512.9	512.6	3.4	3.6
N-7	N-8	S-2	510.3	509.9	411	513.1	513.0	2.8	3.1
N-8	N-5	S-2 to S-3	509.5	508.9	419	513.0	512.6	3.5	3.8
N-9	N-10	S-5	508.5	508.4	129	512.1	513.0	3.6	4.7
N-10	N-11	S-5	508.3	508.1	251	513.0	512.1	4.7	4.0
N-11	N-12	S-5	508.0	507.7	304	512.1	511.2	4.1	3.5
N-12	N-5	S-4 to S-5	507.6	507.1	488	511.2	512.6	3.6	5.5
N-5	N-14	S-1 to S-5	506.8	506.3	512	512.6	511.0	5.8	4.7
N-14	N-15	S-1 to S-5 & S-7	506.2	505.9	271	511.0	510.9	4.8	5.0
N-16	N-17	S-6	509.5	509.3	215	512.5	513.1	3.0	3.8
N-17	N-15	S-6	509.2	508.4	839	513.1	510.9	3.8	2.5
N-18	N-15	S-8	507.5	507.2	332	511.3	510.9	3.8	3.7
N-15	N-19	S-1 to S-8	505.9	505.5	345	510.9	510.7	5.0	5.2
N-19	N-20	S-1 to S-9	505.3	504.9	451	510.7	510.7	5.4	5.8

From Node	To Node	U/S SWMFs	U/S Invert[1]	D/S Invert	Length (m)	U/S Surface	D/S Surface	U/S Depth (m)	D/S Depth (m)
N-21	N-20	S-10	507.5	507.0	484	511.0	510.7	3.5	3.6
N-20	N-22	S-1 to S-10	504.7	504.4	389	510.7	510.5	5.9	6.1
N-22	N-23	S-1 to S-10	504.3	503.8	424	510.5	511.3	6.2	7.5
N-24	N-23	S-11	507.5	507.3	202	510.8	511.3	3.3	4.0
N-23	N-25	S-1 to S-11	503.8	503.1	669	511.3	510.8	7.6	7.7
N-25	N-26	S-1 to S-12	502.9	502.7	223	510.8	509.7	7.9	7.1
N-26	N-27	S-1 to S-13	502.6	502.2	370	509.7	508.5	7.1	6.4
N-27	N-28	S-1 to S-13	502.1	501.7	346	508.5	508.7	6.4	7.0
N-29	N-30	S-14	507.4	507.1	272	510.6	510.2	3.2	3.1
N-30	N-32	S-14	507.1	506.7	401	510.2	510.0	3.1	3.4
N-34	N-32	S-15	505.7	505.5	210	510.5	510.0	4.8	4.5
N-32	N-35	S-13 to S-14	505.4	505.0	396	510.0	510.8	4.6	5.8
N-35	N-37	S-13 to S-14	504.9	504.4	501	510.8	508.4	5.8	4.0
N-37	N-28	S-13 to S-15	504.3	503.7	312	508.4	508.7	4.1	5.0
N-39	N-40	S-17	503.5	503.1	356	507.7	507.2	4.2	4.0
N-40	N-28	S-17	503.1	502.7	346	507.2	508.7	4.1	5.9
N-28	N-41	S-1 to S-17	501.5	501.0	415	508.7	508.0	7.1	7.0
N-41	N-43	S-1 to S-17	500.9	500.4	400	508.0	505.5	7.1	5.0
N-44	N-45	S-18	500.0	499.7	330	503.6	503.9	3.6	4.2
N-45	N-43	S-18	499.6	499.2	353	503.9	505.5	4.3	6.3

Table Footnotes:

1. Upstream inverts located at SWMFs are established at 0.5 m below pond NWLs.

Preliminary pipe sizing of the SWMF outlet piping is provided in **Table 2.3**.

Table 2.3: Proposed SWMF Outlet Piping Sizing

From Node	To Node	U/S SWMFs	Catch. Area (ha)	Des. Flow[1] (m^3/s)	Slope (%)	Diameter. (mm)	Cap. (m^3/s)	Q/Cap
N-1	N-2	S-1	62	0.06	0.10%	525	0.14	0.45
N-2	N-4	S-1	62	0.06	0.10%	525	0.14	0.45
N-4	N-5	S-1	62	0.06	0.10%	525	0.14	0.45
N-7	N-8	S-2	67	0.07	0.10%	525	0.14	0.50
N-8	N-5	S-2 to S-3	136	0.14	0.15%	525	0.17	0.82
N-9	N-10	S-5	71	0.07	0.10%	525	0.14	0.52
N-10	N-11	S-5	71	0.07	0.10%	525	0.14	0.52
N-11	N-12	S-5	71	0.07	0.10%	525	0.14	0.52
N-12	N-5	S-4 to S-5	170	0.17	0.10%	600	0.19	0.87
N-5	N-14	S-1 to S-5	367	0.37	0.10%	900	0.57	0.64
N-14	N-15	S-1 to S-5 & S-7	434	0.43	0.10%	900	0.57	0.76
N-16	N-17	S-6	64	0.06	0.10%	525	0.14	0.47
N-17	N-15	S-6	64	0.06	0.10%	525	0.14	0.47
N-18	N-15	S-8	64	0.06	0.10%	525	0.14	0.47

From Node	To Node	U/S SWMFs	Catch. Area (ha)	Des. Flow[1] (m^3/s)	Slope (%)	Diameter. (mm)	Cap. (m^3/s)	Q/Cap
N-15	N-19	S-1 to S-8	562	0.56	0.12%	900	0.63	0.90
N-19	N-20	S-1 to S-9	627	0.63	0.10%	1,050	0.86	0.73
N-21	N-20	S-10	63	0.06	0.10%	525	0.14	0.47
N-20	N-22	S-1 to S-10	691	0.69	0.10%	1,050	0.86	0.80
N-22	N-23	S-1 to S-10	691	0.69	0.10%	1,050	0.86	0.80
N-24	N-23	S-11	50	0.05	0.10%	450	0.09	0.56
N-23	N-25	S-1 to S-11	741	0.74	0.10%	1,050	0.86	0.86
N-25	N-26	S-1 to S-12	806	0.81	0.12%	1,050	0.95	0.85
N-26	N-27	S-1 to S-13	845	0.85	0.12%	1,050	0.95	0.89
N-27	N-28	S-1 to S-13	845	0.85	0.12%	1,050	0.95	0.89
N-29	N-30	S-14	66	0.07	0.10%	450	0.09	0.73
N-30	N-32	S-14	66	0.07	0.10%	450	0.09	0.73
N-34	N-32	S-15	81	0.08	0.10%	525	0.14	0.60
N-32	N-35	S-13 to S-14	147	0.15	0.10%	600	0.19	0.76
N-35	N-37	S-13 to S-14	147	0.15	0.10%	600	0.19	0.76
N-37	N-28	S-13 to S-15	229	0.23	0.20%	600	0.27	0.83
N-39	N-40	S-17	90	0.09	0.10%	525	0.14	0.66
N-40	N-28	S-17	90	0.09	0.10%	525	0.14	0.66
N-28	N-41	S-1 to S-17	1164	1.16	0.12%	1,200	1.35	0.86
N-41	N-43	S-1 to S-17	1164	1.16	0.12%	1,200	1.35	0.86
N-44	N-45	S-18	68	0.07	0.10%	525	0.14	0.50
N-45	N-43	S-18	68	0.07	0.10%	525	0.14	0.50

Table Footnotes:

1. Design flow = catchment area x 1.0 L/s/ha.

The preliminary information provided in the above tables forms the basis for quantity estimates and cost estimates developed in **Appendix A**.

Downstream Off-Site Stormwater Servicing

The downstream off-site outlet system, located downstream of the study area that will be required to service the study area, comprising a length of piping followed by a length of ditching and culverts, are shown on **Figure 2.7**. Associated design data is provided in **Tables 2.4 through 2.7**. To minimize costs, the length of piping that will be required was minimized with the length of rural drainage maximized. This was achieved by maintaining minimum grade along the outlet pipe until its depth was reduced to a point where a ditch could be developed.

For purposes of this study, the outlet system was extended downstream to discharge into Opimihaw Creek at Township Road 381. At this location along Opimihaw Creek, it appears that the creek should have capacity to assimilate the expected flows without overflowing or causing erosion (see **Figure 2.2**). Further study will be required to determine if the outlet can be discharged into Opimihaw Creek further upstream.

The downstream off-site outlet piping is presented in **Figure 2.7** and key proposed outlet pipe design data are provided in **Table 2.4**.

Table 2.4: Proposed Downstream Off-Site Outlet Piping Configuration

From Node	To Node	U/S Invert	D/S Invert	Length (m)	U/S Surface	D/S Surface	U/S Depth (m)	D/S Depth (m)
N-43	N-46	498.6	498.4	163	505.5	503.9	6.9	5.5
N-46	N-47	498.3	498.0	300	503.9	503.1	5.6	5.1
N-47	N-48	498.0	497.6	344	503.1	505.4	5.1	7.8
N-48	N-49	497.5	497.1	393	505.4	505.5	7.9	8.3
N-49	N-50	497.1	496.6	417	505.5	505.4	8.4	8.8
N-50	N-51	496.5	496.1	417	505.4	504.8	8.8	8.7
N-51	N-52	496.0	495.6	399	504.8	503.2	8.7	7.6
N-52	N-53	495.5	495.1	400	503.2	503.0	7.7	7.9
N-53	N-54	495.1	494.7	400	503.0	500.8	8.0	6.1
N-54	N-55	494.6	494.2	400	500.8	498.7	6.2	4.5
N-55	N-56	494.1	493.7	400	498.7	497.5	4.6	3.8
N-56	N-57	493.6	493.2	325	497.5	493.8	3.9	0.5

Table Footnotes:

1. Outlet piping will be designed to slope at minimum grades until approaching ditch depths, at which point the outlet will continue to route through a rural ditch and culvert drainage system.

Preliminary sizing of the downstream off-site outlet piping is provided in **Table 2.5**.

Table 2.5: Proposed Downstream Off-Site Outlet Piping Sizing

From Node	To Node	Slope (%)	Diameter. (mm)	Cap. (m^3/s)	Q/Cap[1]
N-43	N-46	0.10%	1,200	1.23	1.00
N-46	N-47	0.10%	1,200	1.23	1.00
N-47	N-48	0.10%	1,200	1.23	1.00
N-48	N-49	0.10%	1,200	1.23	1.00
N-49	N-50	0.10%	1,200	1.23	1.00
N-50	N-51	0.10%	1,200	1.23	1.00
N-51	N-52	0.10%	1,200	1.23	1.00
N-52	N-53	0.10%	1,200	1.23	1.00
N-53	N-54	0.10%	1,200	1.23	1.00
N-54	N-55	0.10%	1,200	1.23	1.00
N-55	N-56	0.10%	1,200	1.23	1.00
N-56	N-57	0.10%	1,200	1.23	1.00

Table Footnotes:

1. Design flow Q = 1.23 m^3/s (1,230 ha × 1.0 L/s/ha).

The downstream off-site outlet rural drainage system is presented in **Figure 2.7** and key proposed outlet ditch and culvert design data are provided in **Table 2.6**.

Table 2.6: Proposed Downstream Off-Site Outlet Rural Drainage System Configuration

From Node	To Node	Type	U/S Bottom	D/S Bottom	Length (m)	U/S Surface	D/S Surface	U/S Depth (m)	D/S Depth (m)
N-64	N-65	Ditch	492.9	492.2	472	493.8	492.9	0.9	0.7
N-65	N-66	Culvert	492.2	492.1	11	492.9	493.0	0.7	0.9
N-66	N-67	Ditch	492.1	491.8	172	493.0	492.4	0.9	0.6
N-67	N-68	Culvert	491.8	491.8	10	492.4	492.3	0.6	0.6
N-68	N-70	Ditch	491.8	491.4	208	492.3	492.2	0.6	0.7
N-70	N-71	Ditch	491.4	491.0	409	492.2	494.4	0.7	3.4
N-71	N-72	Culvert	491.0	490.9	27	494.4	494.5	3.4	3.6
N-72	N-73	Ditch	490.9	490.1	626	494.5	492.9	3.6	2.8
N-73	N-74	Culvert	490.1	490.0	18	492.9	492.9	2.8	2.9
N-74	N-75	Ditch	490.0	489.9	55	492.9	492.5	2.9	2.6
N-75	N-76	Culvert	489.9	489.7	52	492.5	489.8	2.6	0.1

Table Footnotes:

1. The rural drainage component of the downstream off-site outlet drainage system will follow below ground surface topography to the outlet into the downstream reaches of Opimihaw Creek.

Preliminary ditch and culvert sizing of the downstream off-site outlet rural drainage system is provided in **Table 2.7**.

Table 2.7: Proposed Downstream Off-Site Outlet Rural Drainage System Sizing

From Node	To Node	Type	Slope (%)	Ditch			Culvert		
				Water Depth (m)	Bottom Width[1] (m)	Velocity (m/s)	Diameter. (mm)	Cap. (m^3/s)	Q/Cap[2]
N-64	N-65	Ditch	0.15%	0.7	2	0.45		1.30	0.95
N-65	N-66	Culvert	0.50%				1100	1.24	0.99
N-66	N-67	Ditch	0.20%	0.6	3	0.48		1.45	0.85
N-67	N-68	Culvert	0.50%				1100	1.24	0.99
N-68	N-70	Ditch	0.15%	0.6	3	0.44		1.26	0.98
N-70	N-71	Ditch	0.11%	0.9	1	0.41		1.77	0.69
N-71	N-72	Culvert	0.50%				1100	1.24	0.99
N-72	N-73	Ditch	0.12%	0.9	1	0.42		1.77	0.69
N-73	N-74	Culvert	0.50%				1100	1.24	0.99
N-74	N-75	Ditch	0.12%	0.9	1	0.42		1.77	0.69
N-75	N-76	Culvert	0.50%				1100	1.24	0.99

Table Footnotes:

1. Assume ditch cross section with 3:1 side slopes.
2. Design flow Q = 1.23 m^3/s (1,230 ha × 1.0 L/s/ha).

The preliminary information provided in the above tables forms the basis for quantity estimates and cost estimates developed in **Appendix A.**

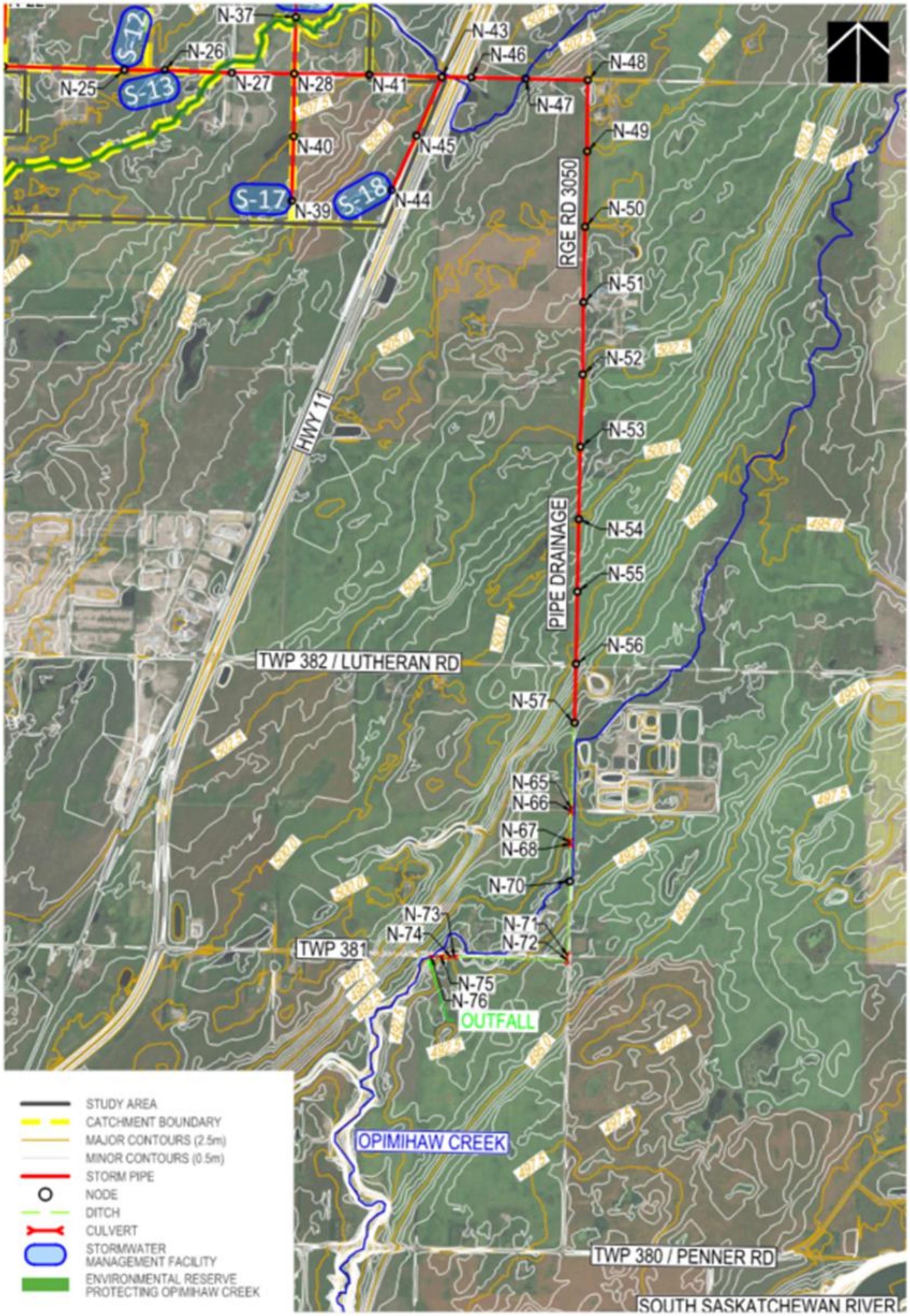


Figure 2.7: Downstream Stormwater Servicing

2.1.4 Development Staging and Financing

Gravity Servicing

Gravity servicing is highly desired as it requires little operation effort and maintenance – it can be relatively maintenance free. To achieve gravity servicing all three of the following system components are required:

- the local major and minor drainage systems will convey catchment area runoff to the local SWMFs;
- the local SWMFs; and
- outlet piping from the SWMFs all the way to a downstream drainage course with adequate conveyance capacity.

Financing Implications

While the proportionate share of the costs of the above services for each development can be considered reasonable and within the capacity of developers to fund, the upfront financing costs for initial developers, if they are expected to install all downstream off-site infrastructure required to achieve immediate gravity servicing for their development, can be so high that it can prohibit development altogether. Most developers cannot afford to upfront the full cost of downstream infrastructure without knowing when future developments will pay their share.

Recommended Implementation Solution

Fortunately, there is a common, staged approach to address the stormwater financing problem that can remove that encumbrance to development. The solution is described below.

- The initial developer:
  - builds the on-site major/minor drainage systems required for their development and the downstream SWMF required to service the catchment area in which their development is located
    - as future developments within the catchment occur, they would pay the initial developer their share of the costs of the SWMF and any major/minor drainage works that are shared; and
  - does not build the downstream system but pays a levy charge for their share of the downstream pond outlet piping and ditching required to drain their site and other sites all the way to a receiving drainage course.
- The municipality:
  - manages both the on-site and off-site levy system, ensuring monies are exchanged in an equitable manner;
  - owns, operates, and maintains the on-site major and minor drainage systems including the SWMF;
  - for an interim period, monitors the water levels within the SWMF and intermittently pumps water out of the SWMF to an adjacent rural ditch system or watercourse to ensure that the full live storage capacity of the SWMF is available for a runoff event; and
  - builds the downstream off-site conveyance infrastructure in the future when enough levy funds are collected, thus converting the existing systems to full gravity service and allowing the municipality to discontinue monitoring pond water levels and pumping out the ponds when levels are too high.

Benefits of Recommended Approach

This approach has the following financing benefits:

- it results in reasonable upfront costs for initial developers that are within their ability to pay and quickly recover from lot sales;
- it avoids large upfront financing costs related to building the required downstream, off-site conveyance infrastructure, thus removing a potential impediment to development; and
- it involves long-term financing and capital spending that is development-driven in which
  - spending occurs only when enough development has occurred to generate enough levy money to pay for the ultimate downstream infrastructure, and
  - spending is not based on development growth predictions, but actual growth that occurs.

Added Operations Responsibility to Municipality

This approach does, however, temporarily place an added operations responsibility on the municipality that involves regularly monitoring pond levels and pumping out excess volumes to maintain design live storage capacity to accommodate runoff from an event. This activity would be potentially required for many years until such time as enough levy funds are collected to pay for the construction of the downstream conveyance infrastructure.

However, this added operations responsibility may be less onerous than might be expected. Experience and continuous computer simulation modelling undertaken on other projects demonstrates that infrequent pumping will be required – something in the order of once or twice per year on average. This is due to the combined, off-setting impacts of additions of volume from small runoff events that commonly occur most of the time and reductions in volume from evaporation on pond water levels. While runoff contributes volumes to SWMFs on multiple occasions each season, most runoff events are quite small, and much of the volumes are evaporated. Additionally, if the SWMFs are developed as constructed wetlands, seasonal water losses can be even greater with evaporation occurring over open water portions of the SWMFs and evapotranspiration occurring over the shallow portions of the SWMFs where submergent and emergent wetland vegetation is present.

In addition, pond water level monitoring programs can be quite simple and do not take much time for operations staff, as follows:

- staff gauges can be installed within the SWMFs or within inlet or outlet structures, which can be easily read by operators;
- readings should be taken regularly, likely monthly, as well as following any large rainfall events; and
- simple rules can be developed to identify the need to pump out, including
  - a range of water levels both above and below NWL can be identified to not require pumping,
  - most of the full live storage capacity should be provided through pumping during the summer months, when the large flood events tend to occur, and
  - a smaller portion of the live storage capacity may be required for periods outside the summer months as large flood events do not occur during those periods.

2.1.5 Planning Level Cost Estimates

Planning level costs estimates have been developed for the following three types of stormwater servicing costs that would be incurred by a developer:

- the urban drainage system required to convey runoff from the development to the SWMF;
- the SWMF required to service the development and other developments within its catchment; and
- the outlet piping from the SWMF downstream to where the existing systems can assimilate the flows.

The initial developer within a pond catchment area would be required to incur the following costs for stormwater servicing:

- 100% of the costs of the storm sewers, manholes, catch basins, etc. required within their development area to direct runoff to a SWMF;
- 100% of the cost of the full SWMF – an on-site levy would be established to provide a means for the developer to recover oversizing costs from future developments within the pond catchment area; and
- the developers share of the ultimate downstream pond outlet system – paid as an off-site levy charge.

As these costs, especially the off-site levy charges, will vary for each development within the study area, these costs will likely prove to be the single largest factor influencing which portions of the study area may be preferred over others from a stormwater servicing perspective. As a result, these high-level planning cost estimates were developed to provide a quantitative approach in assigning stormwater ratings for the quarter sections within the study area to be considered as one factor in selecting the most appropriate location for the regional node.

Development Area Drainage Servicing Costs

Developer costs for the urban drainage conveyance system within their development area will vary dramatically for each development, depending largely on the size of the development. These costs have been estimated coarsely based on typical developments, have been averaged, and are expressed in terms of typical cost per hectare. These costs have been developed for illustrative purposes and to provide a comprehensive consideration of all stormwater related costs to be incurred by developers. However, these costs were not used in the development of the stormwater ratings for this project, as they are independent of development location within the study area.

Cost estimate details are provided in **Appendix A**, including costs for typical developments. The result is that on-site development servicing costs may range from about $70,000/ha to about $90,000/ha depending on the type of development and other influences. A range of costs for on-site stormwater servicing for sample development sizes is provided in **Table 2.8**.

Table 2.8: Typical Development Area Drainage Servicing Costs

Typical Development Area	On-Site Drainage Servicing Costs ($ million)[1,2]
10 ha	$0.7 to $0.9
20 ha	$1.4 to $1.8
30 ha	$2.1 to $2.7

Table Footnotes:

1. Costs estimated at between about $0.07M/ha to about $0.09M/ha.
2. Estimated costs include allowances for engineering (10%) and contingency (30%).

SWMF Costs

Costs were estimated for the sample SWMF design concept for a standard quarter section (65 ha) development area as described in Section 2.1.5 above, with the details provided in **Appendix A**. For purposes of this study, costs for each SWMF were then estimated by prorating the standard pond cost by ratio of catchment areas. So, if a pond catchment area was somewhat larger than 65 ha, that pond would need to be proportionately larger (approximately) and therefore proportionately more expensive. The same would hold true for ponds servicing smaller areas.

Cost estimate details for the standard SWMF are provided in **Appendix A**, and include allowances for land (5 ha), engineering (10%), and contingency (30%). Estimated planning level costs for each SWMF are summarized in **Table 2.9**.

Table 2.9: Estimated Costs for SWMFs

SWMF	Catchment Area (ha)	Estimated Cost ($ million)[1,2]
S-1	61.8	5.4
S-2	67.5	5.4
S-3	68.4	5.4
S-4	99.0	8.1
S-5	70.7	5.4
S-6	64.3	5.4
S-7	66.4	5.4
S-8	64.3	5.4
S-9	65.1	5.4
S-10	63.4	5.4
S-11	50.5	4.3
S-12	64.8	5.4
S-13	39.1	3.2
S-14	65.6	5.4
S-15	81.5	7.0
S-16	81.7	7.0
S-17	90.2	7.6
S-18	67.9	5.4

Table Footnotes:

1. Costs estimated based on prorating cost for a SWMF servicing a quarter section ($4.0M) by catchment area.
2. Estimated costs include allowances for land (at $0.3M/ha), engineering (10%), and contingency (30%).

Downstream Outlet System Costs

The downstream outlet system costs for each length of pipe, ditch, and culvert are summarized in **Table 2.10**, with assumptions and details provided in **Appendix A**. Costs include allowances for engineering (10%) and contingency (30%).

Table 2.10: Downstream Outlet System Costs

From Node	To Node	Type	Cost[1,2] ($mill.)	From Node	To Node	Type	Cost[1,2] ($mill.)	From Node	To Node	Type	Cost[1,2] ($mill.)
On-Site											
N-1	N-2	pipe	0.7	N-17	N-15	pipe	1.3	N-29	N-30	pipe	0.3
N-2	N-4	pipe	0.6	N-18	N-15	pipe	0.5	N-30	N-32	pipe	0.5
N-4	N-5	pipe	0.7	N-15	N-19	pipe	1.2	N-34	N-32	pipe	0.4
N-7	N-8	pipe	0.6	N-19	N-20	pipe	1.7	N-32	N-35	pipe	0.9
N-8	N-5	pipe	0.7	N-21	N-20	pipe	0.8	N-35	N-37	pipe	1.2
N-9	N-10	pipe	0.2	N-20	N-22	pipe	1.5	N-37	N-28	pipe	0.7
N-10	N-11	pipe	0.5	N-22	N-23	pipe	1.9	N-39	N-40	pipe	0.7
N-11	N-12	pipe	0.6	N-24	N-23	pipe	0.3	N-40	N-28	pipe	0.7
N-12	N-5	pipe	1.1	N-23	N-25	pipe	3.3	N-28	N-41	pipe	2.1
N-5	N-14	pipe	1.6	N-25	N-26	pipe	1.1	N-41	N-43	pipe	1.9
N-14	N-15	pipe	0.8	N-26	N-27	pipe	1.6	N-44	N-45	pipe	0.5
N-16	N-17	pipe	0.3	N-27	N-28	pipe	1.5	N-45	N-43	pipe	0.7
										On-Site Subtotal:	**$35.7**
Off-Site											
N-43	N-46	pipe	0.8	N-53	N-54	pipe	2.2	N-68	N-70	Ditch	0.05
N-46	N-47	pipe	1.3	N-54	N-55	pipe	1.7	N-70	N-71	Ditch	0.18
N-47	N-48	pipe	1.8	N-55	N-56	pipe	1.5	N-71	N-72	Culvert	0.06
N-48	N-49	pipe	2.3	N-56	N-57	pipe	1.0	N-72	N-73	Ditch	0.42
N-49	N-50	pipe	2.6	N-64	N-65	ditch	0.11	N-73	N-74	Culvert	0.04
N-50	N-51	pipe	2.6	N-65	N-66	culvert	0.02	N-74	N-75	Ditch	0.03
N-51	N-52	pipe	2.4	N-66	N-67	ditch	0.04	N-75	N-76	Culvert	0.15
N-52	N-53	pipe	2.3	N-67	N-68	culvert	0.02				
										Off-Site Subtotal:	**$23.7**
										Total:	**$59.4**

Table Footnotes:

1. Estimated costs include allowances for engineering (10%) and contingency (30%).
2. Costs include allowances for manholes on pipes, spaced at 150 m intervals, and an outlet structure at Opimihaw Creek required to dissipate energy from the discharges.

2.1.6 Off-Site Levy Expectations

Developments within each SWMF catchment area will be required to pay into an off-site levy their share of the costs of the downstream pond outlet drainage systems required to service the study area. Their "fair share" is typically defined as the sum of the portion of the catchment area to each pipe segment over the total catchment area for each segment. For example, the furthest upstream catchment will be required to pay a levy charge equal to 100% of the cost of the immediate downstream pipe plus percentages of the costs of all further downstream pipes based on portion of contributing area.

If the upstream SWMF catchment area was 65 ha, and the total study area catchment is 1,230 ha, the off-site levy charge for the upstream catchment would include 5.3% (65 ha / 1230 ha) of the projected cost of the downstream off-site outlet system as well as the appropriate shares of the pipes within the study area from the catchment downstream to the downstream off-site outlet system.

The off-site levy charges for each SWMF catchment area are developed through a spreadsheet in **Appendix A** where the costs for each segment of the outlet system are allocated to all upstream SWMFs based on proportion of contributing area to that segment, then the proportionate costs for each pipe downstream of a SWMF are summed to get the total levy charge for each SWMF.

2.1.7 Stormwater Ratings

Stormwater Ratings for Each SWMF Catchment Area

As can be observed in the following table, there will be stormwater servicing costs to be incurred when developing anywhere within the study area. The costs will include on-site servicing costs within the development (not shown), the full cost of the ultimate SWMF, and the downstream off-site outlet levy costs. The unit cost per SWMF catchment is expected to range between about $110,000/ha to about $170,000/ha, as shown in **Table 2.11**. These costs are expected to be within the capacity of developers to pay and are not expected to provide an encumbrance to development within any part of the study area. As a result, it was concluded that the difference in costs may likely present a moderate level of consideration for developers. Thus, the differences in cost may be considered as minimally impactful to the stormwater ratings assigned. As a result, the following summarizes the proposed stormwater ratings to be assigned to each SWMF catchment area:

- rating = 1 – the best place to develop from a stormwater servicing perspective;
- rating = 3 for SWMF catchments with unit servicing costs between $110,000/ha and $120,000/ha;
- rating = 4 for SWMF catchments with unit servicing costs between $130,000/ha and $140,000/ha;
- rating = 5 for SWMF catchments with unit servicing costs between $150,000/ha and $170,000/ha; and
- rating = 10 – the worst place to develop from a stormwater servicing perspective

Note that no catchments were rated “1” since to achieve that rating it was considered that there should be no downstream outlet costs. Also, no catchments were rated “10” as it was considered that servicing costs could be reasonably afforded within the ability of the developer to pay. Since there is not a significant difference in projected stormwater servicing costs, all SWMF catchments were assigned similar, moderate ratings.

The servicing costs, unit costs, and resulting stormwater ratings for each SWMF catchment area are provided in **Table 2.11**.

Table 2.11: SWMF Catchment Storm Ratings

SWMF	Catch. Area (ha)	SWMF Cost	Off-Site Levy Cost	Total Cost	Unit Cost	Catchment Storm Rating
S-1	61.8	$5.4	$4.9	$10.3	$0.17 /ha	5
S-2	67.5	$5.4	$4.2	$9.6	$0.14 /ha	4
S-3	68.4	$5.4	$3.6	$9.0	$0.13 /ha	4
S-4	99.0	$8.1	$5.4	$13.5	$0.14 /ha	4
S-5	70.7	$5.4	$5.1	$10.5	$0.15 /ha	5
S-6	64.3	$5.4	$4.3	$9.7	$0.15 /ha	5
S-7	66.4	$5.4	$2.9	$8.3	$0.13 /ha	4
S-8	64.3	$5.4	$3.2	$8.6	$0.13 /ha	4
S-9	65.1	$5.4	$2.6	$8.0	$0.12 /ha	3
S-10	63.4	$5.4	$3.1	$8.5	$0.13 /ha	4
S-11	50.5	$4.3	$1.9	$6.2	$0.12 /ha	3
S-12	64.8	$5.4	$1.8	$7.2	$0.11 /ha	3
S-13	39.1	$3.2	$1.0	$4.3	$0.11 /ha	3
S-14	65.6	$5.4	$3.5	$8.9	$0.14 /ha	4
S-15	81.5	$7.0	$3.6	$10.7	$0.13 /ha	4
S-16	81.7	$7.0	$2.1	$9.1	$0.11 /ha	3
S-17	90.2	$7.6	$3.4	$11.0	$0.12 /ha	3
S-18	67.9	$5.4	$2.5	$7.9	$0.12 /ha	3

Table Footnotes:

1. Estimated costs are in $million.

Stormwater Ratings by Planning Unit

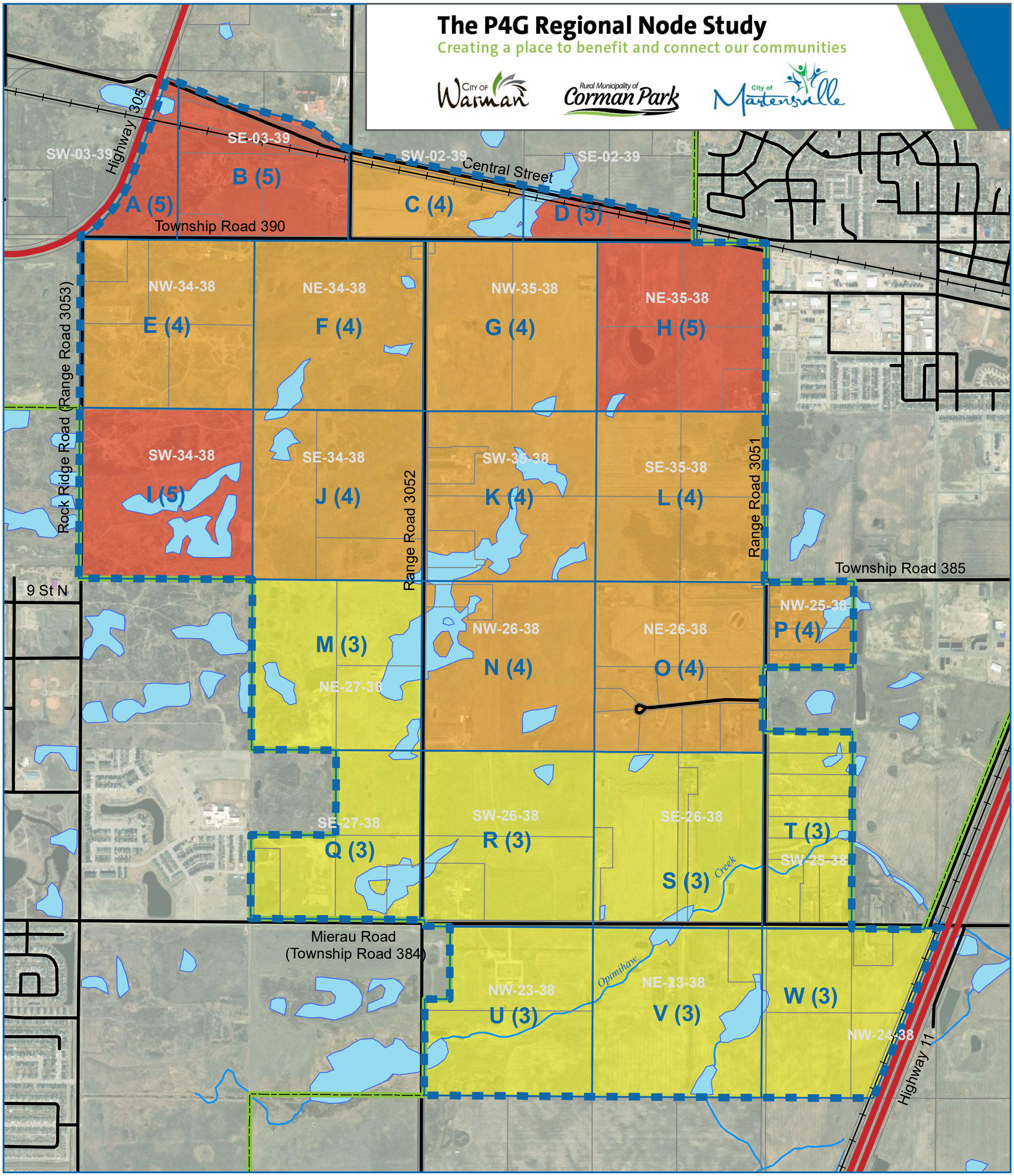
Stormwater ratings needed to be developed for the 23 planning units previously introduced in **Figure 2.1**. As not all SWMF catchment areas aligned well with a planning unit, a means of developing the planning unit ratings based on the catchment area ratings was required. The approach involved consideration of the ratings of the catchments that overlapped each planning unit to select an appropriate stormwater rating for the planning unit.

This method and its results are summarized in **Table 2.12** and illustrated in **Figure 2.8**.

Table 2.12: Planning Unit Stormwater Ratings

Planning Unit	SWMF Catchment Areas		Planning Unit Storm Rating
	Overlapping Catchments	Catchment Storm Ratings	
A	S-1	5	5
B	S-1	5	5
C	S-4	4	4
D	S-4, S-5	4,5	5
E	S-2	4	4
F	S-3	4	4
G	S-4	4	4
H	S-5	5	5
I	S-6	5	5
J	S-7	4	4
K	S-8	4	4
L	S-14	4	4
M	S-9	3	3
N	S-10	4	4
O	S-15	4	4
P	S-15	4	4
Q	S-11	3	3
R	S-12	3	3
S	S-16	3	3
T	S-16	3	3
U	S-13, S-17	3, 3	3
V	S-13, S-17	3, 3	3
W	S-18	3	3

These stormwater rating results will be considered along with ratings for other infrastructure serviceability and land use considerations in the process of developing an overall rating for each planning unit as the quantitative means to inform selection of the best planning unit for the regional node.



ISL

Study Area
Planning Unit
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

Ratings

1
2
3
4
5

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

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FIGURE 2.8:
STORMWATER RATINGS BY PLANNING UNIT

2.2 Water and Wastewater Analysis

Providing effective and reliable potable water supply and sanitary sewage collection to the proposed P4G regional node development are essential services to be considered in selecting its ultimate location. In this preliminary assessment of water and sewer serviceability options, it has been assumed that these services would be best provided by connecting to existing municipal infrastructure instead of the RM and P4G having to create and manage new utility boards. As such, servicing options for the potable water supply reviewed the efforts for connecting to the City of Martensville or City of Warman water distribution systems or the SaskWater potable water transmission pipelines that transect the regional node study area. Connections to the City of Martensville or City of Warman sewage collection systems were reviewed for sanitary sewer service.

The use of onsite water supply and treatment and septic tanks/fields is not recommended for the P4G regional node due to the expected high demands that densely developed and commercial/institutional land use of the development will have. Developing new onsite water and sewer treatment facilities for the P4G node will ultimately result in much higher construction and ongoing maintenance costs versus working with and utilizing existing and or collaboratively improving available capacities of the existing water and municipal water and sewer infrastructure within and adjacent to the study area.

This initial water and sewer review consists of the following:

- Reviewing and estimating the water and sewer demands that each planning unit would generate and ideally could be supplied with;
- Identifying potentially suitable connection points for new water and sewer mains to connect each of the 23 planning units within the study area to the existing Warman or Martensville water and sewer networks or to the SaskWater water transmission system (water service only);
- Estimating the extent to which each existing Warman and Martensville sanitary sewer system can extend within the node study area and which planning units are serviceable with gravity sewage collection and those that would likely require a sewage pumping station and force main when serviced by either municipality; and
- Identifying and estimating the costs for installing new water and sewer mains and providing initial recommendations for the sizes.

It should be noted that these serviceability analyses do not include the design and costs of the local level water distribution and sewer mains and appurtenances that would be installed within the regional node development as these costs will largely be dependent on the ultimate layout and development plan and would generally be the same cost regardless of which planning unit is developed. This preliminary servicing review determines which planning units can more readily and effectively provide water and sewer service from their boundaries to suitable connection points to nearby water and sewer infrastructure.

This stage of water and sewer servicing analysis assumes that the potential existing service providers (City of Warman, City of Martensville and SaskWater) already have available capacity to meet the estimated peak water and sewer demands and water storage (reservoir capacity) requirements for servicing at least one of the regional node planning units.

Upon the full results of this overall Regional Node Study and the identification of the most suitable overall location planning units, it is recommended each of the potential water and sewer service providers review their internal water and sewer system capacities and overall growth plans to ensure their systems (water distribution and storage, sewage collection and treatment) can handle the preliminary water, sewer and fire fighting demands determined in this study for at least the top three (3) overall rated location planning units.

2.2.1 Estimated Regional Node Water and Sewer Demands

ISL Engineering compiled and reviewed land use and area-based water and sewer servicing design criteria of Saskatchewan municipalities' design and development standards to recommend design parameters for these early planning stages of the P4G Node development. Municipalities included in this review were the City of Martensville, the City of Saskatoon, the City of Regina, the City of Swift Current and the City of Lloydminster. Except for the City of Saskatoon, most of these municipalities have similar water and sewer design parameters, which were adopted within this analysis and summarized below.

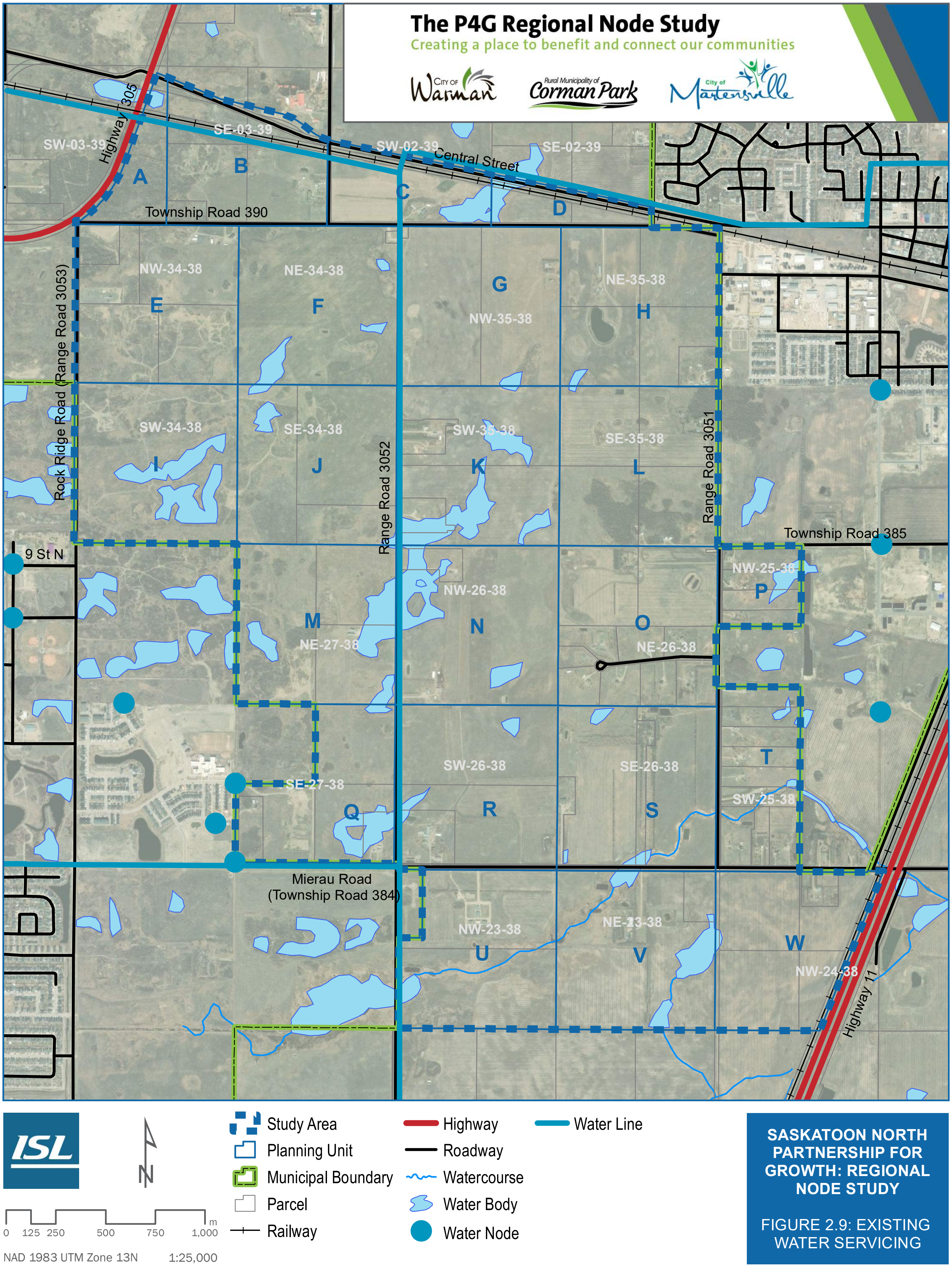
Table 2.13: Recommended Design Criteria

	Water Servicing Criteria				Sewer Servicing Criteria				
City	Average Day Demand (L/s/ha)	Max Day Peaking Factor (x Average)	Max Hour Peaking Factor	Min Fire Flow (L/s)	Average Dry Sewage Generation Rate (L/s/ha)	Peaking Factor for Dry Sewage	Peak Dry (L/s/ha)	Infiltration Allowance (L/s/ha)	Peak Wet Sewage Generation Rate (L/s/ha)
Martensville	NA	2.0	3.0	90	NA	NA	NA	NA	NA
Saskatoon	0.54	2.0	3.0	220	0.54	3.0	1.62	0.17	1.79
Regina	0.29	1.8	2.9	150	0.34	3.3	1.122	0.24	1.362
Swift Current	0.29	2.1	3.2	95	0.46	3.0	1.38	0.28	1.66
Lloydminster	0.3	2.0	3.0	185	0.2	3.4	0.68	0.28	0.96
Recommended Design Criteria	**0.3**	**2.0 x**	**3.0**	**150**	**0.4**	**3.2**	**1.25**	**0.25**	**1.5**

Potential water service providers for the P4G Node would also need enough water storage capacity within their existing (or planned near future) reservoirs to meet the Water Security Agency's minimum of two times the average day demand volume. For a typically full quarter section, 64 ha-sized planning unit, this equates to slightly under 3,500 m^3 of storage.

2.2.2 Water

Presently, three (3) existing potable service supply and service providers have potential service connection points adjacent to or with the regional node study area: The City of Warman, The City of Martensville and SaskWater. **Figure 2.9** identifies the existing SaskWater potable water supply mains within and adjacent to the study area and the most suitable tie-in points for connecting new water main(s) that would service the regional node development. These tie-in points were selected by reviewing the available water distribution main maps for locations where connecting two (or more) 200 mm diameter or one 300 mm diameter (or larger) existing mains are possible and close to the Node Study Area.



SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.9: EXISTING WATER SERVICING

Two water supply main options were evaluated for each planning unit being serviced by either Martensville or Warman, where the water main connecting the development to those existing systems would be a single watermain or two smaller-sized mains built in a looped configuration. Water service using one main will have a lower overall cost, as it entails constructing one larger main along the shortest distance between the planning unit and the nearest tie-in location in Martensville or Warman. The disadvantages of using a single main servicing configuration are:

- It results in a larger demand being exerted at a single location within the existing Martensville or Warman distribution systems that may be more difficult for those networks to accommodate;
- There would be no redundant water supply to the P4G node if there were a required shutdown of the single main for maintenance or repair; and
- A single line would offer less overall future development opportunity for potentially servicing additional development within the study area beyond the regional node as a single main would abut fewer planning unit lands.

Using the water demand criteria outlined in Section 2.2.1, a single water supply main between any planning unit lands and a tie-in location to Warman or Martensville should be a 400mm diameter size. A looped water supply main configuration would require two lengths of 300mm diameter tied to two (2) locations within the Martensville or Warman water distribution system. While using the looped water main configuration is generally estimated to cost 50% more than a single main to construct, the supply, redundancy and future growth potential advantages it offers make it the recommended water servicing method when tying to the Warman or Martensville system. While servicing cost estimates for tying to the Martensville and Warman water distribution systems are included within Sections 2.2.3 and 2.2.4, respectively, the water serviceability ratings presented are those for a looped water main configuration.

Preliminary water serviceability ratings for each planning unit were determined by dividing the estimated cost of installing a looped potable water supply main to a unit by its area to determine the cost/hectare for connecting to existing potential potable water supply infrastructure. For the SaskWater connection option, the costs of constructing a new storage reservoir facility and constructing a supply main between the reservoir and the nearest existing SaskWater transmission line were used. It should be noted that most smaller planning units will have lower ratings from having a higher water servicing cost per hectare.

Table 2.14: Water Serviceability Rating

Water Serviceability Rating	Estimated Servicing Cost/ha
1	Under $25,000/ha
2	$25,000 to $50,000/ha
3	$50,000 to $75,000/ha
4	$75,000 to $100,000/ha
5	Over $100,000/ha

2.2.3 Water Serviceability via Martensville

The preliminary serviceability analysis results for providing potable water service to each regional node planning unit by connecting to the existing City of Martensville water distribution system are summarized below in **Table 2.15.** A set of maps is provided in **Appendix B** that illustrates the water main routes (single and double) and tie-in locations that were assigned and assumed for each planning unit.

At this stage, connecting to the Martensville water distribution systems is more advantageous than being supplied by SaskWater if it does not require the P4G development to construct and operate a dedicated potable water storage facility. It is assumed that connecting and servicing the P4G node to the Martensville system would not require a new reservoir. Water servicing costs/efforts would entail constructing new water mains between each planning unit and the nearest tie-in location(s).

Table 2.15: Martensville Water Serviceability Influences and Ratings by Planning Unit

Planning Unit	Area (ha)	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Recommended Minimum Fire	Maximum Day Demand + Fire	Storage at 2× Average Day Demand	Shortest Single Line (m)	400 mm Single Line Cost ($)	Single Line Cost/ha ($)	Additional Length for Looped Line	300 mm Looped Supply Main Cost ($)	Looped Supply Cost/ha ($)	Water Serviceability Rating
A	15	5	9	14	150	159	1000	2000	3,000,000	200,000	3150	5,150,000	343,333	5
B	46	14	28	41	150	178	2500	2400	3,600,000	78,261	2800	5,200,000	113,043	5
C	24	7	14	22	150	164	1500	3200	4,800,000	200,000	4000	7,200,000	300,000	5
D	10	3	6	9	150	156	500	4000	6,000,000	600,000	4800	8,800,000	880,000	5
E	64	19	38	58	150	188	3500	1200	1,800,000	28,125	2000	3,200,000	50,000	2
F	64	19	38	58	150	188	3500	2000	3,000,000	46,875	3200	5,200,000	81,250	4
G	64	19	38	58	150	188	3500	2800	4,200,000	65,625	3200	6,000,000	93,750	4
H	64	19	38	58	150	188	3500	3600	5,400,000	84,375	4000	7,600,000	118,750	5
I	64	19	38	58	150	188	3500	400	600,000	9,375	1200	1,600,000	25,000	1
J	64	19	38	58	150	188	3500	1200	1,800,000	28,125	1200	2,400,000	37,500	2
K	64	19	38	58	150	188	3500	2000	3,000,000	46,875	2400	4,400,000	68,750	3
L	64	19	38	58	150	188	3500	2900	4,350,000	67,969	3300	6,200,000	96,875	4
M	64	19	38	58	150	188	3500	400	600,000	9,375	600	1,000,000	15,625	1
N	64	19	38	58	150	188	3500	1200	1,800,000	28,125	1600	2,800,000	43,750	2
O	64	19	38	58	150	188	3500	2000	3,000,000	46,875	2400	4,400,000	68,750	3
P	16	5	10	14	150	160	1000	3600	5,400,000	337,500	3600	7,200,000	450,000	5
Q	48	14	29	43	150	179	2500	100	150,000	3,125	100	200,000	4,167	1
R	64	19	38	58	150	188	3500	800	1,200,000	18,750	1200	2,000,000	31,250	2
S	64	19	38	58	150	188	3500	1600	2,400,000	37,500	2000	3,600,000	56,250	3
T	39	12	23	35	150	173	2000	2400	3,600,000	92,308	2800	5,200,000	133,333	5
U	59	18	35	53	150	185	3500	1000	1,500,000	25,424	2100	3,100,000	52,542	3
V	64	19	38	58	150	188	3500	1600	2,400,000	37,500	3000	4,600,000	71,875	3
W	53	16	32	48	150	182	3000	2400	3,600,000	67,925	3600	6,000,000	113,208	5

2.2.4 Water Serviceability via Warman

The preliminary serviceability analysis results for providing potable water service to each regional node planning unit by connecting to the existing City of Warman water distribution system are summarized below in **Table 2.16**. A set of maps is provided in **Appendix C** that illustrates the water main routes (single and double) and tie-in locations that were assigned and assumed for each planning unit.

At this stage, connecting to the Warman water distribution systems is more advantageous than being supplied by SaskWater if it does not require the P4G development to construct and operate a dedicated potable water storage facility. It is assumed that connecting and servicing the P4G node to the Warman system would not require a new reservoir. Water servicing costs/efforts would entail constructing new water mains between each planning unit and the nearest tie-in location(s).

Table 2.16: Warman Water Serviceability Influences and Ratings by Planning Unit

Planning Unit	Area (ha)	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Recommended Minimum Fire	Maximum Day Demand + Fire	Storage at 2× Average Day Demand	Shortest Single Line (m)	400 mm Single Line Cost ($)	Single Line Cost/ha ($)	Additional Length for Looped Line	300 mm Looped Supply Main Cost ($)	Looped Supply Cost/ha ($)	Water Serviceability Rating
A	15	5	9	14	150	159	1000	4400	6,600,000	440,000	5600	10,000,000	666,667	5
B	46	14	28	41	150	178	2500	3600	5,400,000	117,391	4800	8,400,000	182,609	5
C	24	7	14	22	150	164	1500	2800	4,200,000	175,000	4000	6,800,000	283,333	5
D	10	3	6	9	150	156	500	2000	3,000,000	300,000	3200	5,200,000	520,000	5
E	64	19	38	58	150	188	3500	3200	4,800,000	75,000	4000	7,200,000	112,500	5
F	64	19	38	58	150	188	3500	2400	3,600,000	56,250	3200	5,600,000	87,500	4
G	64	19	38	58	150	188	3500	1600	2,400,000	37,500	2400	4,000,000	62,500	3
H	64	19	38	58	150	188	3500	800	1,200,000	18,750	1600	2,400,000	37,500	2
I	64	19	38	58	150	188	3500	3200	4,800,000	75,000	3200	6,400,000	100,000	4
J	64	19	38	58	150	188	3500	2400	3,600,000	56,250	2400	4,800,000	75,000	3
K	64	19	38	58	150	188	3500	1600	2,400,000	37,500	1600	3,200,000	50,000	2
L	64	19	38	58	150	188	3500	800	1,200,000	18,750	800	1,600,000	25,000	1
M	64	19	38	58	150	188	3500	2400	3,600,000	56,250	2400	4,800,000	75,000	3
N	64	19	38	58	150	188	3500	1600	2,400,000	37,500	1600	3,200,000	50,000	2
O	64	19	38	58	150	188	3500	800	1,200,000	18,750	1000	1,800,000	28,125	2
P	16	5	10	14	150	160	1000	400	600,000	37,500	800	1,200,000	75,000	3
Q	48	14	29	43	150	179	2500	2600	3,900,000	81,250	3200	5,800,000	120,833	5
R	64	19	38	58	150	188	3500	1800	2,700,000	42,188	2400	4,200,000	65,625	3
S	64	19	38	58	150	188	3500	1000	1,500,000	23,438	1600	2,600,000	40,625	2
T	39	12	23	35	150	173	2000	400	600,000	15,385	1600	2,000,000	51,282	3
U	59	18	35	53	150	185	3500	2400	3,600,000	61,017	3200	5,600,000	94,915	4
V	64	19	38	58	150	188	3500	1600	2,400,000	37,500	2400	4,000,000	62,500	3
W	53	16	32	48	150	182	3000	800	1,200,000	22,642	2400	3,200,000	60,377	3

2.2.5 Water Serviceability via SaskWater

The preliminary serviceability analysis results for providing potable water service to each regional node planning unit by connecting to the existing SaskWater distribution system are summarized below in **Table 2.17**. A set of maps is provided in **Appendix D** that illustrates the water main routes (single and double) and tie-in locations that were assigned and assumed for each planning unit.

For water servicing by SaskWater, it is assumed that a new reservoir would be required for the P4G development since SaskWater does not provide any potable water storage capacity within its transmission system. P4G Node water servicing costs for each planning unit when serviced by SaskWater are assumed to consist of the length of a 200mm diameter water transmission line from the nearest planning unit boundary and existing SaskWater transmission line as well as the estimated cost for constructing a new potable water storage reservoir.

Table 2.17: SaskWater Water Serviceability Influences and Ratings by Planning Unit

Planning Unit	Area (ha)	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Recommended Minimum Fire	Maximum Day Demand + Fire	Storage at 2× Average Day Demand	Distance to Nearest SaskWater Main (m)	200 mm Supply Line Cost ($)	Reservoir Cost ($)	Total SaskWater Supply Cost ($)	Total SaskWater Cost/ha ($)	Water Serviceability Rating
A	15	5	9	14	150	159	1000	1200	960,000	2,000,000	2,960,000	197,333	5
B	46	14	28	41	150	178	2500	400	320,000	5,000,000	5,320,000	115,652	4
C	24	7	14	22	150	164	1500	adjacent	n/a	3,000,000	3,000,000	125,000	4
D	10	3	6	9	150	156	500	450	360,000	1,000,000	1,360,000	136,000	4
E	64	19	38	58	150	188	3500	800	640,000	7,000,000	7,640,000	119,375	4
F	64	19	38	58	150	188	3500	adjacent	n/a	7,000,000	7,000,000	109,375	4
G	64	19	38	58	150	188	3500	adjacent	n/a	7,000,000	7,000,000	109,375	4
H	64	19	38	58	150	188	3500	800	640,000	7,000,000	7,640,000	119,375	4
I	64	19	38	58	150	188	3500	800	640,000	7,000,000	7,640,000	119,375	4
J	64	19	38	58	150	188	3500	adjacent	n/a	7,000,000	7,000,000	109,375	4
K	64	19	38	58	150	188	3500	adjacent	n/a	7,000,000	7,000,000	109,375	4
L	64	19	38	58	150	188	3500	800	640,000	7,000,000	7,640,000	119,375	4
M	64	19	38	58	150	188	3500	adjacent	n/a	7,000,000	7,000,000	109,375	4
N	64	19	38	58	150	188	3500	adjacent	n/a	7,000,000	7,000,000	109,375	4
O	64	19	38	58	150	188	3500	800	640,000	7,000,000	7,640,000	119,375	4
P	16	5	10	14	150	160	1000	1600	1,280,000	2,000,000	3,280,000	205,000	5
Q	48	14	29	43	150	179	2500	adjacent	n/a	5,000,000	5,000,000	104,167	4
R	64	19	38	58	150	188	3500	adjacent	n/a	7,000,000	7,000,000	109,375	4
S	64	19	38	58	150	188	3500	800	640,000	7,000,000	7,640,000	119,375	4
T	39	12	23	35	150	173	2000	1600	1,280,000	4,000,000	5,280,000	135,385	4
U	59	18	35	53	150	185	3000	adjacent	n/a	6,000,000	6,000,000	101,695	4
V	64	19	38	58	150	188	3500	800	640,000	7,000,000	7,640,000	119,375	4
W	53	16	32	48	150	182	3000	1600	1,280,000	6,000,000	7,280,000	137,358	4

2.2.6 Consolidated Water Serviceability Summary

Table 2.18 below summarizes the water serviceability ratings for each study area planning unit when being serviced by each of the three (3) potential water service providers. This table and **Figure 2.10** identify each planning unit's best (lowest) water serviceability rating and corresponding potential water service provider.

Table 2.18: Consolidated Water Serviceability Ratings by Planning Unit

Planning Unit	Area (ha)	Looped Service to Martensville	Looped Service to Warman	SaskWater Supply to Reservoir	Best (Lowest) Water Serviceability Rating
A*	15	5	5	5	5 (E)
B*	46	5	5	4	4 (S)
C*	24	5	5	4	4 (S)
D*	10	5	5	4	4 (S)
E	64	2	5	4	2 (M)
F	64	4	4	4	4 (E)
G	64	4	3	4	3 (W)
H	64	5	2	4	2 (W)
I	64	1	4	4	1 (M)
J	64	2	3	4	2 (M)
K	64	3	2	4	2 (W)
L	64	4	1	4	1 (W)
M	64	1	3	4	1 (M)
N	64	2	2	4	2 (M/W)
O	64	3	2	4	2 (W)
P*	16	5	3	5	3 (W)
Q	48	1	5	4	1 (M)
R	64	2	3	4	2 (M)
S	64	3	2	4	2 (W)
T*	39	5	3	4	3 (W)
U	59	3	4	4	3 (M)
V	64	3	3	4	3 (M/W)
W	53	5	3	4	3 (W)

Table Footnotes:
* Poorer rating due to smaller area. Could be improved by consolidating with adjacent planning units.
(M) Martensville
(W) Warman
(S) SaskWater
(E) Either Martensville, Warman, or SaskWater

Overall, planning units centrally located within the Study Area and closer to the Cites of Warman or Martensville have the best water serviceability rankings. Planning units in the north end of the study area rank worst due to their smaller sizes and further distances from the Warman or Martensville water tie-in locations.

The next stages of the P4G Regional Node Study should include feedback from each of the three (3) potential water service providers (Martensville, Warman and SaskWater) on their system capacities to accommodate the initial water supply demand forecasts of the front-runner planning units. These reviews would ideally determine if additional system upgrades and expansion costs would be necessary and provide an estimate of the resulting costs of those upgrades that would apply to the regional node development to produce an updated water serviceability rating.

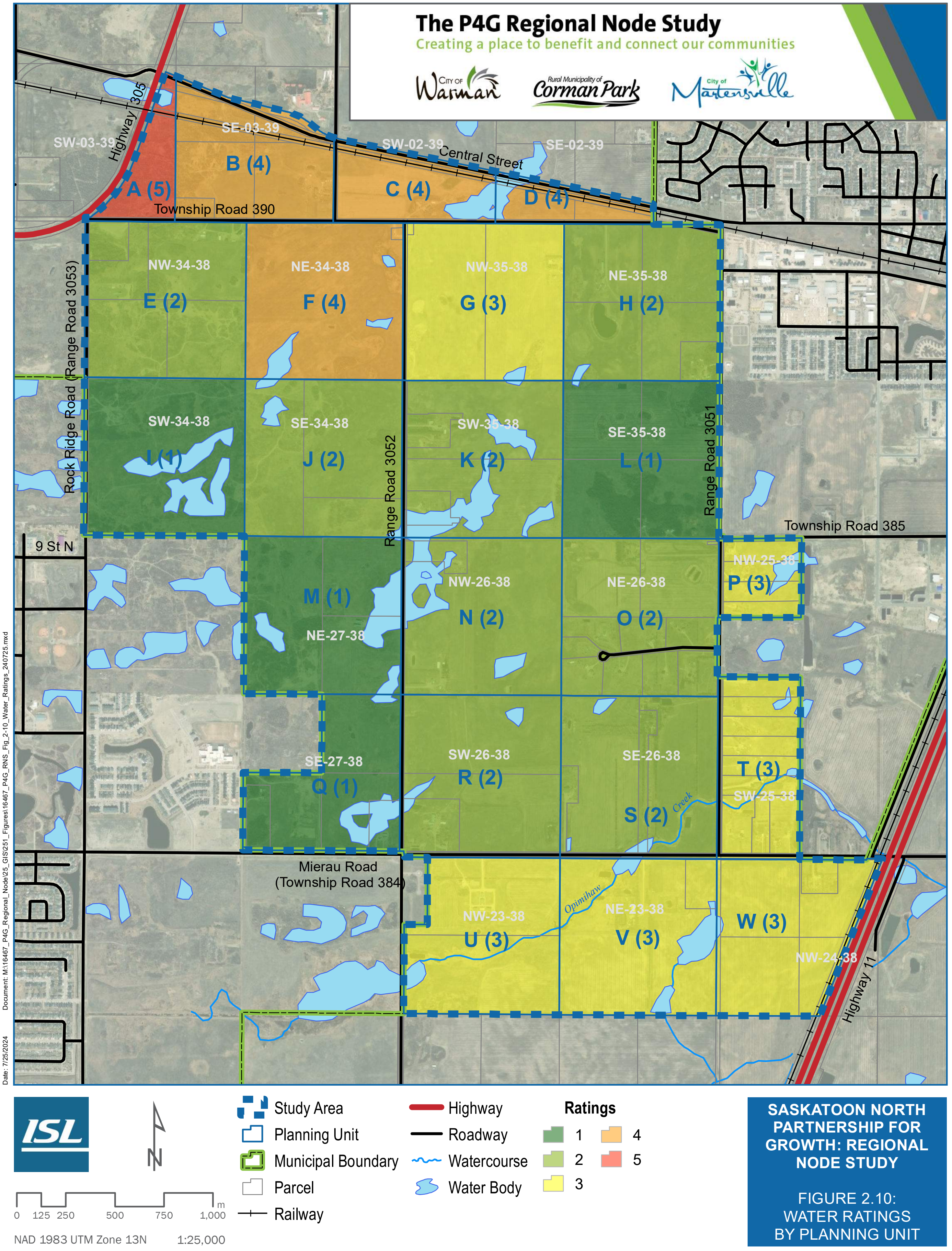


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FIGURE 2.10: WATER RATINGS BY PLANNING UNIT

2.2.7 Wastewater

Presently, two (2) existing potential wastewater service providers have service connection points adjacent to or with the regional node study area: the City of Warman and the City of Martensville. **Figure 2.11** identifies suitable tie-in points for connecting new sewer main(s) that would service the regional node development. These tie-in points were selected by reviewing the available sanitary sewer maps for locations where connecting and discharging wastewater to a 300 mm diameter (or larger) existing main near the Study Area was possible and close to the Node Study area.

Using the wastewater demand criteria outlined in Section 2.2.1, the recommended preliminary and assumed design for a sanitary sewer servicing trunk of 450 mm diameter was graded at 0.2%. This size and grade would be able to convey peak wastewater flows from a full-quarter-sized (64 ha) planning unit (96 L/s) while allowing an allowance for future additional development (125 L/s trunk capacity).

All 23 planning units were first evaluated to determine if they could be serviced by a gravity-drained trunk main, given the sewer inverts at the available wastewater service tie-in locations and study area topography. A planning unit was determined to be serviceable by gravity sewer if a 450 mm diameter sized sewer trunk could reach its boundary while maintaining a burial depth (pipe cover) of 5.0 m or more. Having the connecting trunk sewer this deep (or deeper) provides a workable amount of grade for the local sewer mains installed within the regional node development to drain to the connecting trunk.

If a gravity sewer trunk could not service a planning unit, its servicing costs and resultant serviceability rating were evaluated assuming the use of a sewage pumping station and a 300 mm diameter force main (125L/s design pumping capacity) connected to the nearest sewer tie-in location.

Preliminary wastewater serviceability ratings for each planning unit were determined by dividing the estimated cost of installing a gravity sewer main or lift station and force main by its area to determine the cost/hectare. It should be noted that most smaller planning units will have lower ratings from having a higher water servicing cost per hectare.

Table 2.19: Wastewater Serviceability Rating

Wastewater Serviceability Rating	Estimated Servicing Cost/ha
1	Under $25,000/ha
2	$25,000 to $50,000/ha
3	$50,000 to $75,000/ha
4	$75,000 to $100,000/ha
5	Over $100,000/ha

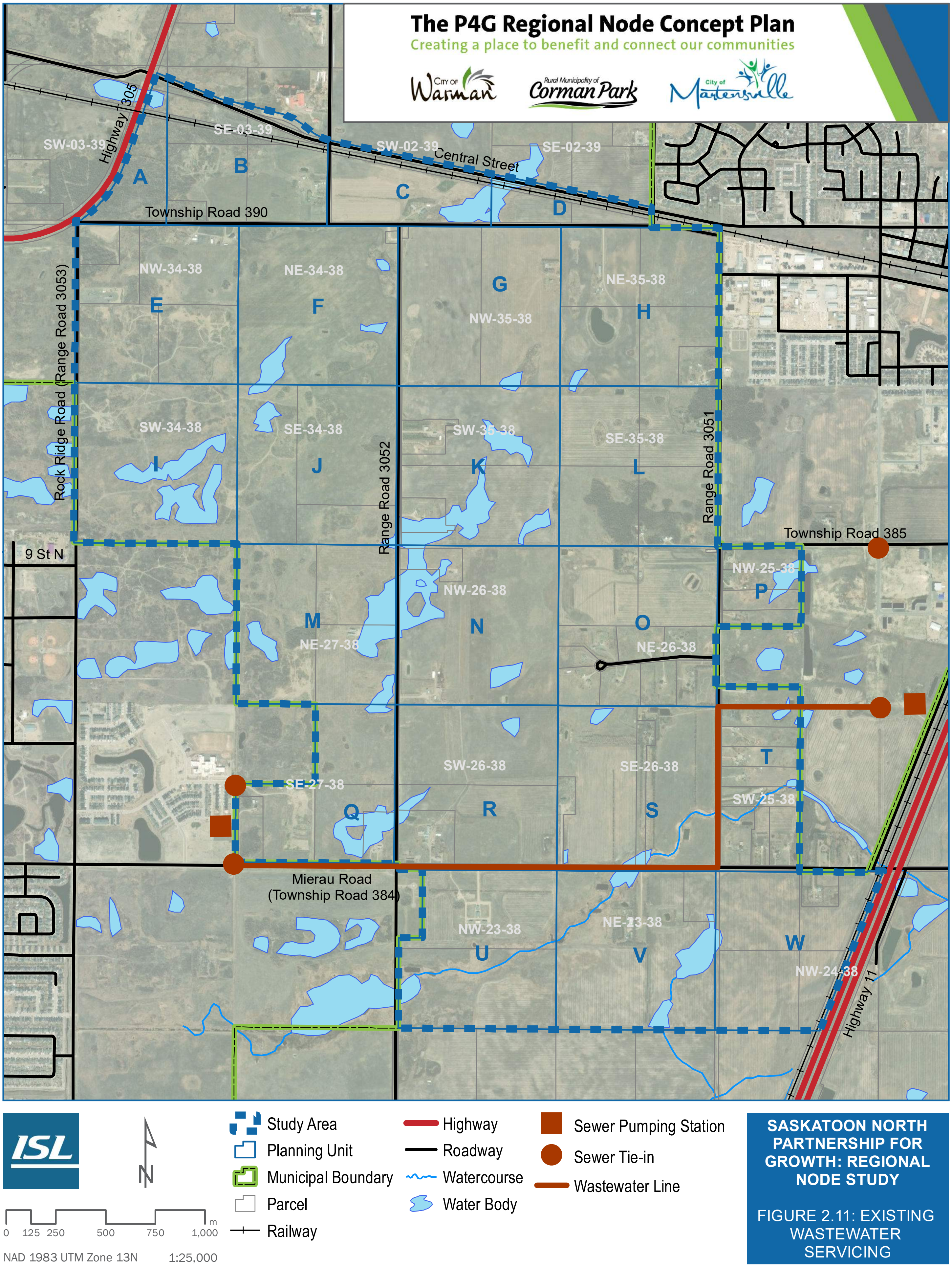

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FIGURE 2.11: EXISTING WASTEWATER SERVICING

2.2.8 Wastewater Serviceability via Martensville

The preliminary serviceability analysis results for providing wastewater service to each regional node planning unit by connecting to the existing City of Martensville sewage collection system are summarized below in **Table 2.20**. It should be noted that a new sewer line is being constructed from Martensville south to Saskatoon, which will increase the sewage conveyance capacity for Martensville. A set of maps is provided in **Appendix E** that illustrates the gravity sewer trunk routes and tie-in locations that were assigned and assumed for each planning unit.

Table 2.20: Martensville Wastewater Serviceability Influences and Ratings by Planning Unit

Planning Unit	Area (ha)	Dry Maximum (1.25 L/s/ha))	Infill & Infiltration Allowance	Qpeak	Martensville Gravity Trunk Route	Shortest Gravity Main (m)	450 mm Gravity Sewer Line Cost ($)	Lift Station Cost ($)	300 mm Force Main Length (m)	Force Main Cost ($)	Wastewater Cost/ha ($)	Wastewater Serviceability Rating
A+B	61	76	15	92	1	2800	7,000,000				114,754.10	5
C+D	34	43	9	51	1	3200	8,000,000				235,294.12	5
E	64	80	16	96	1	2000	5,000,000				78,125.00	3
F	64	80	16	96	1	2000	5,000,000				78,125.00	3
G	64	80	16	96	2	2800	7,000,000				109,375.00	5
H	64	80	16	96	3	3600	9,000,000				140,625.00	5
I	64	80	16	96	1	1200	3,000,000				46,875.00	2
J	64	80	16	96	1	1200	3,000,000				46,875.00	2
K	64	80	16	96	2	2000	5,000,000				78,125.00	3
L	64	80	16	96	3	2800	7,000,000				109,375.00	5
M	64	80	16	96	1	400	1,000,000				15,625.00	1
N	64	80	16	96	2	1200	3,000,000				46,875.00	2
O	64	80	16	96	3	2000	5,000,000				78,125.00	4
P	16	20	4	24	Not serviceable by gravity			1,500,000	3700	3,700,000	325,000.00	5
Q	48	60	12	72	Possible direct tie-in to existing sewer						n/a	1
R	64	80	16	96	4	800	2,000,000				31,250.00	2
S	64	80	16	96	4	1600	4,000,000				62,500.00	3
T	39	49	10	59	Not serviceable by gravity			1,750,000	2400	2,400,000	106,410.26	5
U	59	74	15	89	4	1000	2,500,000				42,372.88	2
V	64	80	16	96	Not serviceable by gravity			2,000,000	3200	3,200,000	81,250.00	4
W	53	66	13	80	Not serviceable by gravity			2,000,000	3600	3,600,000	105,660.38	5

2.2.9 Wastewater Serviceability via Warman

The preliminary serviceability analysis results for providing wastewater service to each regional node planning unit by connecting to the existing City of Warman sewage collection system are summarized below in **Table 2.21.** A set of maps is provided in **Appendix F** that illustrates the gravity sewer trunk routes and tie-in locations that were assigned and assumed for each planning unit.

Table 2.21: Warman Wastewater Serviceability Influences and Ratings by Planning Unit

Planning Unit	Area (ha)	Dry Maximum (1.25 L/s/ha))	Infill & Infiltration Allowance	Qpeak	Warman Gravity Trunk Route	Shortest Gravity Main (m)	450 mm Gravity Sewer Line Cost ($)	Lift Station Cost ($)	300 mm Force Main Length (m)	Force Main Cost ($)	Wastewater Cost/ha ($)	Wastewater Serviceability
A+B	61	76	15	92	Not serviceable by gravity			2,000,000	4800	4,800,000	111,475	5
C+D	34	43	9	51	1	3500	8,750,000				257,353	5
E	64	80	16	96	Not serviceable by gravity			2,000,000	4000	4,000,000	93,750	4
F	64	80	16	96	2	3200	8,000,000				125,000	4
G	64	80	16	96	2	2400	6,000,000				93,750	3
H	64	80	16	96	1	1600	4,000,000				62,500	2
I	64	80	16	96	3	3200	8,000,000				125,000	4
J	64	80	16	96	3	2400	6,000,000				93,750	3
K	64	80	16	96	3	1600	4,000,000				62,500	2
L	64	80	16	96	1	800	2,000,000				31,250	1
M	64	80	16	96	4	2400	6,000,000				93,750	3
N	64	80	16	96	4	1600	4,000,000				62,500	2
O	64	80	16	96	4	800	2,000,000				31,250	1
P	16	20	4	24	1	400	1,000,000				62,500	2
Q	48	60	12	72	5	3200	8,000,000				166,667	5
R	64	80	16	96	5	2400	6,000,000				93,750	3
S	64	80	16	96	5	1300	3,250,000				50,781	2
T	39	49	10	59	5	800	2,000,000				51,282	2
U	59	74	15	89	Not serviceable by gravity			2,000,000	3200	3,200,000	88,136	4
V	64	80	16	96	Not serviceable by gravity			2,000,000	2400	2,400,000	68,750	4
W	53	66	13	80	Not serviceable by gravity			2,000,000	1600	1,600,000	67,925	4

2.2.10 Consolidated Wastewater Serviceability Summary

Table 2.22 below summarizes the water serviceability ratings for each study area planning unit when being serviced by each of the two (2) potential wastewater service providers. This table and **Figure 2.12** identify each planning unit's best (lowest) water serviceability rating and corresponding potential wastewater service provider.

Table 2.22: Consolidated Wastewater Serviceability Ratings by Planning Unit

Planning Unit	Area (ha)	Martensville Wastewater Serviceability Rating	Warman Wastewater Serviceability Rating	Best (Lowest) Wastewater Serviceability Rating
A+B	61	5	5*	5 (M)
C+D	34	5	5	5 (E)
E	64	3	4*	3 (M)
F	64	3	4	3 (M)
G	64	5	3	3 (W)
H	64	5	2	2 (W)
I	64	2	4	2 (M)
J	64	2	3	2 (M)
K	64	3	2	2 (W)
L	64	5	1	1 (W)
M	64	1	3	1 (M)
N	64	2	2	2 (E)
O	64	4	1	1 (W)
P	16	5*	2	2 (W)
Q	48	1	5	1 (M)
R	64	2	3	2 (M)
S	64	3	2	2 (W)
T	39	5*	2	2 (W)
U	59	2	4*	2 (M)
V	64	4*	4*	4* (E)
W	53	5*	4*	4* (W)

Table Footnotes:

* Requires lift station and forcemain.

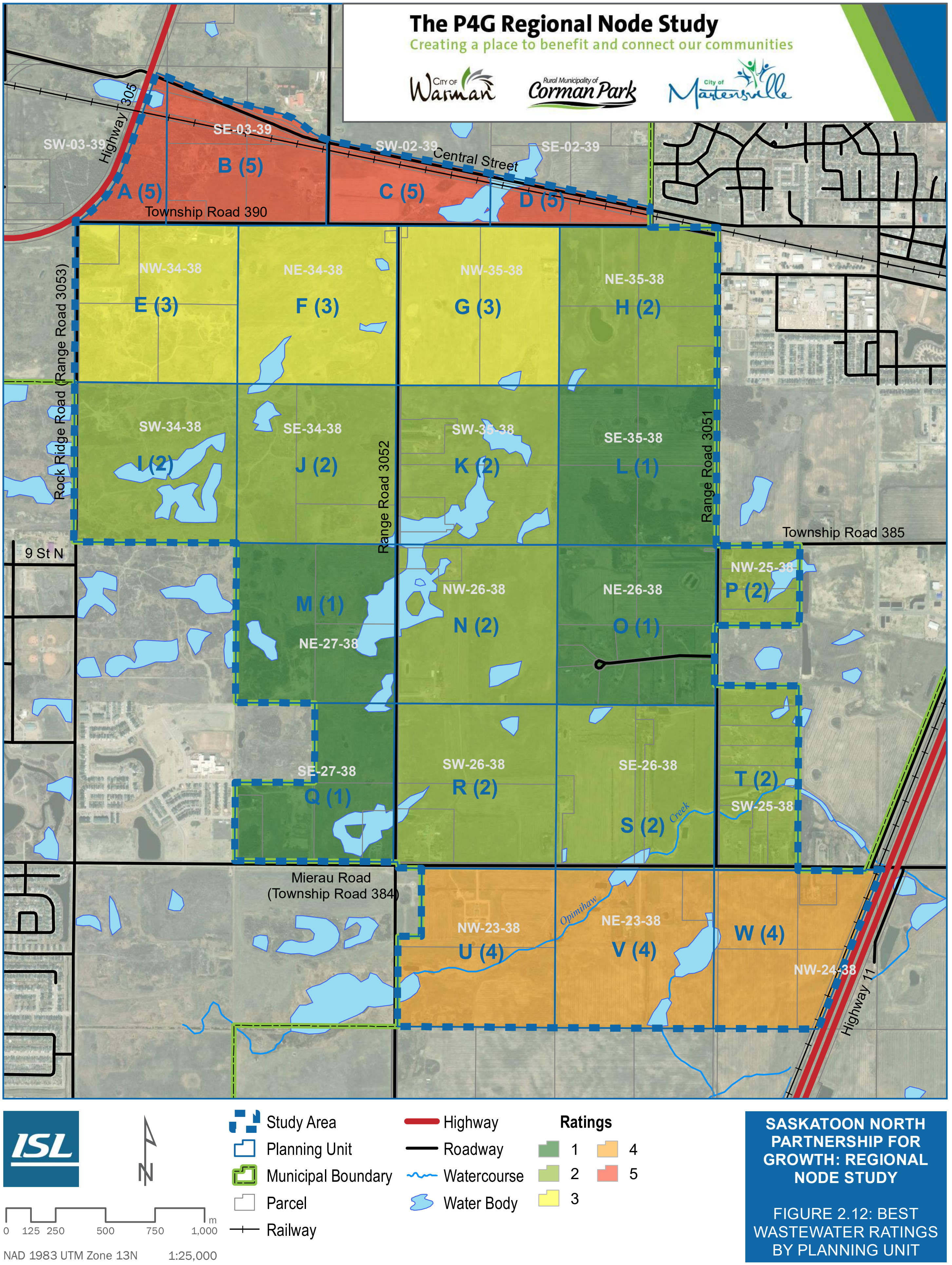
(M) Martensville

(W) Warman

(E) Either Martensville or Warman

Overall, planning units centrally located within the Study Area and closer to the Cites of Warman or Martensville have the best wastewater serviceability rankings since they would require shorter lengths of connecting sewer trunk. Planning units in the north end of the study area rank worst due to their smaller sizes and further distances from the Warman or Martensville wastewater tie-in locations. Planning units on the south end of the study area (south of Mireau Road/Township Road 384) have poorer rankings due to their lower topographic surface elevations that become lower in the south/southwest direction. This causes the available ground cover over any sewer trunks connected to Warman or Martensville to quickly fall under the required minimum (3.2m typical minimum). Therefore, wastewater service to the southern planning units would require using a sewage pumping station and force main, which entail higher ongoing maintenance and servicing costs.

Future design stages for the regional node should include feedback from each of the two (2) potential wastewater service providers (cities of Martensville and Warman) on their system capacities to accommodate the initial wastewater demand forecasts of the front-runner planning units. These reviews would ideally determine if additional system upgrades and expansion costs would be necessary and provide an estimate of the resulting costs of those upgrades that would apply to the regional node development.



SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.12: BEST WASTEWATER RATINGS BY PLANNING UNIT

2.3 Transportation Analysis

2.3.1 Existing Plans and Policies

A review of existing plans and policies influencing the study area was conducted to understand their implications on transportation serviceability. Summaries of each policy and their implications are provided below.

2.4.1 P4G District Official Community Plan and North Concept Plan

The P4G Planning District is a regional collaboration between five partnering municipalities, including the Town of Osler, the RM of Corman Park, and the cities of Martensville, Warman, and Saskatoon. Together, the partnering municipalities have adopted the P4G Planning District Official Community Plan (DOCP) to provide a comprehensive approach to regional planning and servicing throughout the District, which includes the entirety of the RNCP's study area. The DOCP provides a specific focus for transportation, including objectives and policies and are applicable to the study area, including a direction to encourage location of development adjacent to existing roadways. Schedule D of the DOCP includes the P4G North Concept Plan (NCP), which identifies future transportation networks applicable to the southern portion of the study area as shown in **Figure 2.13**. This includes designation of Mierau Road (Township Road 384) as a major arterial. Costs for a future interchange at Highway 11 and Mierau Road are identified at $50M.

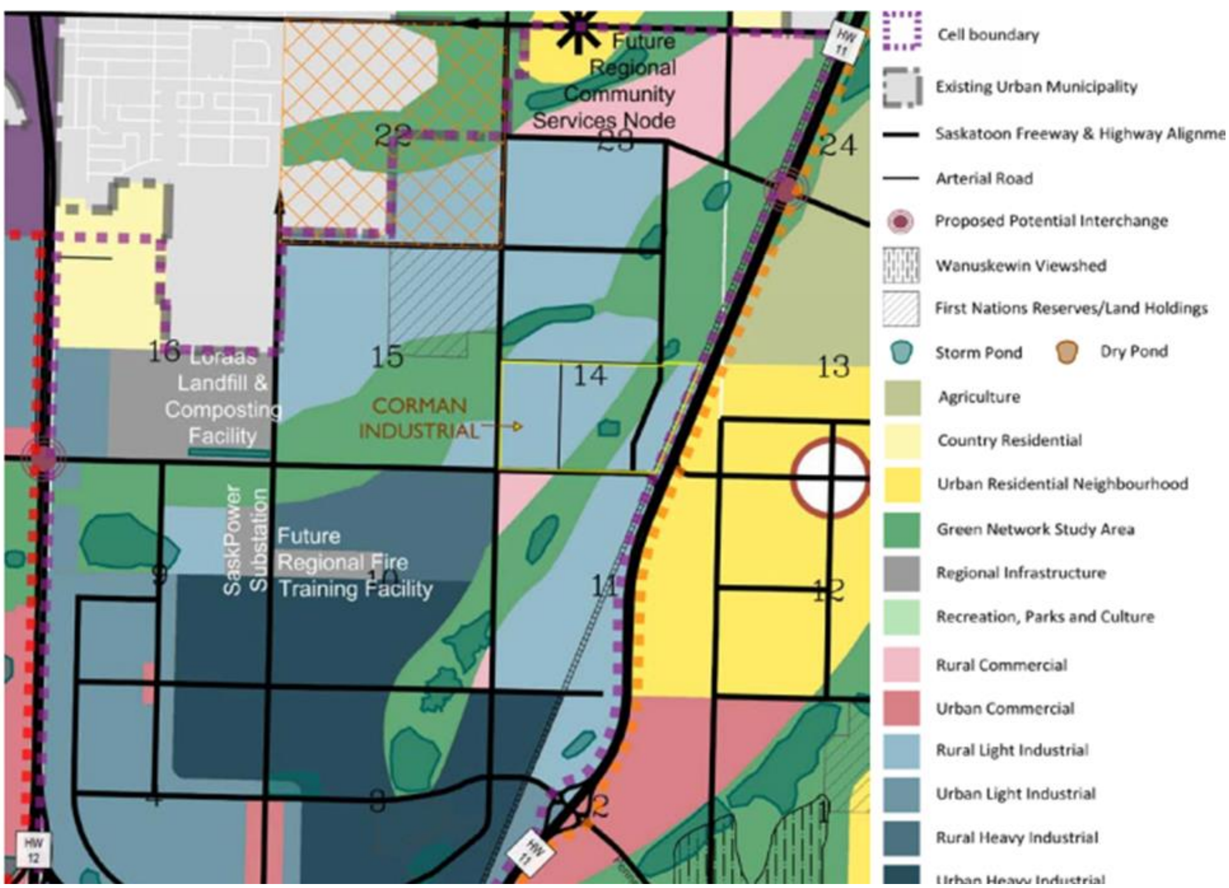


Figure 2.13: P4G North Concept Plan, Cell 3

Potential Implications: Placement of the regional node should be adjacent to existing and/or future roadways identified in the DOCP. Costs for constructing the interchange at Highway 11 and Mierau Road (Township Road 384) are significant and will rely on an extensive funding program. Several arterial roadways are designated in the P4G North Concept Plan as shown in **Figure 2.13**.

Martensville: Transportation Master Plan (2017)

The City of Martensville has a transportation master plan (TMP) that assesses current road conditions and projects growth to 2040. The TMP addresses traffic operations based on traffic growth and due to the Highway 12/Main Street interchange construction. With 69 proposed measures categorized by urgency, the TMP aims to enhance overall road network efficiency and safety in response to existing challenges and anticipated growth.

Several future arterial and collector roadways are identified in the TMP. Range Road 3052 is identified as a proposed arterial road with a new collector roadway (Collector C) connecting the Range Road to 10 Avenue. A new east-west arterial roadway (Arterial A) is proposed 800 m south of Highway 305 between Centennial Drive and 10 Avenue. This Arterial A forms a part of the recommended dangerous goods and truck route, traveling south along 10 Avenue, east on Collector C, then south via Range Road 3052. An excerpt of the recommended future roadway network from TMP is shown in **Figure 2.14**. It is noted that many of the eastern collector roadway extensions no longer align with the City's strategic direction, as a large potion of the land between 16th Avenue and Range Road 3052 has since been identified as part of the Green Network Study Area. This includes Collector C, 3rd Street North, Parr Hill Drive, and 16th Avenue.

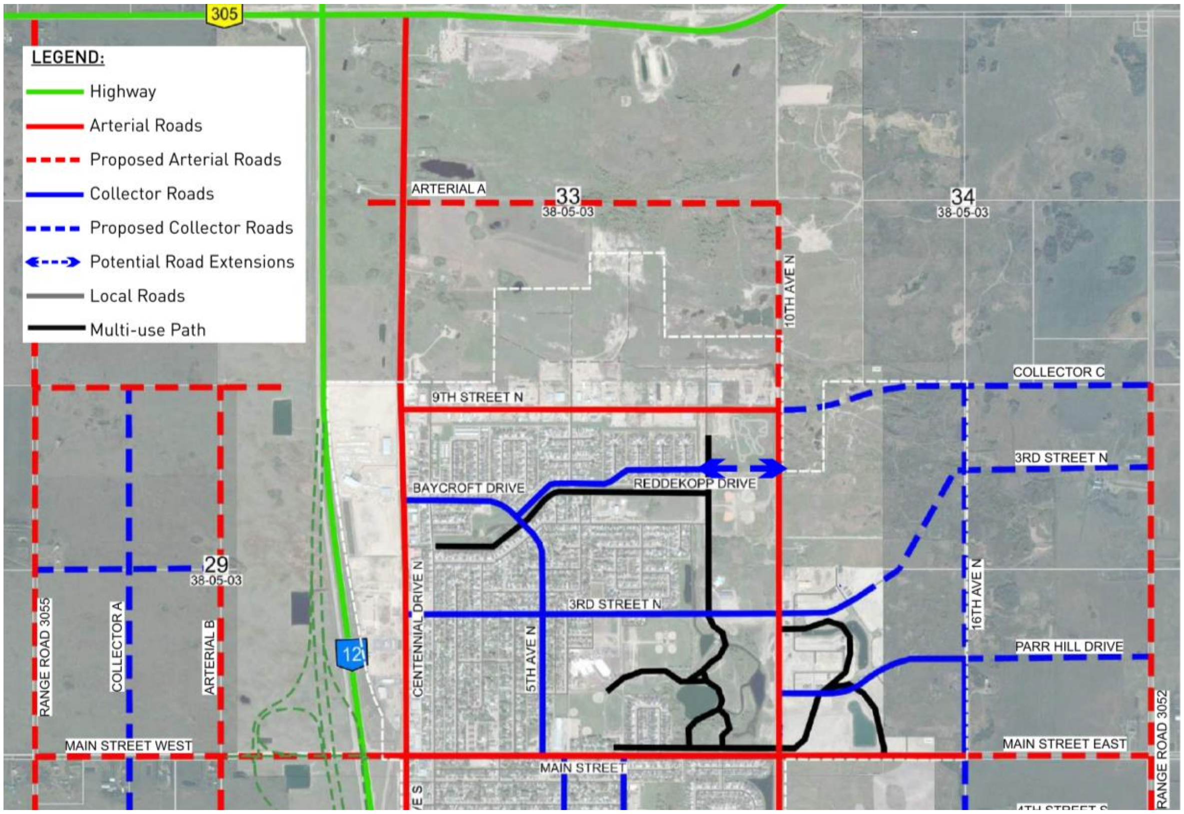


Figure 2.14: Section of the City of Martensville TMP Recommended Future Roadway Network.

Potential Implications: The TMP recommends extending Main Street East cross section to the City's boundary. Main Street East becomes Mierau Road (Township Road 384) within the study area and is planned to have a future intersection with Highway 11 to the east, south of Warman. The TMP also recommends several arterial and collector roadway extensions or improvements, which will be considered in the recommended transportation concept, except those within the Green Network Study area which are no longer planned.

Warman: Transportation Master Plan (2016)

Warman's TMP reviews the existing and future road network to the 20-to-30-year horizon, establishes supporting policies, and develops a recommended network plan and improvement strategy. Several improvements are provided based on timing priority (low, medium, and high) with a focus on addressing operational and safety issues and accommodating future growth.

Potential Implications: The TMP recommends corridor improvements to Range Road 3051 North in the short-term and Range Road 3051 South in the medium-term. Improvements include upgrading the existing unimproved gravel road to an urban arterial as an important link for vehicles and goods movement.

Ministry of Highways: Highway 305 Control of Access Plan (2018)

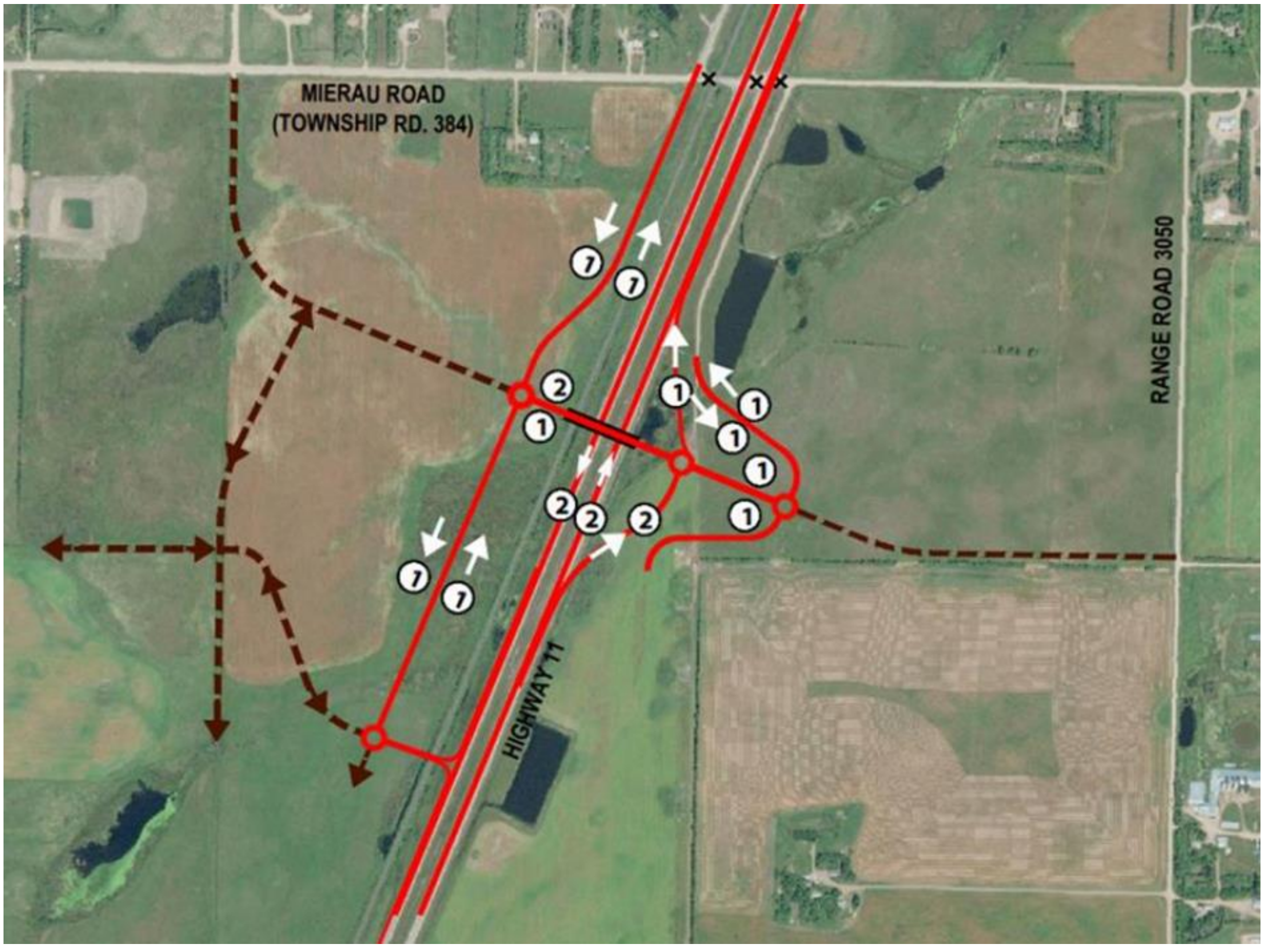
The Ministry of Highways established the *Highway 305 Control of Access Plan* in 2018. It defines locations for future access along Highway 305, between Highway 11 and Highway 12, north of Warman and Martensville. The plan was completed due to the relocation of Highway 305 north to provide a connector between Highway 11 and Highway 12 at around the time the Highway 11/Highway 305 interchange was under construction. The recommended plan is based on the traffic conditions within the 25-year horizon, with temporary access permitted at Centennial Boulevard, Range Road 3051, Centennial Drive, and Highway 11. Ultimately, permanent access will be provided at Range Road 3051 and/or Range Road 3052 beyond the 25-year horizon.

Potential Implications: The plan recommends permanent access to Range Road 3051 and Range Road 3052, which provides access into the northern areas of the larger study area. The existing access at Central Street is expected to be closed while the access at Rock Ridge Road (Range Road 3053) is expected to be realigned to the west.

Ministry of Highways: Highway 11 Corridor Review (2023)

The Ministry of Highways completed a *Highway 11 Corridor Review* in 2023. After conducting a multiple account analysis for three locations, it identified the preferred location of a permanent access at Mierau Road (Township Road 384). Six interchange concepts were developed to arrive at the preferred intersection configuration published in the report. The Ministry of Highways has since shifted the interchange location northwards to better align with Mierau Road (Township Road 384). A specific configuration for the shifted location has yet to be determined. The previously preferred Highway 11/Mierau Road (Township Road 384) interchange configuration is provided in **Figure 2.15** is thus provided in the meantime.

Potential Implications: The future interchange of Highway 11/Mierau Road (Township Road 384) provides permanent access between the study area and Highway 11 and will support significant growth in traffic volumes. The interchange results in realignment of the existing Mierau Road connection across Highway 11. Development near the future interchange will be constrained where it falls within the interchange control of access area.



(Source: Highway 11 Corridor Review)

Figure 2.15: Former Preferred Highway 11/Mierau Road (Township Road 384) Interchange Configuration

2.3.2 Transportation Network

Existing Transportation Network

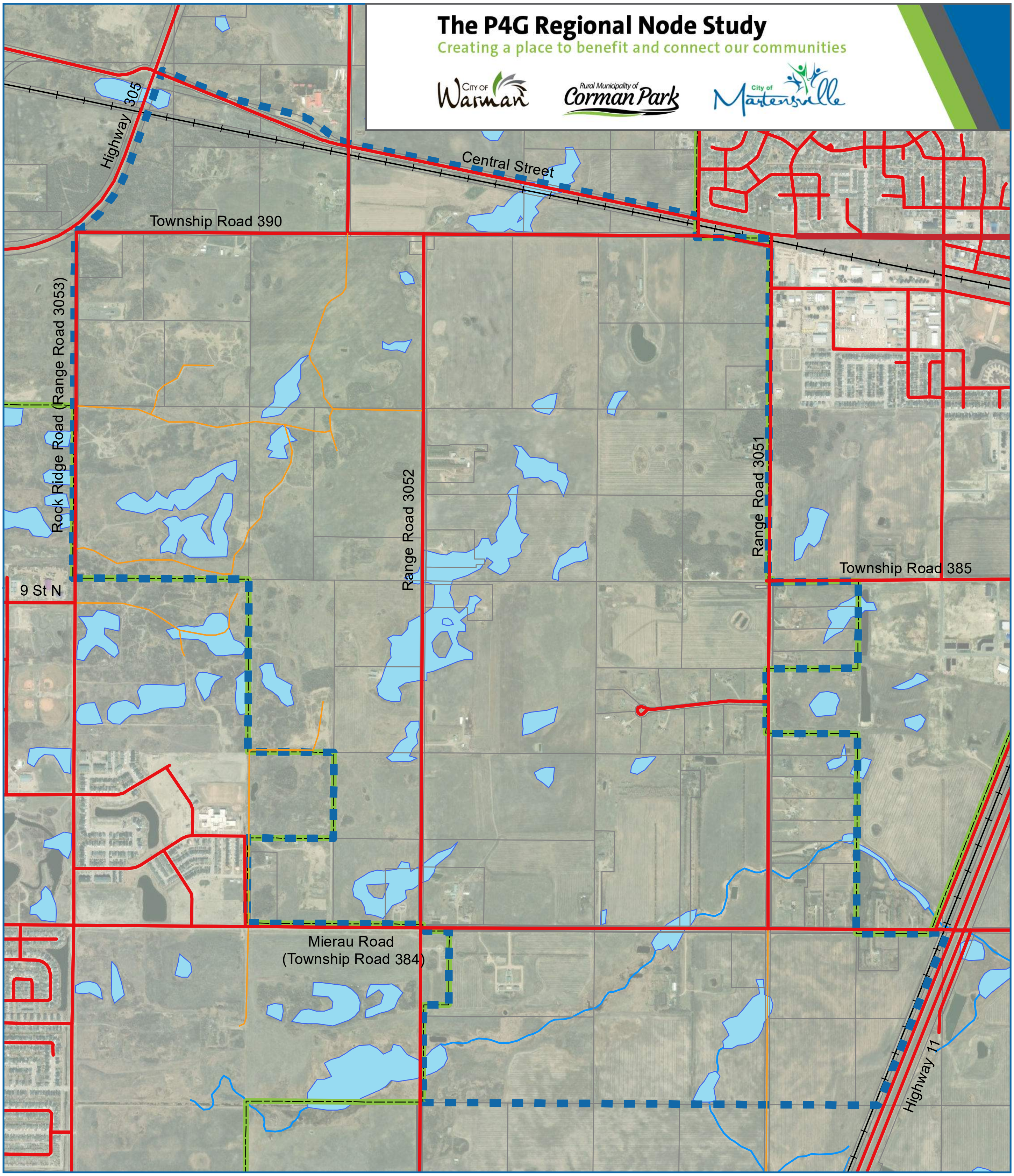
ISL completed a review of the existing transportation network to identify the number of lanes, roadway classifications, and surface conditions within the study area. **Figures 2.16 through 2.18** illustrate these aspects of the existing transportation network. The following is a brief overview of each road segment.

- **Central Street West:** This is a paved two-lane rural arterial (assumed) connecting with an at-grade intersection at Highway 305. In the *Highway 305 Control of Access Plan*, it is noted as a temporary highway access that will be ultimately closed in future.
- **Central Street East (Warman)**: This is a paved two-lane rural arterial roadway that transitions to a four-lane urban arterial roadway into the City of Warman.
- **Range Road 3052**: This is an unimproved two-lane gravel roadway. To the north, access to Highway 305 is not currently provided but it is designated as a potential permanent access alternative to Range Road 3051 with implementation of the *Highway 305 Control of Access Plan*. To the south, Range Road 3052 connects to the Corman Industrial Park and is designated as an arterial as it is part of 'Planning Cell 3' within the P4G North Concept Plan. Based on its classification in the P4G North Concept Plan and future connectivity to Highway 305, it is assumed to be an arterial through the study area in the future.
- **Range Road 3051**: A two-lane rural arterial roadway that connects to Highway 305, paved through portions of the City of Warman, but is unimproved through the study area, except for a short section south of Centre Street. It is designated for improvements in the short- and medium-terms in Warman's TMP. It is also identified as having a permanent access to Highway 305 by the *Highway 305 Control of Access Plan* and will ultimately be converted to an interchange access (beyond the 25-year horizon). It is shown as an arterial in the P4G North Concept Plan.
- **Mierau Road (Township Road 384) East**: This is a paved two-lane arterial road that connects with an at-grade intersection at Highway 11. It is planned for realignment at the time of construction of the future Highway 11 interchange. Paving improvements were jointly funded for by the three (3) subject municipalities.
- **Mierau Road (Township Road 384) West (Martensville)**: This is a paved two-lane arterial road designated as Main Street within Martensville and has an interchange access at Highway 12 to the west. The first 800 m is paved as two lanes but only half is currently constructed. The other half will be constructed when development necessitates. Beyond this point, the roadway can accommodate four lanes with implementation of a parking restriction.
- **Rock Ridge Road (Range Road 3053) and Township Road 390**: TWP Road 390 is an unimproved two-lane gravel roadway. Range Road 3053 is a summer road from TWP Road 390 to the City of Martensville. Both roads have no access to Highway 305.

Planned Future Transportation Network

The various network improvements defined in the review of existing plans and policies were combined to develop the planned future transportation network shown on **Figure 2.19**. The planned future transportation network represents an undefined horizon in which all currently planned improvements have been implemented. The assumed future transportation network includes:

- **Central Street West:** The connection to Highway 305 will be closed per the *Highway 305 Access Control Plan*.
- **Central Street East**: No change is planned from its existing state.
- **Range Road 3052**: This will be widened and upgraded to a four-lane arterial from 9 Street to south of the study area. Connection to Highway 305 is identified as a potential permanent access alternative to Range Road 3051 in the *Highway 305 Control of Access Plan* and supports future development potential within the study area.
- **Range Road 3051:** This will be upgraded to a four-lane arterial from Central Street to Township Road 385. Connection to Highway 305 is expected to remain as it was identified as a permanent access location in the *Highway 305 Control of Access Plan*.
- **Mierau Road (Township Road 384):** This will be upgraded to a four-lane arterial within the study area.
- **Rock Ridge Road (Range Road 3053) and Township Road 390:** This is planned to remain a summer road.
- **Highway 11:** This will have an interchange at Central Street and a realigned connection to Mierau Road (Township Road 384).
- **Highway 305**: This will have a diamond interchange at Range Road 3051 with all other accesses closed as identified in the *Highway 305 Control of Access Plan* except for Range Road 3052.



Study Area
Municipal Boundary
Parcel
Railway
Watercourse
Water Body
One-Lane Roadway
Two-Lane Roadway
Four-Lane Roadway

ISL

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:24,660

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.16: EXISTING NUMBER OF LANES

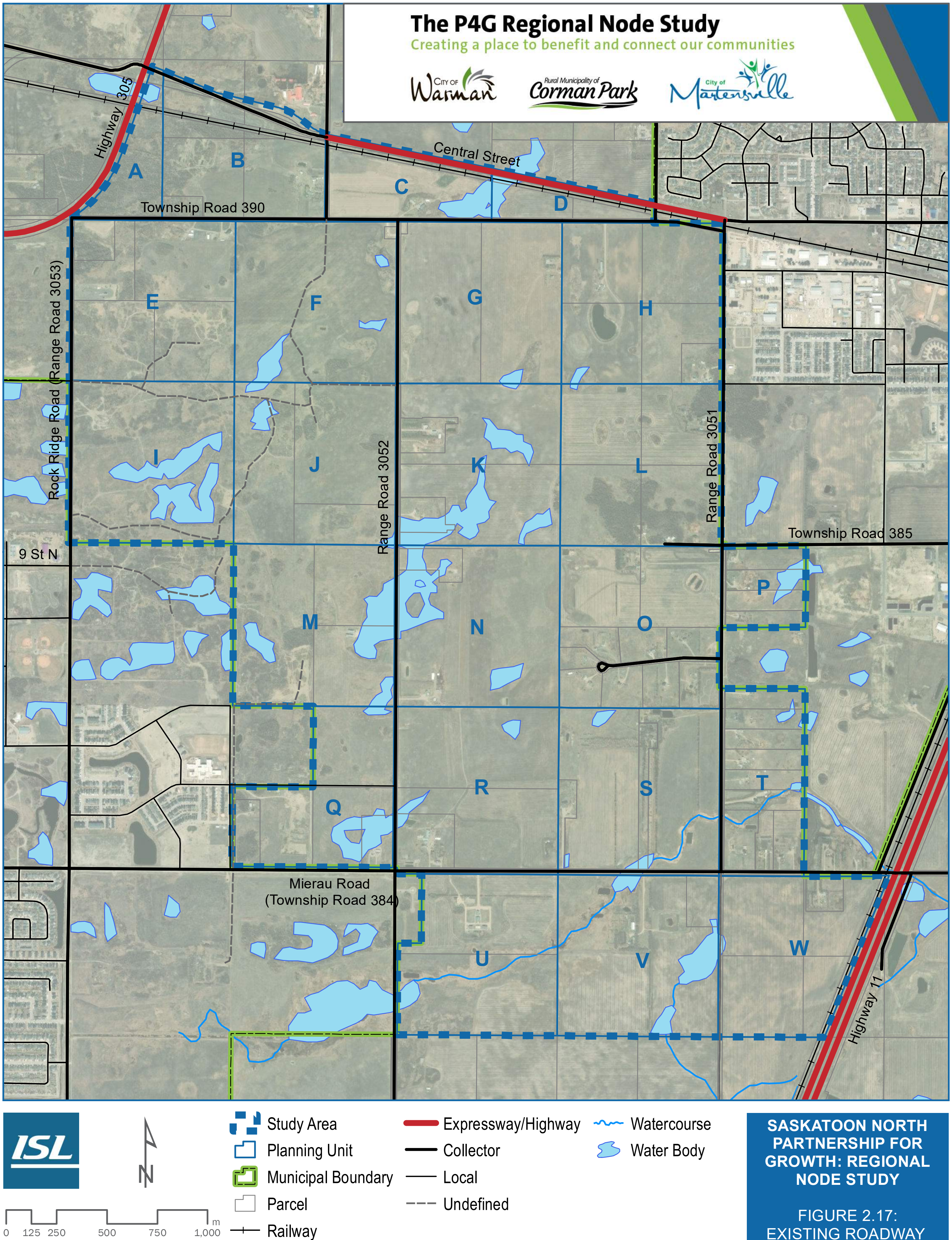
Date: 7/25/2024 Document: M:\16467_P4G_Regional_Node\25_GIS\251_Figures\16467_P4G_RNS_Fig_2-16_Ext_Lanes_240725.mxd

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

The P4G Regional Node Study

Creating a place to benefit and connect our communities

City of Warman · Rural Municipality of Corman Park · City of Martensville



ISL

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.17: EXISTING ROADWAY CLASSIFICATIONS

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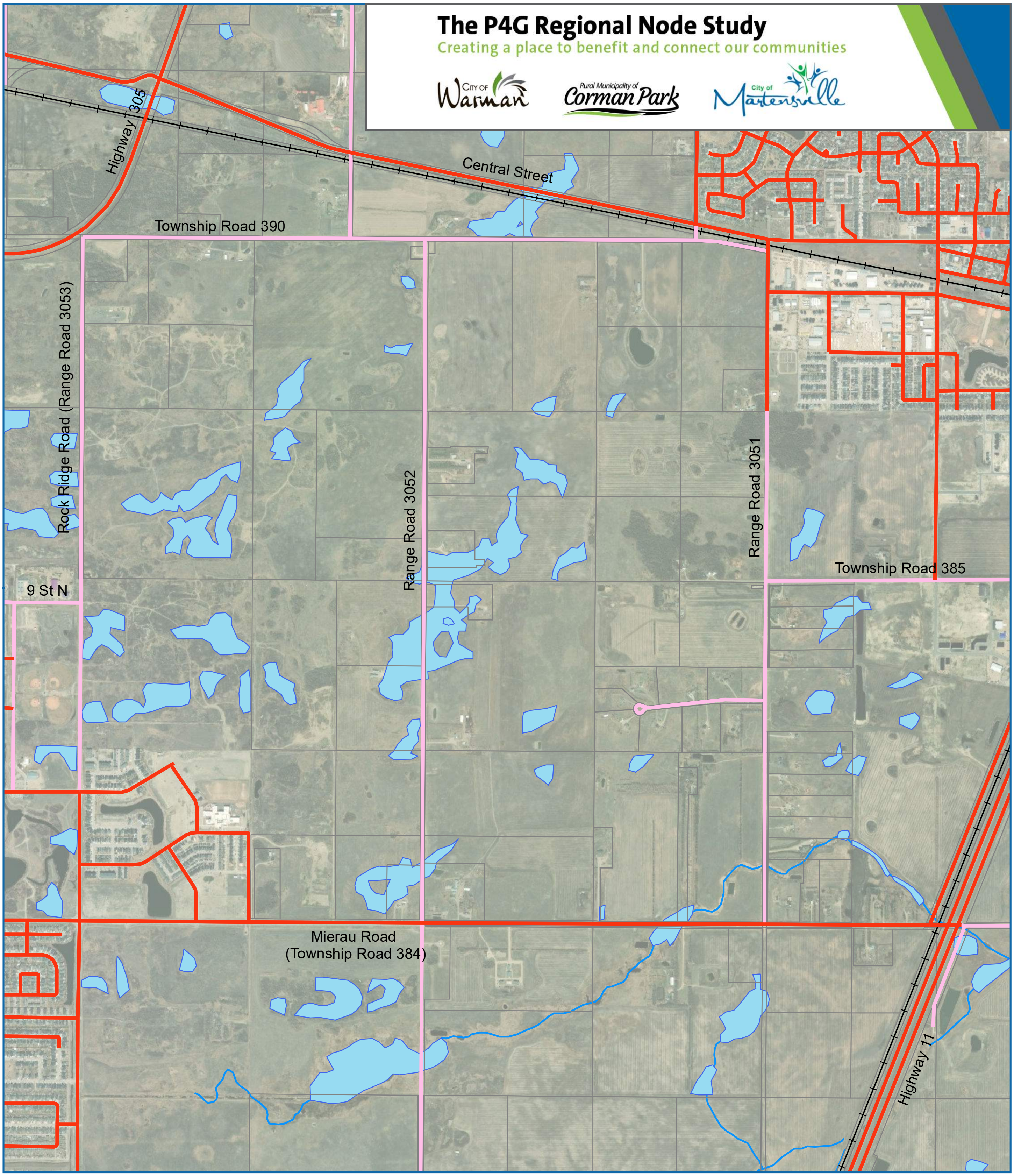
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



Date: 2024-08-30

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Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ISL

N

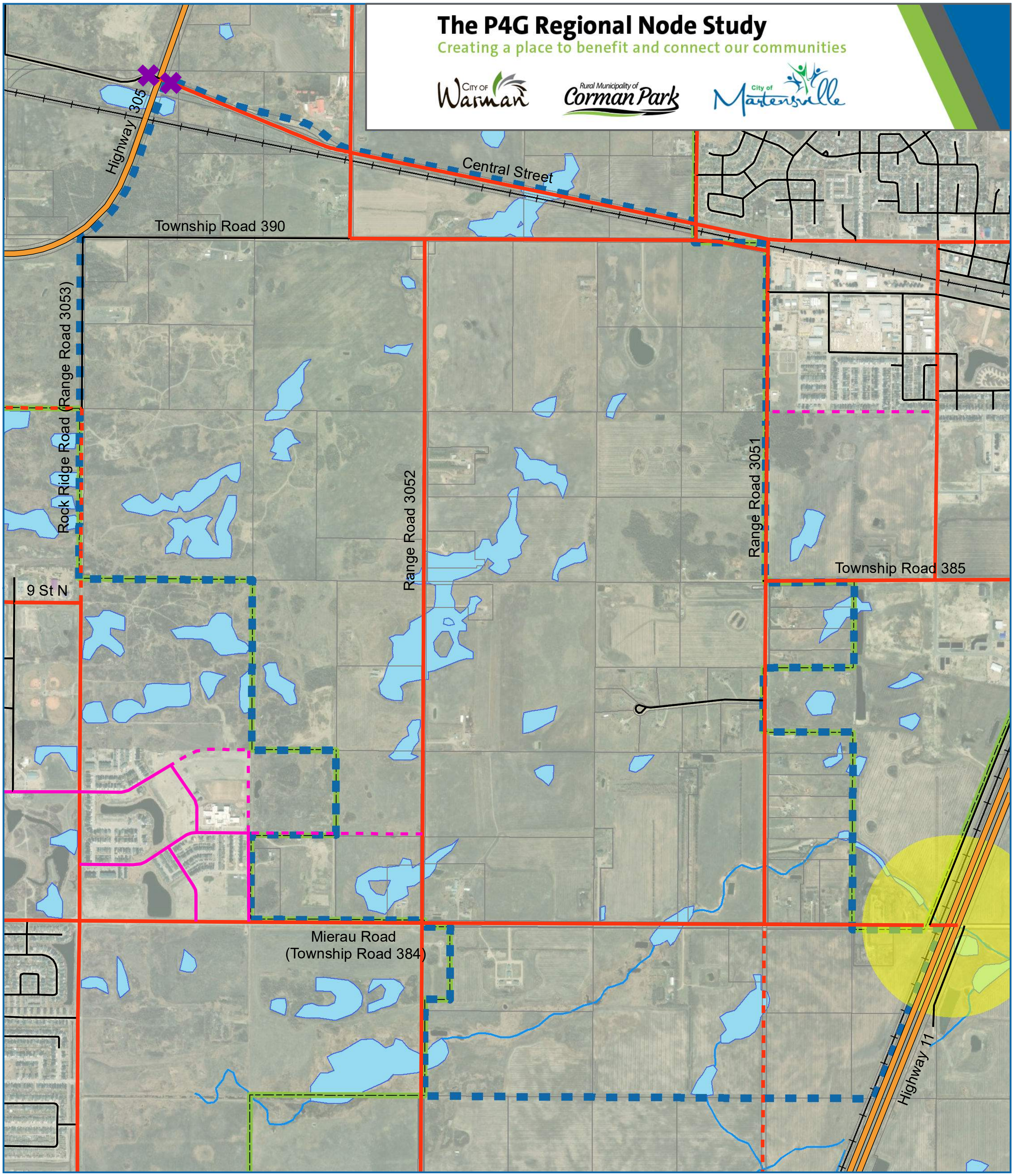
Parcel
Railway
Watercourse
Water Body
Paved Roadway
Unpaved Roadway

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.18:
EXISTING ROADWAY SURFACE CONDITIONS



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Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ISL

N

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

Study Area
City Boundary
Parcel
Railway
Watercourse
Water Body
Expressway / Highway
Arterial
Collector
Local
Future Arterial
Future Collector
Access Closure
Future Interchange

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.19: PLANNED FUTURE ROADWAY NETWORK

2.3.3 Serviceability Analysis

The existing transportation infrastructure within the study area was used to evaluate complexity to provide transportation services for future urban development, both within the regional node and beyond. Lands near highway access points are treated as the simplest for servicing, while lands adjacent to an existing paved road are seen as easier to service than those on a gravel road. For this analysis exercise, the distance from a highway access or paved road is measured as the length of the path from the paved road to the edge of the planning units using the established roadway network. For example, planning unit A is close to the temporary Highway 305 access if measured in a straight line but is much farther when measured along the roadways. Some planning units are less than a quarter section in size due to the configuration of the study area – the distance of these planning units from a highway access or paved road is measured by including the nearby lands outside of the study area to make up a quarter section unless the rail line blocks the access to the road network. The number of roads does not include roadway segments that are too short to allow enough room for new access.

A transportation serviceability ranking of 1 – 10 was applied to each of the planning units within the study area for the existing network. A ranking of 1 means there is transportation infrastructure immediately available to accommodate urban development, while a ranking of 10 requires the greatest number of improvements to the transportation system to accommodate urban development. More details on the ranking system is provided in **Table 2.23** below.

Table 2.23: Transportation Serviceability Ranking System

Rank	Adjacent Roadway Attributes	
	Number of Roads	Criteria
1	Any	Adjacent highway access
2	2+	At least one paved road
3	1	Paved
4	Any	Within 800 – 1,600 m of a highway access
5	2	Gravel road, within 800 – 1,600 m of a paved road
6	1	Gravel road, within 800 – 1,600 m of a paved road
7	Any	Gravel road, within 1,600 – 2,400 m of a highway access
8	2	Gravel road, within 1,600 – 2,400 m of a paved road
9	1	Gravel road, within 1,600 – 2,400 m of a paved road
10	Any	Gravel road, over 2,400 m to a paved road or highway access

The serviceability ranking by planning unit is provided in **Table 2.24**.

Table 2.24: Transportation Serviceability Ranking by Planning Unit

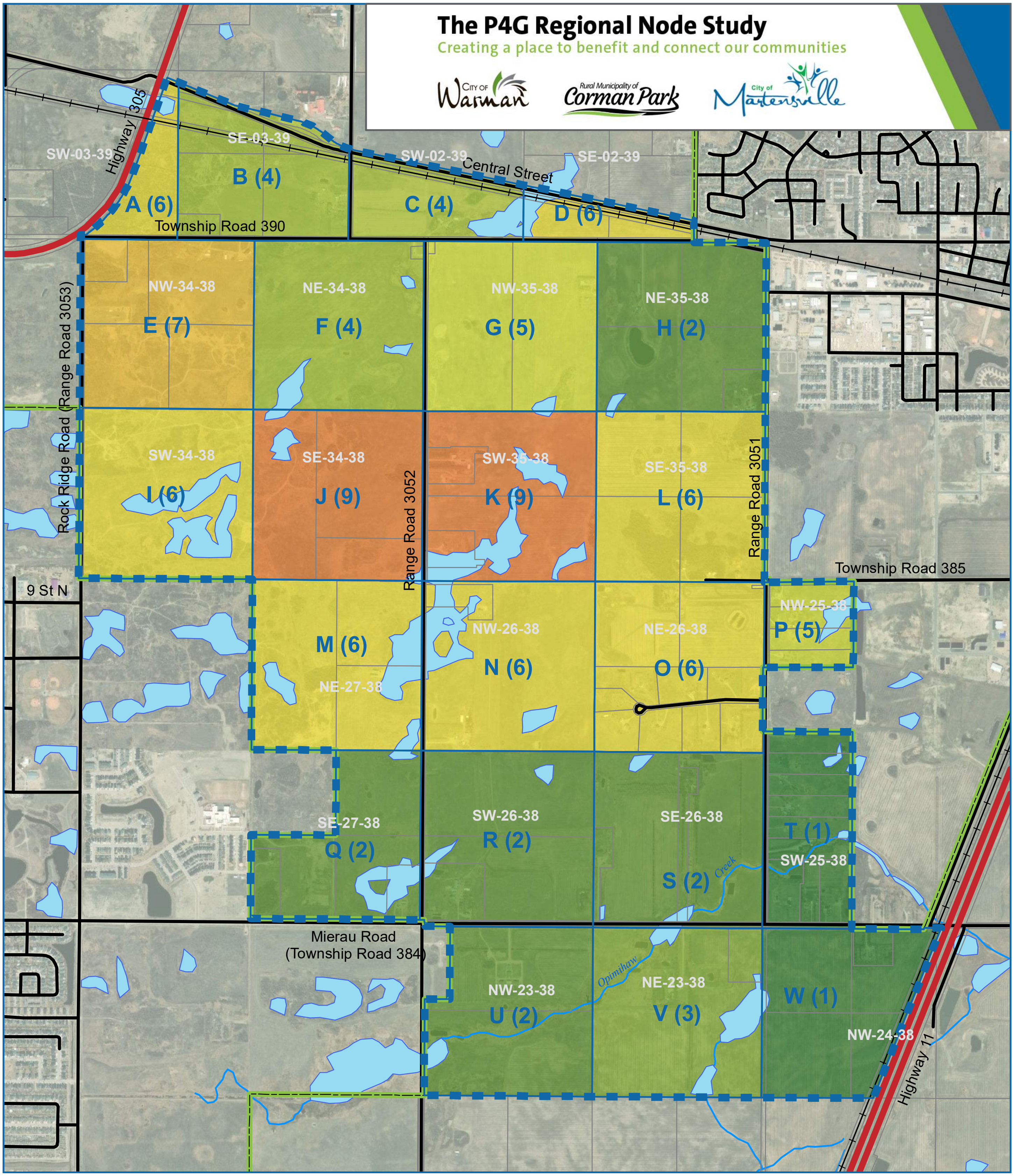
Node	Number of Adjacent Roads	Rank	Node	Number of Adjacent Roads	Rank
A	1	6	M	1	6
B	2	4	N	1	6
C	2	4	O	1	6
D	1	6	P	2	5
E	1	7	Q	2	2
F	2	4	R	2	2
G	2	5	S	2	2
H	2	2	T	2	1
I	1	6	U	2	2
J	1	9	V	1	3
K	1	9	W	1	1
L	1	6			

The results indicate that the best transportation service potential is in the areas adjacent to Mierau Road (Township Road 384). The corridor has easy access to Highway 11 to the east and Highway 12 to the west, both currently and in the future. It has already been identified as a future four-lane arterial based on its classification as a minor arterial in the P4G North Concept Plan and has good connectivity to both Martensville and Warman. Planning units J and K within the study area are the most difficult for transportation service because of low highway access and limited transportation infrastructure.

The future transportation network was not assessed as part of the serviceability review as the timing of key infrastructure investments, such as the Highway 305 interchange and the Highway 11 access realignment, are uncertain. Thus, it is recommended that transportation servicing decisions be made based on today's infrastructure with considerations for the future transportation network. For information and future discussion, the following rankings would be impacted by the future planned transportation infrastructure improvements:

- Planning units B and C would receive worse (higher) rankings due to the closure of the Central Street intersection access at Highway 305.
- Planning units M, N, Q, and R east of Martensville would be easily serviceable as the Martensville TMP includes collector road connections up to Range Road 3052 as well as arterial road improvements for Range Road 3052.
- Planning units L and O along Range Road 3051 west of Warman would have improved serviceability with future improvements planned for this roadway per Warman's TMP.

Overall, the lands adjacent to Mierau Road (Township Road 384) are easily serviced with the existing and future transportation infrastructure. It is noted that the lands required for the future Highway 11 interchange and the Highway 305 access realignment should be reserved.



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Date: 7/25/2024

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ISL

N

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

- Study Area
- Planning Unit
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
- Watercourse
- Water Body

Ratings

1, 2, 3, 4, 5, 6, 7, 8, 9, 10

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.20: TRANSPORTATION RATINGS BY PLANNING UNIT

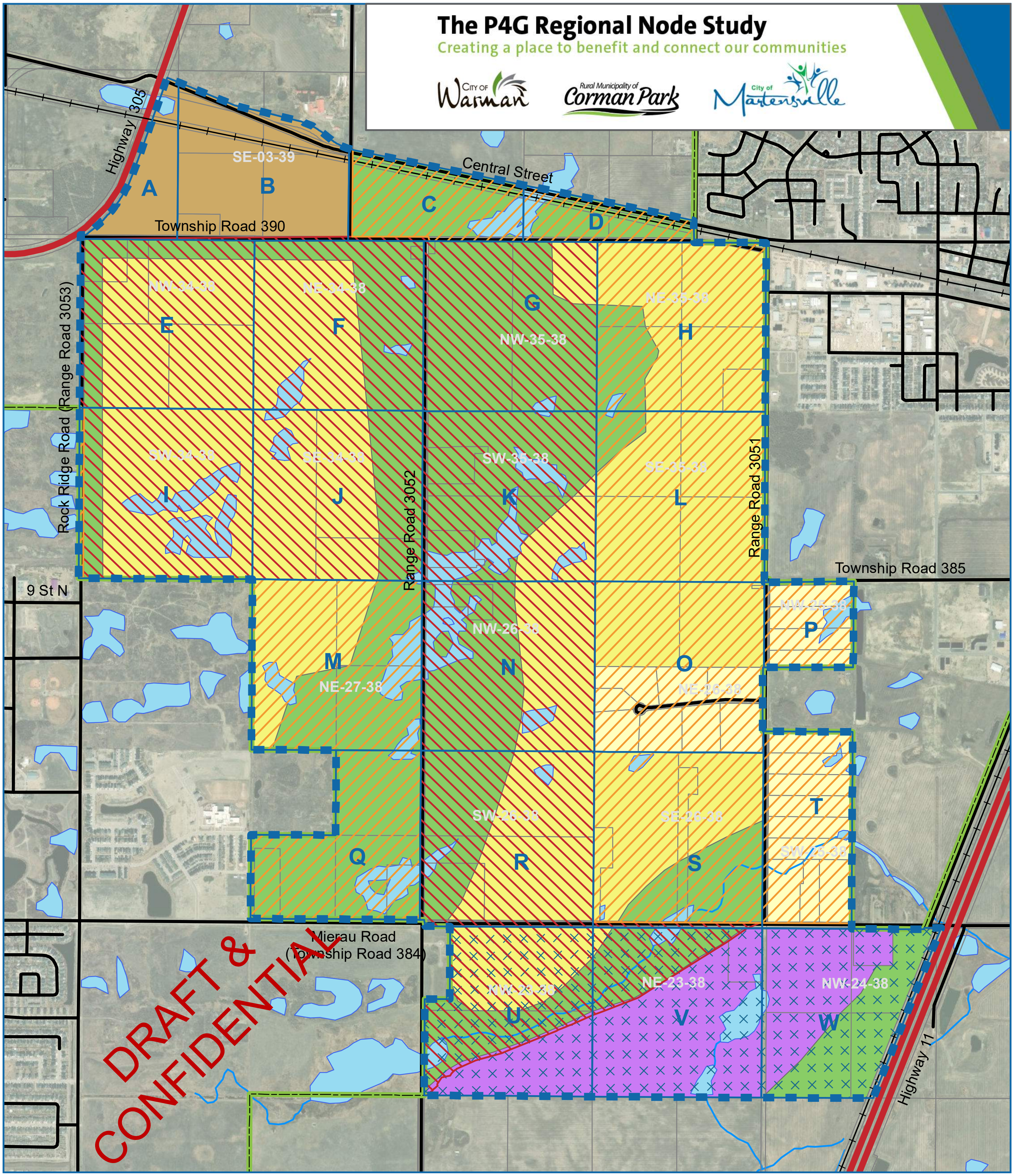
2.4 Land Use Analysis

ISL has prepared a set of figures for the study area that present land use considerations such as existing land uses, parcel fragmentation, wetlands, shallow utilities, and energy infrastructure. The intent is to confirm what land use opportunities and constraints may influence selection of a recommended location for the regional node and determine development potential within the study area.

2.4.1 P4G District Official Community Plan

As shown in **Figure 2.21**, the P4G DOCP applies the following land use designations within the study area:

- **Agriculture,** which applies to the northwest portion of the study area in planning units A and B. This land use designation intends to enable agriculture and pasture uses, as well as agricultural residential uses with the purpose of protecting local food production and the land's natural ecosystem and drainage characteristics. Policies for this area focus on minimizing fragmentation and the disruption of agricultural operations.
- **Country Residential,** which applies to the eastern portion of the study area, adjacent to Warman, in planning units P and T, and the southern half of planning unit O. This land use designation intends to enable multi-parcel residential subdivisions at rural densities with the purpose of preserving open space and buffers between urban development and adjacent farmland. Policies for this land use designation focus on defining criteria to assess the suitability of lands to support country residential development, establishing design standards for this type of development, and minimizing impacts on different adjacent land use classes.
- **Urban Residential**, which applies to most of the lands in planning units E, F, H, I, J, L, R, and S, approximately half of planning units M, N, and O, and a small portion of planning units K and U. This land use designation intends to enable Martensville and Warman to grow within the P4G population threshold of one million through residential neighbourhoods at urban densities and standards. Policies for this land use designation focus on defining interim land uses, creating a framework for the adoption of future land use concept plans as Martensville and Warman expand toward the designated area, and protecting the integrity of the lands for future urban growth.
- **Rural Commercial/Industrial,** which applies to the southern portion of the study area in planning units U, V, and W. The rural commercial designation intends to enable small-scale retail and service-oriented uses. Policies for this aspect of the land use designation focus on location criteria to assess the suitability of lands to support these uses. The rural industrial designation intends to enable large-scale employment uses. Policies for this aspect of the land use designation focus on location criteria to assess the suitability of lands to support these uses, requirements to mitigate impacts on other land use classes, and strategies to deal with hazardous industries.
- **Green Network Study Area (GNSA),** which applies to planning units C, D, E, F, G, I, J, K, M, N, Q, R, S, U, and W, creating a green belt that bisects the middle of the study area in a north-south direction. This land use designation intends to protect an interconnected network of natural areas with a significant role in water and stormwater management. Policies for this area focus on minimizing development impacts on native vegetation and habitat, enabling passive recreation opportunities, and establishing criteria for the P4G partners to further refine the boundaries of the GNSA.



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Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ISL

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

Study Area	Railway	Agriculture
Planning Unit	Highway	Country Residential
Municipality	Roadway	Urban Residential
Parcel	Growth to 700,000	Rural Commercial/Industrial
Watercourse	Growth to 1 Million	Green Network Study Area
Water Body	North Concept Plan	

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.21: DISTRICT OFFICIAL COMMUNITY PLAN INFLUENCES

2.4.2 P4G District Zoning Bylaw

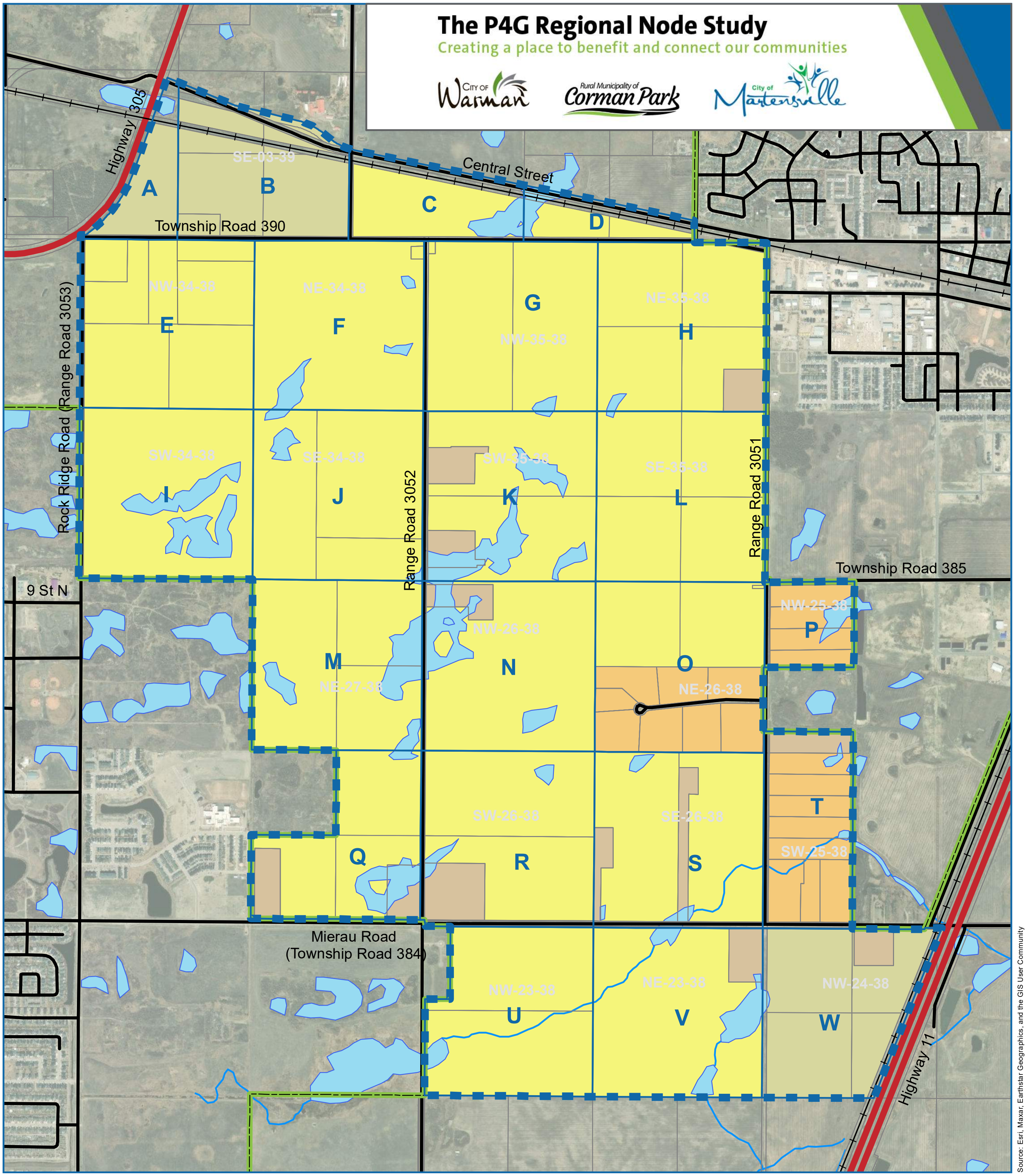
As shown in **Figure 2.22**, zoning applied by the P4G District Zoning Bylaw within the study area include:

- **Agricultural District 1 (DAG1),** which applies to the far northwest and southeast corners of the study area in planning units A, B, and W. The purpose of this district is to allow extensive and intensive agricultural activities, while also allowing non-agricultural development. The minimum parcel size for agricultural operations is 32.4 ha (80 ac), while the minimum parcel size for non-agricultural uses, including dwellings, suites, lodging, and some institutional uses, is 1 ha (2.47 ac).
- **Agricultural District 2 (DAG2),** which applies to most of the study area. The purpose of this district is to allow extensive and intensive agricultural activities in areas designated for future urban growth in the DOCP. This district enables a range of agricultural and other uses that promote agricultural diversification, while protecting lands in and adjacent to the P4G urban municipalities for future growth. The regulations for specific use development standards require consideration of impacts on future subdivision, servicing, and development of lands when processing permits for discretionary uses. Some agricultural uses are deemed interim uses, and the maximum timeframe for operation is 20 years, subject to approval from the affected urban municipality.
- **Agricultural Residential 1 District (AR1),** which applies to farmstead parcels scattered throughout the study area, specifically in planning units H, K, N, Q, R, S, V, and W. The purpose of this district is to accommodate single lot residential development in a rural setting, allowing uses that are compatible with agricultural operations. Site development regulations under this district indicate that the size of the lots must range between 1 ha (2.47 ac) and 4.05 ha (10 ac).
- **Country Residential 1 District (DCR1),** which applies to the eastern portion of the study area, adjacent to Warman, in planning units P and T, and the southern half of planning unit O. This coincides with the extent of the DOCP country residential land use designation. The purpose of this district is to accommodate low density residential development in multi-parcel subdivisions in a rural setting. Uses in this district are limited to dwellings and suites, and a limited number of institutional uses. Site development regulations under this district indicate that the size of the lots must range between 0.4 ha (1 ac) and 4.05 ha (10 ac), with dwellings of at least 90 m^2 (968.7 ft^2).

2.4.3 P4G Natural Area Screening 2020

As part of the effort to refine the GNSA within the P4G area and in accordance with the P4G Green Network Pilot Project, the City of Saskatoon prepared a *Green Network Refinement Stage 1: Natural Areas Screening* (NAS) report in 2020 that conducted a desktop inventory and assessment of significant natural and heritage resources in the P4G region, including wetlands, wildlife, environmentally significant and managed areas, soil capability, and important heritage resources. The goal of this report was to allow the P4G partners to make informed decisions about the location and design of developments located in or adjacent to the GNSA. As shown in **Figure 2.23**, land use considerations from the NAS report include:

- **Agricultural Crown Land**, present in the northwest portion of the study area in the unsubdivided portions of planning unit E and planning units F, I, and J. This land use consideration refers to the public ownership of the land, which presents development constraints due to the onerous land acquisition process. These lands are administered by the Ministry of Agriculture on behalf of the Crown and may be sold in response to an unsolicited development proposal subject to a process involving an eligibility screening, a review of environmental and resource impacts, and engagement with stakeholders, local communities, First Nations, and Metis people. This means that the planning units affected by this land use consideration will be less appealing from a development standpoint.



Study Area
Planning Unit
Municipal Boundary
Parcel
Watercourse
Water Body

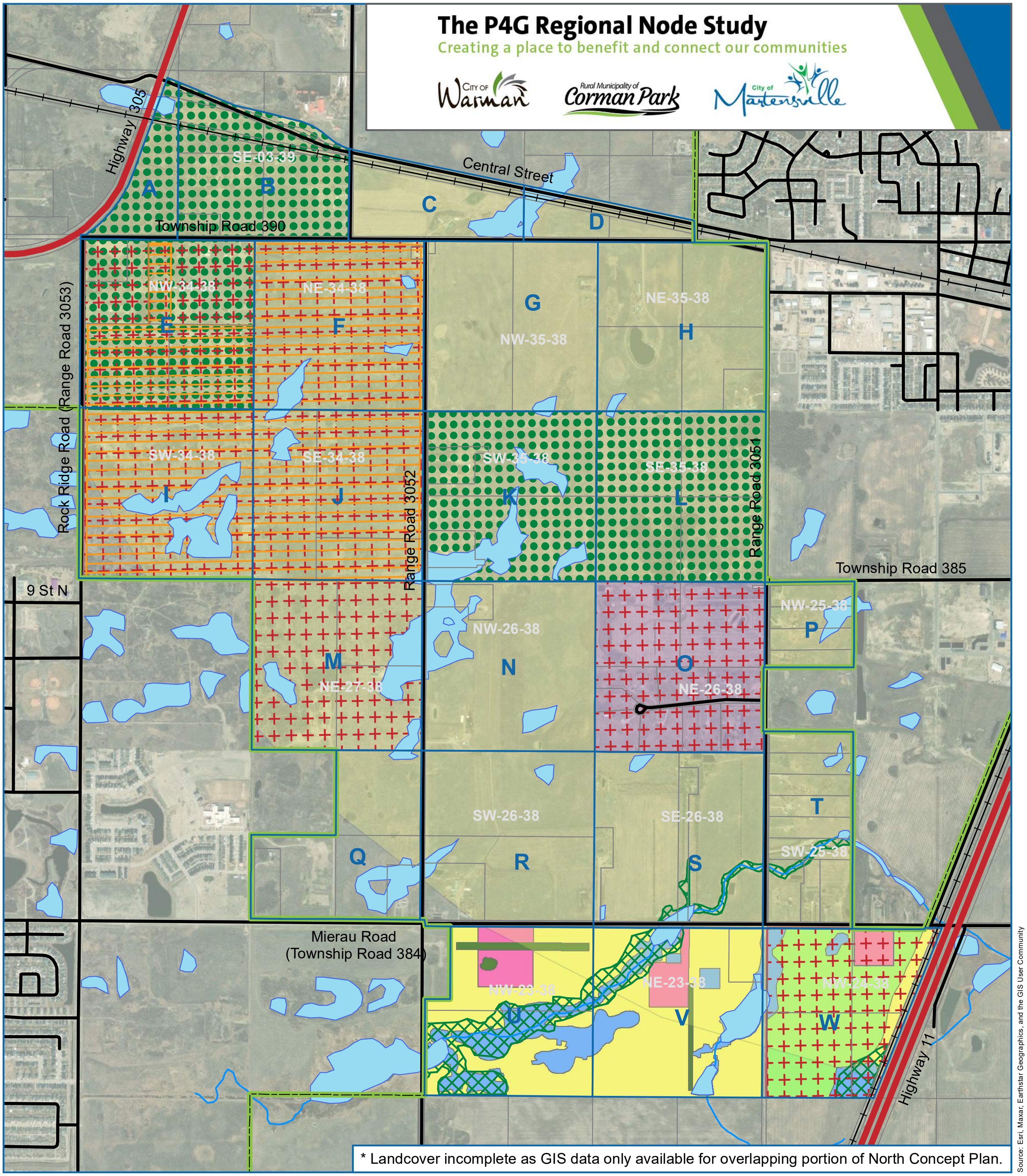
D-Agricultural District 1 (DAG1) District
D-Agricultural District 2 (DAG2) District
D-Agricultural Residential 1 (DAR1) District
D-Country Residential 1 (DCR1) District

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.22: DISTRICT ZONING BYLAW INFLUENCES



ISL

N

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

- Planning Unit
- Municipal Boundary

Species of Concern
- Vascular Plant
- Vertebrate

- Agricultural Crown Land
- Homestead
- Heritage Sensitive Area
- Environmentally Significant Area

Landcover*
- Cropland
- Hayland/Grassland
- Tree/Shrub
- Wetland/Water Body
- Yard Site/Developed

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.23: NATURAL AREA SCREENING INFLUENCES

- **Homestead Records**, available for planning units E, F, I, J, M, O, and W. This land use consideration refers to an important historical resource, containing information about the individuals that first settled and worked in a specific quarter section of land through the historic Dominion Lands Branch homestead process. This land use consideration does not represent a significant development constraint, but rather an extra step in the development process to ensure that homestead files are reviewed in advance of development occurring, and that provisions under the Homesteads Act of 1989 are consulted on any additional requirements that may apply.
- **Heritage Sensitive Areas**, identified in planning units A, B, E, K, and L. This land use consideration refers to potential archeological sites within a planning unit. This includes any municipal heritage properties and provincial heritage properties designated for the protection and preservation of pre-contact and early European settlement history. Depending on the significance and scale of the archeological sites present in each planning unit, this land use consideration could pose a substantial development constraint. Further investigation at the subdivision and development stage would need to be undertaken to confirm what portion (if any) of the affected planning units would be considered undevelopable.
- **Environmentally Significant Areas**, present in southern portion of the study area in planning units S, T, U, V, and W, corresponding to environmental protection buffers around two wetlands stemming from Opimihaw Creek. This land use consideration refers to the protection of environmentally significant elements with an key role in the sustenance of healthy and diverse ecosystems and landscapes, and in supporting adequate drainage. The benefits of environmental protection policies are twofold, as they are also important for the protection of anthropogenic activities and urban development from environmental risks and damage such as floods, erosion, and landslides. Environmentally sensitive lands are considered undevelopable, and therefore pose a significant development constraint. However, the extent of environmentally sensitive lands identified within the study area, and their clustered location, can be considered an advantage for the purpose of this analysis.
- **Species of Concern,** vertebrate animals, present in planning unit O, and vascular plants, present in all other planning units within the study area, refer to at-risk or threatened species that have historically been present or observed within the study area. This land use consideration refers to the protection of at-risk or threatened species, which depending on their current presence and habitat, could pose a substantial development constraint.
- **Landcover,** identified in planning units U, V, and W, as the only available data was for the portion of the study area that overlaps with the North Concept Plan. This land use consideration refers to the presence of land classifications (i.e., cropland, hayland/grassland, tree/shrub, wetland/waterbody, and yard site/developed) within a planning unit. Each landcover type presents different constraints that could impact developability of these planning units.

2.4.4 Wetlands

The 2020 NAS report also investigated landcover and wetlands. Respective excerpt figures from the NAS report are presented as **Figure 2.24** and **Figure 2.25**, while **Figure 2.26** presents an extract of wetland data from AutoCAD files associated with the NAS report. It is noted that there appears to be discrepancies between the delineations of wetlands in the excerpt figures with the extract of wetland delineations from the NAS report in **Figure 2.26**. A comparison of the delineations in **Figure 2.26** to existing satellite imagery is described below. The AutoCAD data containing full landcover coverage for the study area is inconsistent with that shown in the NAS report, so a qualitative comparison was conducted.

- **2021 Google Earth Imagery:** The Google Earth Satellite imagery from April 29, 2021, shows fewer evident wetlands than delineated in Figure 9 of the 2020 NAS. However, many of the wetlands evident on the imagery are consistent in size and shape with those shown in Figure 9 of the 2020 NAS.

- **2023 Google Earth Imagery:** The Google Earth Satellite imagery from September 7, 2023, shows fewer evident wetlands than delineated in Figure 9 of the 2020 NAS. This is likely the result of the timing of the imagery in the fall when all the water in seasonally permanent wetlands has dried. The wetlands evident on the imagery are consistent in size and shape with those show in Figure 9 of the 2020 NAS.

In general, the wetlands and water bodies shown in the 2020 NAS appear consistent with current imagery and ISL believes it remains accurate for use in other analyses.

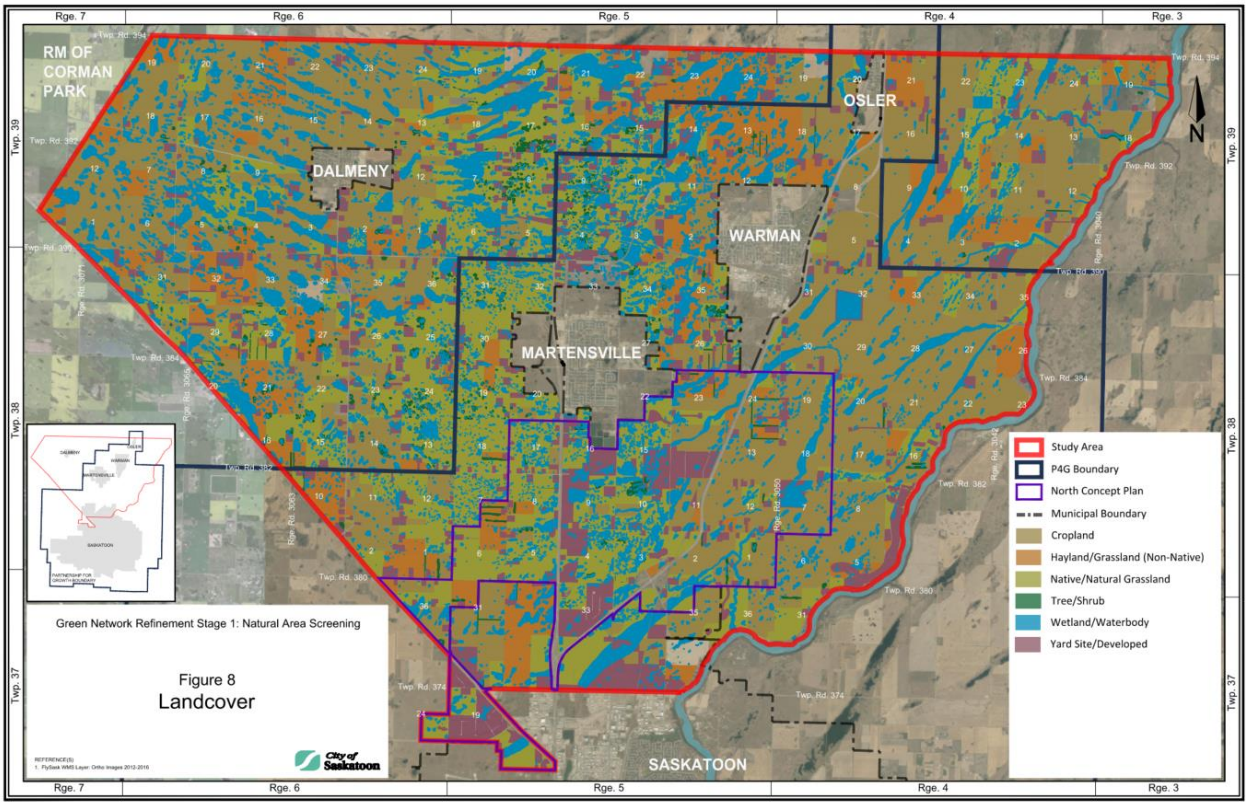


Figure 2.24: Excerpt Landcover Figure from 2020 Natural Area Screening Report

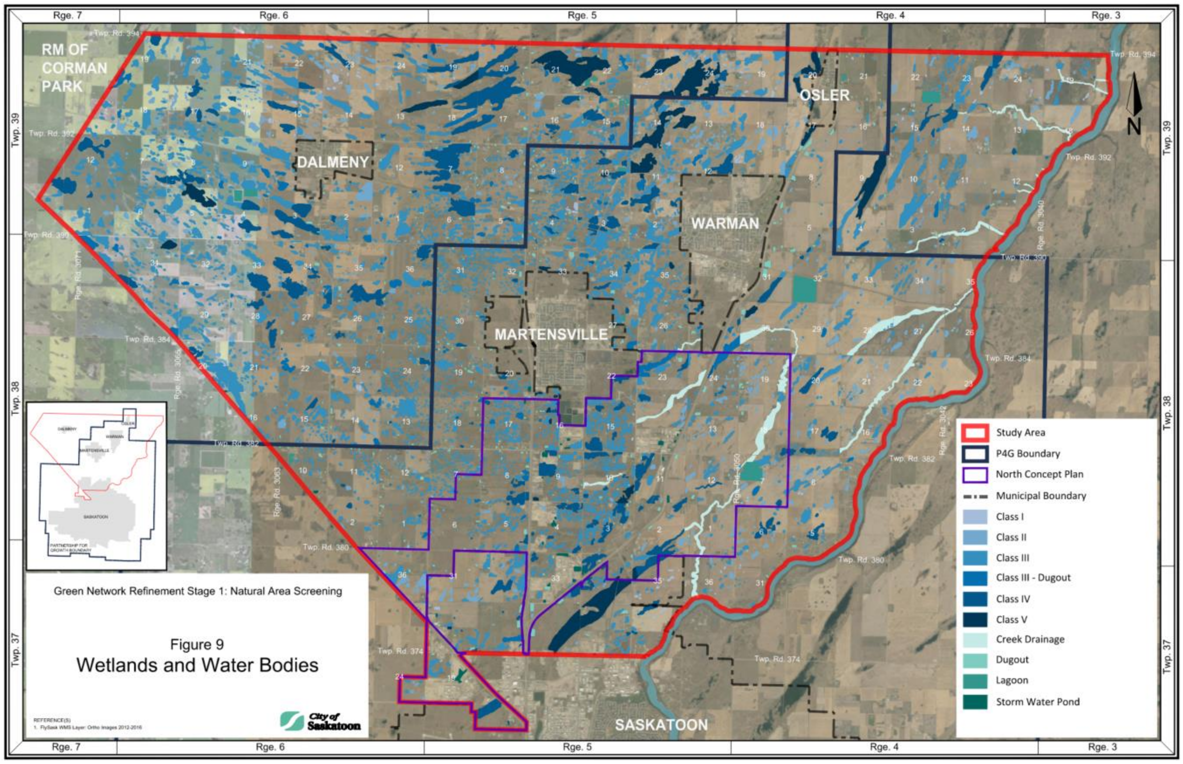
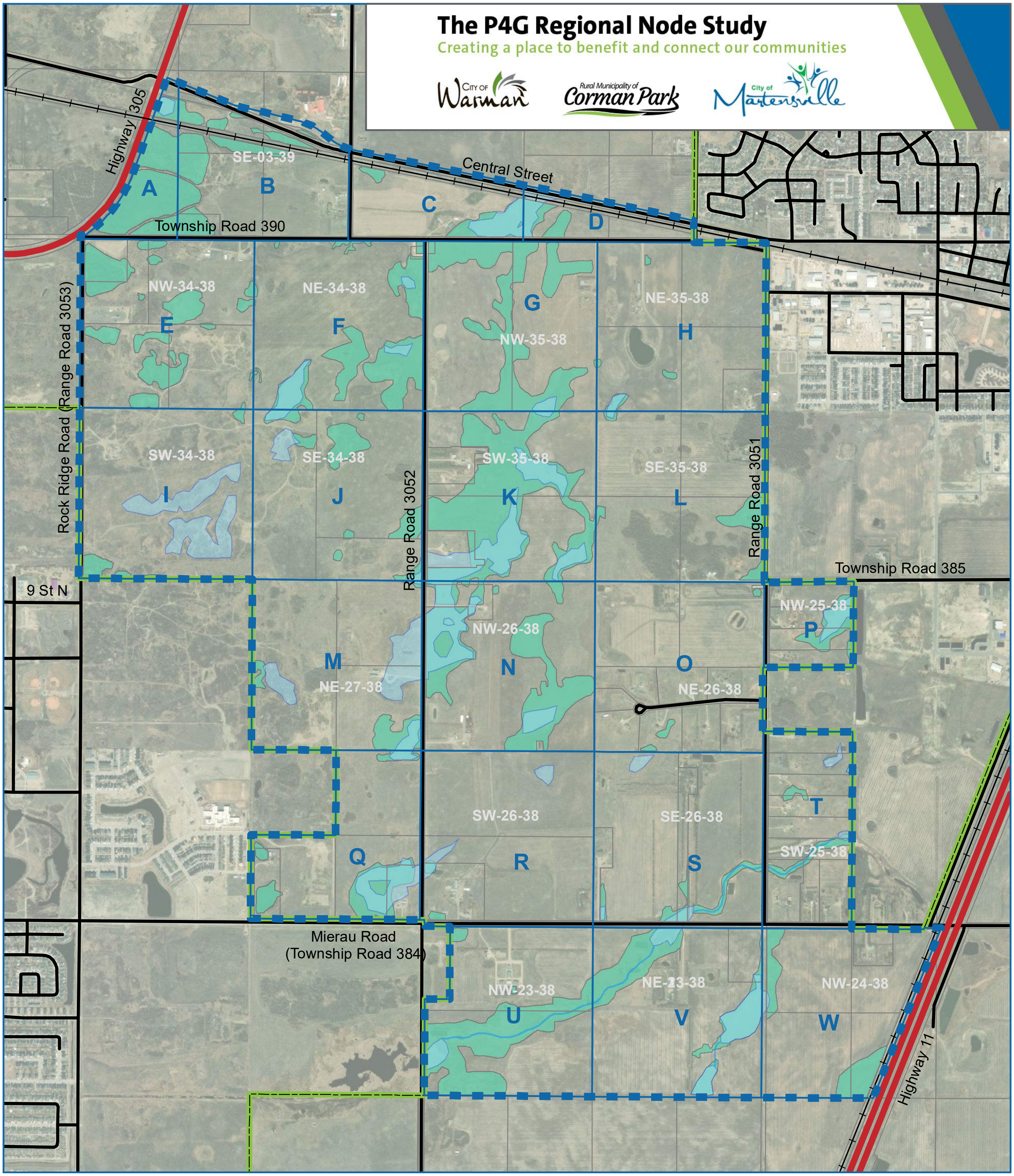


Figure 2.25: Excerpt Wetlands Figure from 2020 Natural Area Screening Report



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Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ISL

- Study Area
- Planning Unit
- Municipal Boundary
- Watercourse
- Water Body
- Natural Area Screening Wetland Delineation*

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

Note: These wetland delineations are from AutoCAD files associated with the *Green Network Refinement Stage 1: Natural Areas Screening* (NAS) prepared in 2020. These delineations appear to be inconsistent with those actually presented in Figure 8 and Figure 9 of the 2020 NAS report.

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.26: NATURAL AREA SCREENING WETLAND DELINEATIONS

2.4.5 Parcel Fragmentation Patterns

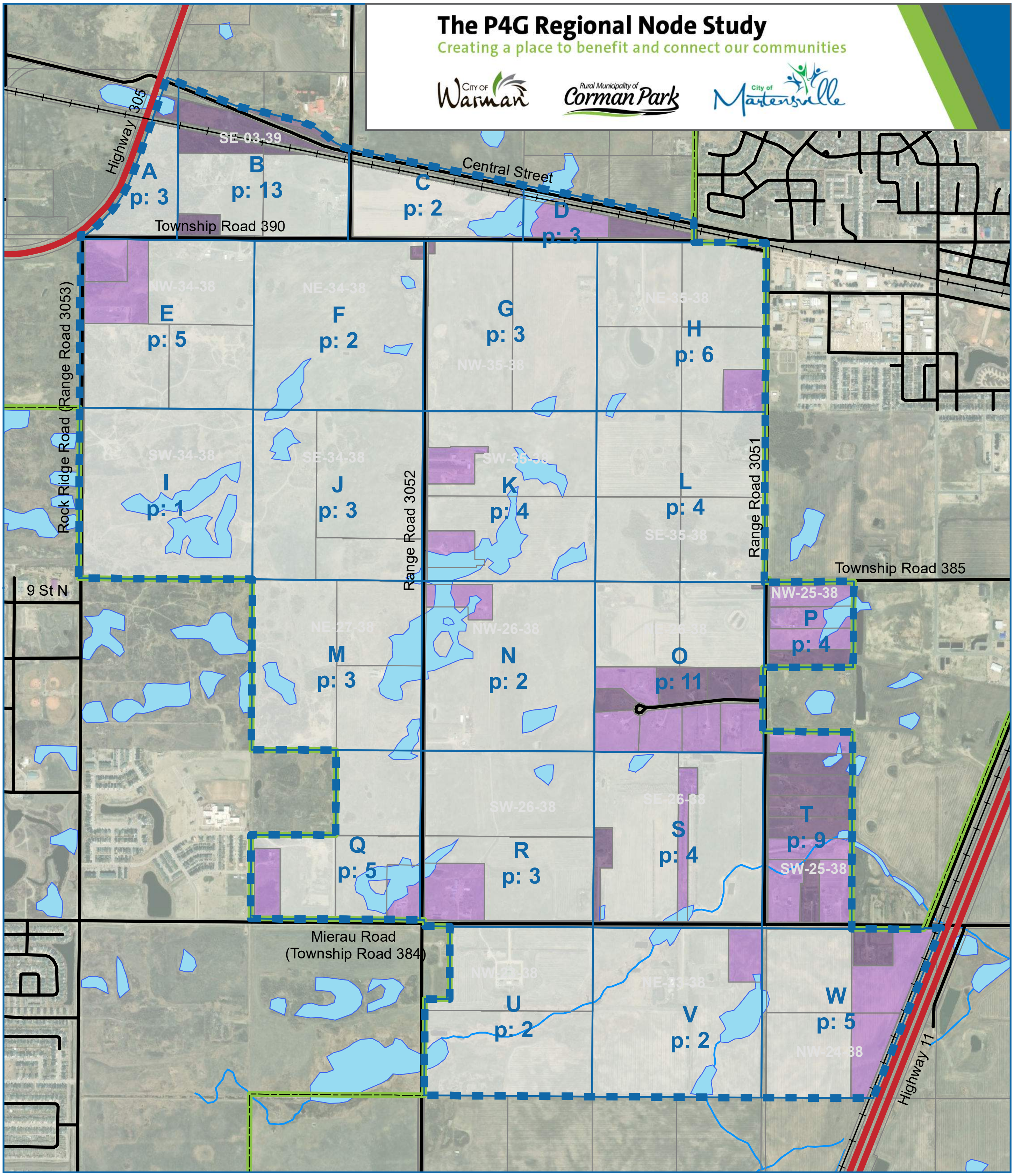
Preserving the integrity of agricultural quarter sections prior to their integration into urban development is essential for efficient land use planning. Starting with a clean slate supports an effective land use concept and ultimately seamless subdivision design. Conversely, dealing with fragmented lands and existing developments poses the risk of a less cohesive, piecemeal approach. Another consideration is the number of affected landowners during the implementation of plans. Working with a more limited number of landowners simplifies the engagement process and is likely to facilitate more expeditious consensus on future land use planning exercises.

Figure 2.27 provides a count of parcels by planning unit. Of the 23 planning units, 12 have one to three parcels. Having three or less makes land assembly for the regional node or other forms of urban development less difficult. Four planning units – K, L, P, and S – have four parcels and three planning units – E, Q, and W – have five parcels while planning unit H has six. The three remaining planning units with the most parcels landowners are T, O, and B at nine, eleven, and thirteen respectively. This is due to the proliferation of country residential lots in planning units T and O, which would be difficult to assemble for the purpose of developing the regional node or other forms of urban development, while parcel fragmentation in planning unit B is mostly due to bisection by the rail line and former and current alignments of Central Street between Highway 305 and Range Road 3052.

Figure 2.27 also shows that most of the study area remains unsubdivided beyond the legal subdivision level or consists of larger subdivided agricultural parcels greater than 10 ha in size. This configuration offers an advantageous position for comprehensive land use planning and initiating future urban development.

Parcels within the 4 to 10-ha range, while not ideal, do not significantly constrain the planning process compared to smaller parcels. These parcels, dispersed throughout the study area, represent farmsteads separated from the original agricultural quarter section and some country residential parcels.

Parcels smaller than 4 ha present a challenge to future development. While these lands could be considered undevelopable for the foreseeable future, the design of the regional node and other development within the study area would have to acknowledge and integrate these smaller parcels to prevent land use incompatibilities and minimize potential nuisances until such time as the owners of these parcels are prepared to participate in urban development. Notably, these parcels are concentrated in the country residential developments in the southern half of planning unit O, as well as planning units P and T, with additional instances in planning units B, D, S, and W.



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Date: 7/25/2024

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ISL

N

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

- Study Area
- Planning Unit
- Municipal Boundary
- Watercourse
- Water Body
- Parcel < 4.0 ha
- Parcel 4.0 to 10.0 ha
- Parcel > 10.0 ha
- p: # Parcel Count

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.27: PARCEL FRAGMENTATION PATTERNS

2.4.6 Ownership Patterns

Figure 2.28 provides a count of the unique sets of landowners per planning unit. Of the 23 planning units, 17 have one to three sets of unique landowners. Having three or less makes land assembly for the regional node or other forms of urban development less difficult. Three planning units – E, H, and K – have four sets of unique landowners while planning unit B has five despite having 13 parcels within it. The two planning units with the most sets of landowners are T and O at nine and ten respectively. This again is due to the proliferation of country residential lots, which would be subject to land assembly challenges for the purpose of developing the regional node or other forms of urban development.

Figure 2.28 also shows parcel ownership by type within the study area. Most notably, the Crown owns three full quarter sections of land plus one-half of a fourth quarter section in the northwest portion of the study area (within planning units E, F, I, and J). As introduced in Section 2.4.3, the Crown-owned lands in these planning units are considered Agricultural Crown Land and have an onerous land acquisition process from the Government of Saskatchewan. The Crown also owns a small parcel within planning unit A, which appears to protect the east portion of a wetland that is bisected by Highway 305. Due to its small size and being severed from the balance of the planning unit by a rail line, this parcel does not inhibit future development of the balance of planning unit A to the south.

All three municipalities that are parties to this study own one parcel within the study area each. Warman and Martensville both own a parcel in the northwest portion of planning unit E while the RM of Corman Park owns a small parcel in the northeast corner of planning unit F. A utility corporation owns a smaller parcel across Range Road 3052 to the east within the northwest corner of planning unit G. Due to their small sizes, the RM of Corman Park and utility corporation parcels do not pose significant hurdles to future urban development. However, the two parcels owned by Martensville and Warman total 12.1 ha. Coupled with the southern half of planning unit E being owned by the Crown and the unknown ownership situation[1] of the northeastern balance of the planning unit, these parcels may not be viable for the two municipalities to turnover for future urban development.

[1] Based on the Agricultural Crown Land designation in the 2020 NAS report (refer to Section 2.4.3 and **Figure 2.22**), it appears this parcel with unknown ownership may in fact be Crown-owned. However, the presence of agricultural activity and a farmstead on the parcel, based on a review of aerial imagery, may indicate it is now under private ownership, or at minimum leased by a private party from the Crown.

The P4G Regional Node Study

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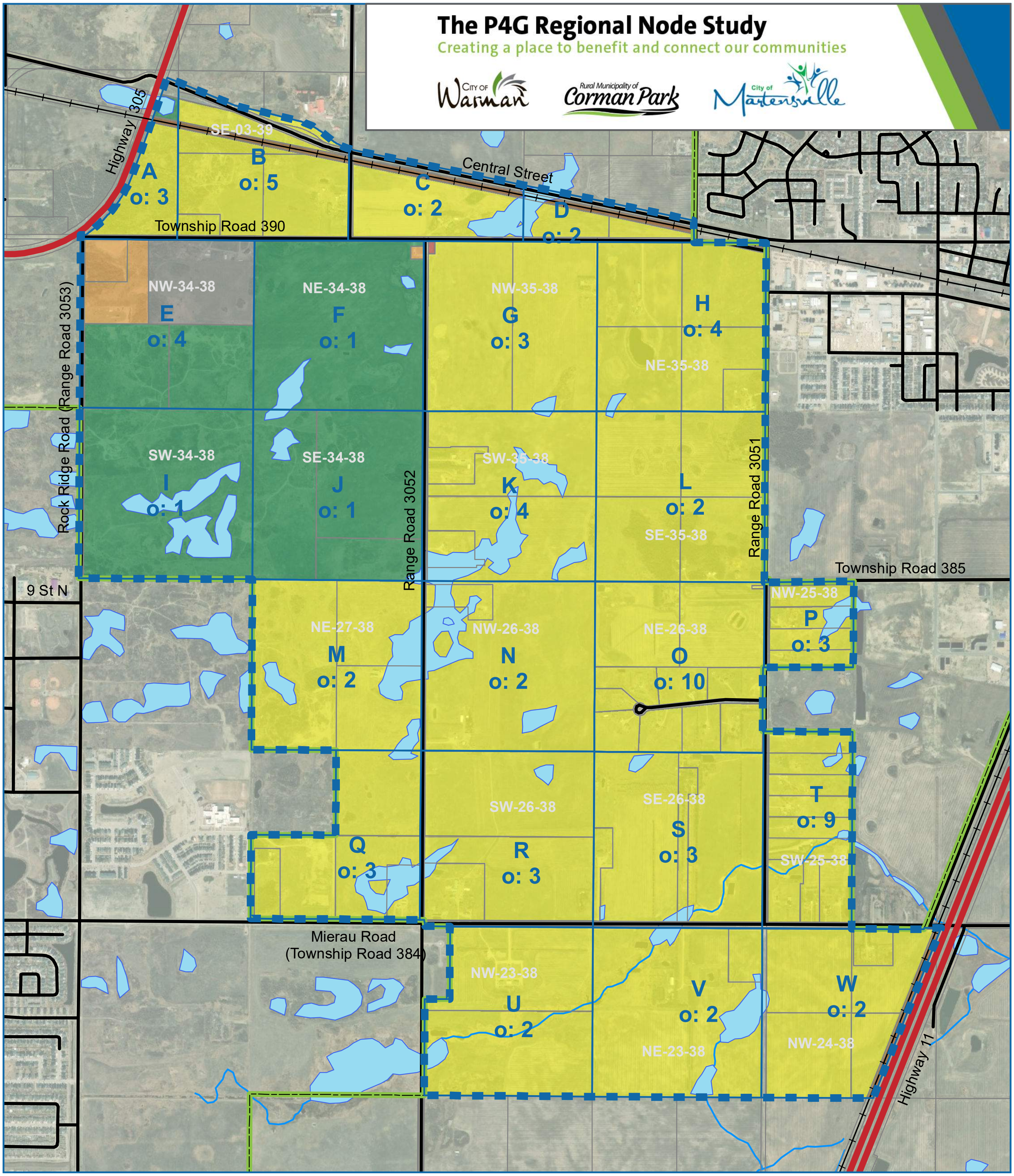
City of Warman | Rural Municipality of Corman Park | City of Martensville



ISL

Legend:
- Study Area
- Planning Unit
- Municipal Boundary
- Parcel
- Watercourse
- Water Body
- Crown Ownership
- Municipal Ownership
- Utility Ownership
- Unknown Ownership
- Rail Ownership
- Private Ownership
- o: # Unique Set of Landowners Count

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.28: OWNERSHIP PATTERNS

Document: M:\16467_P4G_Regional_Node\25_GIS\251_Figures\16467_P4G_RNS_Fig_2-28_Ownership_240725.mxd

Date: 7/25/2024

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

2.4.7 Shallow Utilities and Energy Infrastructure

ISL contacted Sask 1st Call to identify existing shallow utilities within the study area. A request was also sent to DigShaw as Shaw Communications is not currently a Sask 1st Call member company.

Servicing a regional node and urban development within the balance of the study area with power, gas, and telecommunications is not identified as a constraint for this project. At the preliminary design phase of a proposed future development, the utility companies would be engaged to identify servicing requirements. Services would be brought to site with the costs typically covered under end-user agreements. Any requirement for overhead/underground shallow utility relocation or crossing agreements may be addressed in preliminary design discussions with the respective utility companies.

SaskPower

SaskPower owns and operates overhead power infrastructure throughout the study area. Overhead power transitions to underground services in several of the country residential acreage developments.

SaskTel

SaskTel owns and operates both overhead and underground telecommunication infrastructure within the study area. Based on the background information provided by SaskTel, no fibre optic infrastructure is located within the study area.

Shaw

Shaw Communications was contacted as part of the data collection for this report. At the time of report submission, Shaw had not responded to our request for existing utility information.

Access Communications

Access Communications (Access) owns and operates underground fibre communications infrastructure within the study area. Heading east out of Martensville, Access has a fibre alignment along the north side of Mierau Road (Township Road 384) before heading north along the west side of Range Road 3051. The alignment then heads east along the north side of Township Road 385.

SaskEnergy

SaskEnergy owns and operates an elevated pressure distribution main within the study area as shown in **Figure 2.29**. The line is located along the south side of Mierau Road (Township Road 384) before it transitions north midway between Range Road 3051 and Range Road 3052. The line heads east at Township Road 390 before exiting the study area. The distribution main also tees to the east between planning units L and O. The line has a protected right-of-way width of 15 m.

SaskEnergy also owns and operates low pressure natural gas infrastructure within the study area. Larger mains are located along the south side of Mierau Road (Township Road 384) and the west side of Range Road 3051. The mains feed smaller service lines that distribute natural gas to properties within the study area.

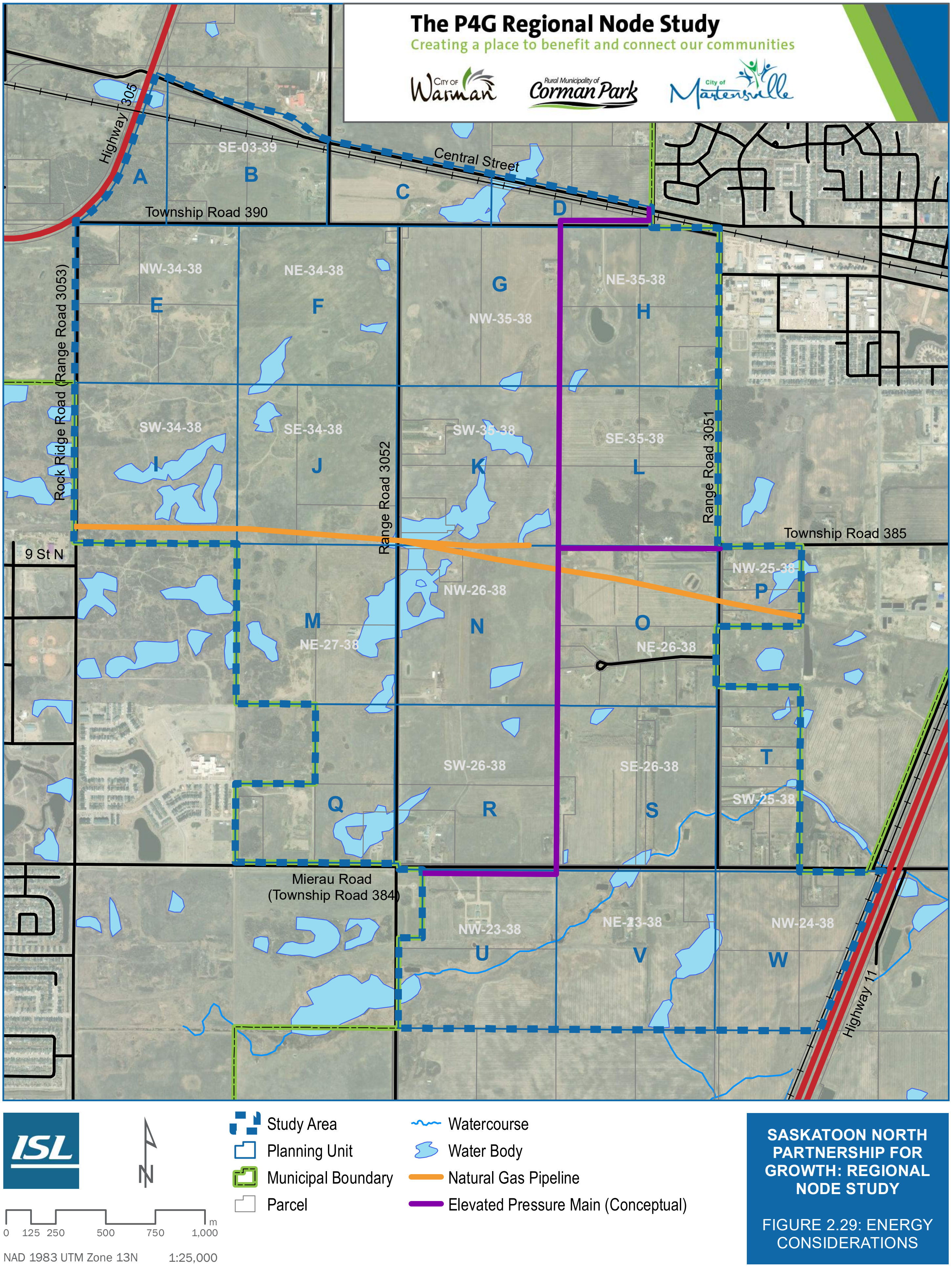
TransGas

TransGas owns and operates a high-pressure natural gas line that bisects the study area through planning units I, J, K, N, O, and P as shown in **Figure 2.29**. It is protected by a utility right-of-way easement that is generally 15-25 m in width. TransGas also defines the minimum safe building setback from edge of transmission right-of-way based on the pipe diameter and adjacent land use. Within the study area, a 114.3 mm main is present, which correlates to building setback of 10 m and 20 m for low density residential and high density commercial, respectively. It is recommended that TransGas be approached to verify such setbacks prior to the sector planning stage.

2.4.8 Rail Guidelines

CN Rail owns and operates a main line track through the study area (planning units A, B, C, and D) known as the Aberdeen Subdivision. The track is operational and is primarily used for freight transport. The Federation of Canadian Municipalities and the Railway Association of Canada have issued *Guidelines for New Development in Proximity to Railway Operations.* The guidelines encourage jurisdictions to consult with the railway company early in the development process to determine appropriate building setbacks. For residential development, the recommended building setback is 30 m from a main line track.

Through the land use planning process, trespassing issues can be avoided by discouraging schools and commercial areas adjacent to a railway corridor. When development proceeds adjacent to the railway corridor, it is important to consult the railway company so that options for noise and vibration mitigation can be explored.



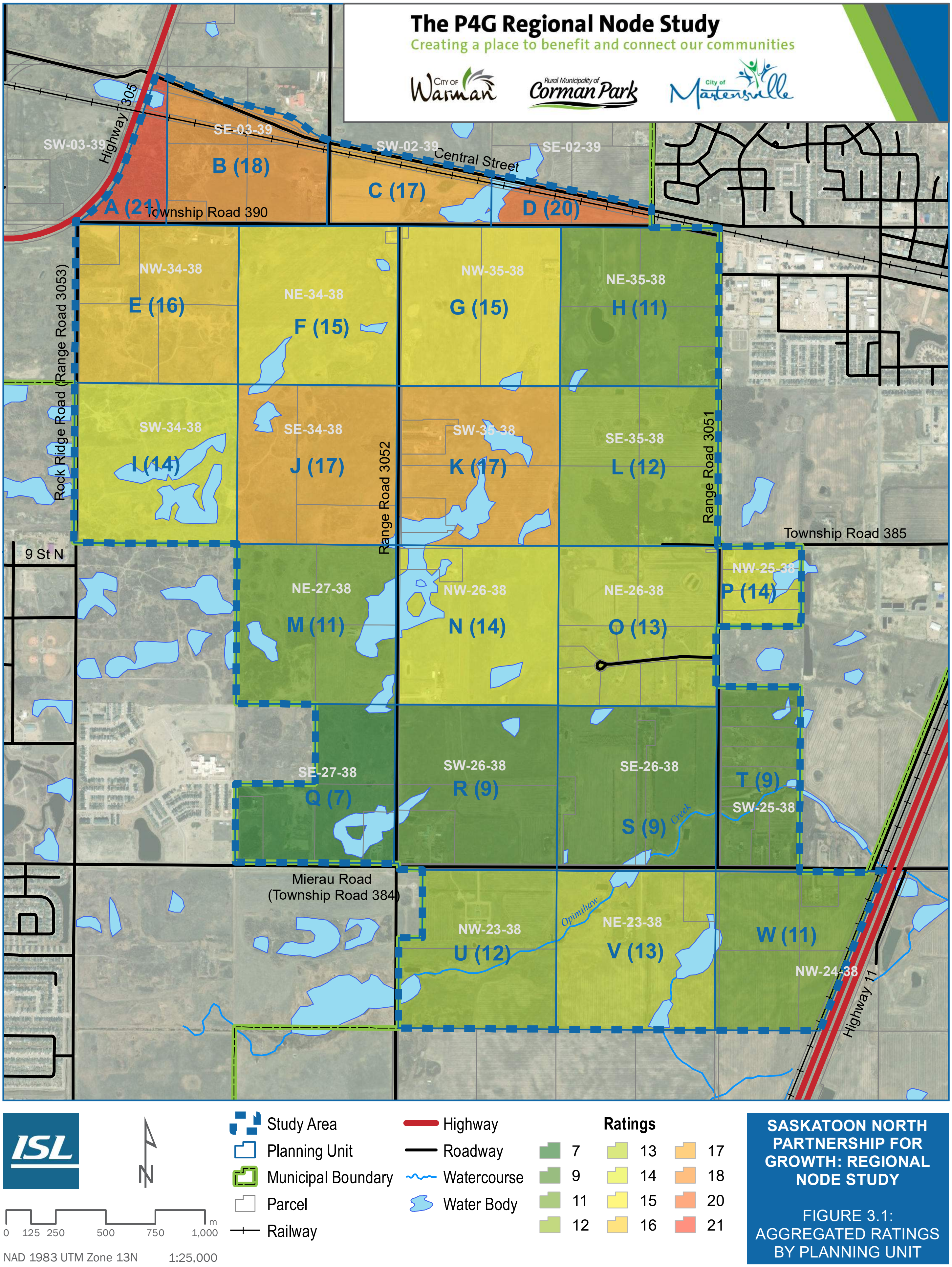
SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 2.29: ENERGY CONSIDERATIONS

3.0 Conceptualizing the Regional Node

3.1 Regional Node Location Selection

ISL combined the land use considerations and servicing rankings presented in Section 2 to evaluate the feasibility of each planning unit within the study area. This resulted in an aggregated rating by planning unit, as presented in **Figure 3.1**. This aggregation shows that the southern and northeastern portions of the study area are more suitable options for locating the regional node based on the opportunities and constraints identified through each analysis.



SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 3.1:
AGGREGATED RATINGS BY PLANNING UNIT

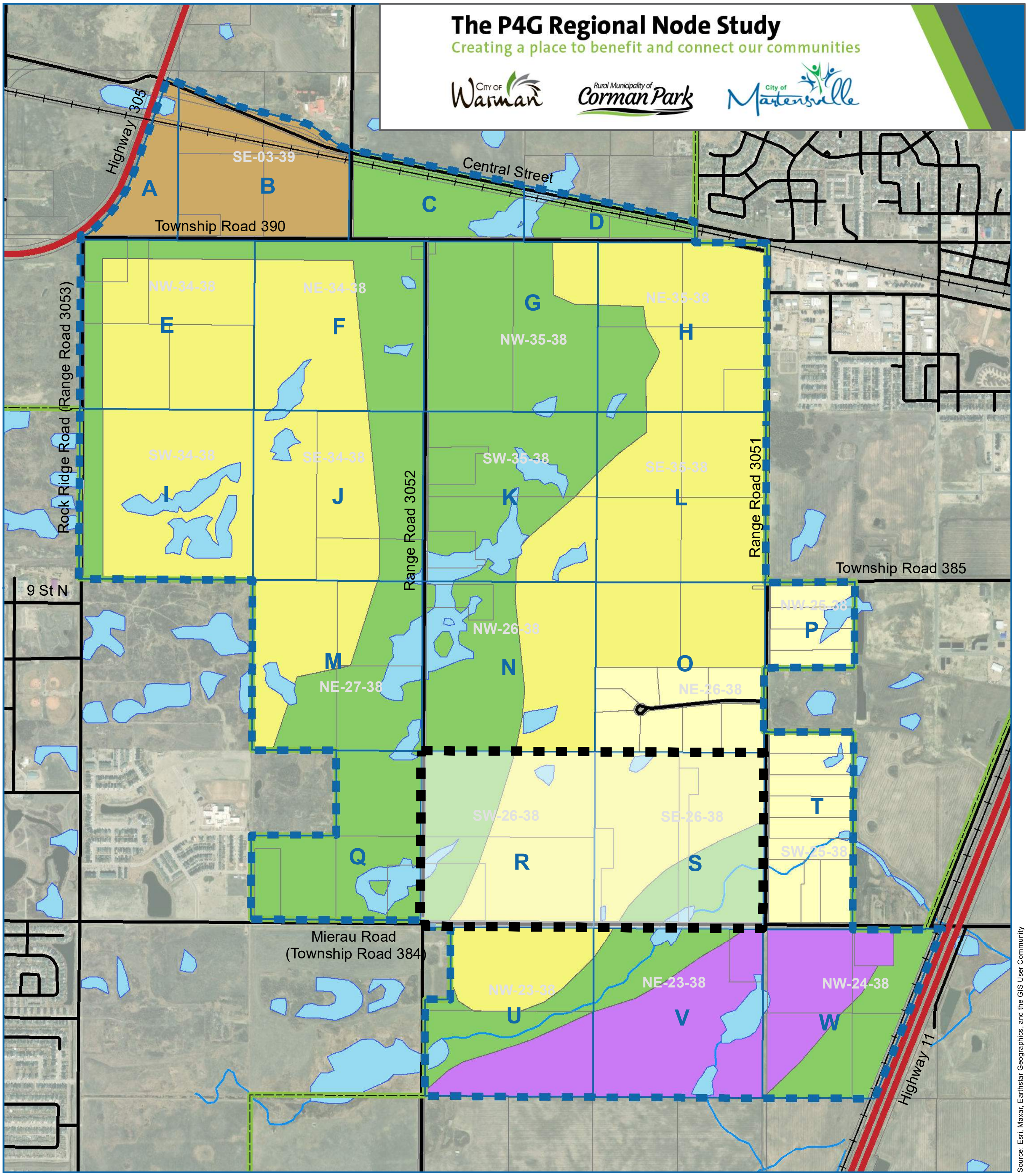
3.1.2 Workshop Review

With the aggregated ratings prepared, ISL hosted a workshop with the Project Partners to recommend a single location for the regional node in consideration of all potential opportunities and constraints. Together, the Project Partners identified planning units R and S as the most suitable location that best supports and benefits all three municipalities (see **Figure 3.2**).

The P4G Regional Node Study

Creating a place to benefit and connect our communities

City of Warman · Rural Municipality of Corman Park · City of Martensville



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Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ISL

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

- Study Area
- Planning Unit
- Municipality
- Parcel
- Water Body
- Watercourse
- Railway
- Highway
- Roadway
- Agriculture
- Country Residential
- Urban Residential
- Rural Commercial/Industrial
- Green Network Study Area
- Recommended Node

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 3.2: REGIONAL NODE LOCATION RECOMMENDATION

3.2 Potential Future Land Uses

Following the regional node selection workshop, ISL prepared a graphic, as shown in **Figure 3.3**, that delineates the extent of the recommended regional node and considers potential future land uses that would provide regional or intermunicipal benefit. Specific uses that informed the development of the graphic included assisted living developments, firehalls, healthcare/medical facilities, education facilities, police stations, and religious assemblies. Although approximate sizes of each use were identified for preliminary planning purposes, the graphic does not identify the location or spatial distribution of these uses within the regional node; this level of detail will be identified at a later stage in the planning process.

ISL applied two key assumptions to allocating potential future land uses:

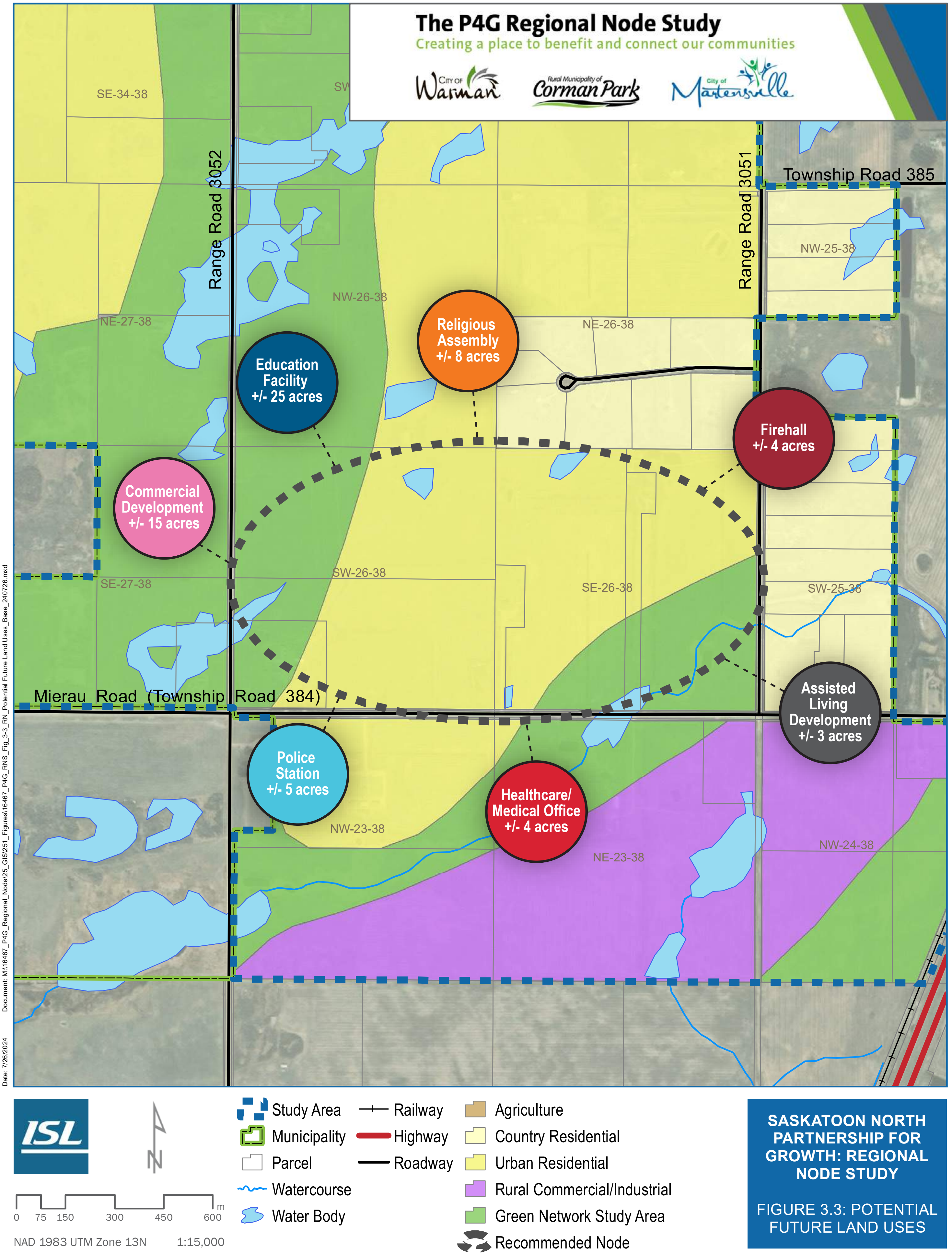
1. Traditional residential uses are not desired within the regional node; and
2. Development should be directed outside of the Green Network Study Area.

Table 3.1 compares the inventory of land between the existing future land use designations identified in Schedule B in the DOCP and the proposed Future Land Use Concept, where the concept accommodates the above assumptions; the Green Network Study Area is identified as "Undevelopable", and the area identified for Urban Residential Neighbourhood has been decreased to accommodate the desired land uses.

Any land within the Recommended Node area that is not developed as part of the regional node will remain planned for the future land use designations identified in Schedule B – Future Land Uses of the DOCP. If the regional node is not pursued, the underlying future land use designations identified in the DOCP prevail.

Table 3.1: Future Land Use Concept Inventory

	Area (ac)	Percent
Existing Future Land Uses		
Undevelopable		
Green Network Study Area	107.0	33.9%
Developable		
Urban Residential Neighbourhood	209.0	66.1%
Gross Developable Area	209.0	66.1%
Proposed Land Use Concept		
Undevelopable		
Green Network Study Area	107.0	33.9%
Developable		
Commercial	~15.0	4.7%
Institutional	~49.0	15.5%
Assisted living development	~3.0	
Firehall	~4.0	
Healthcare/medical	~4.0	
Joint-use school	~25.0	
Police station	~5.0	
Religious assembly	~8.0	
Urban Residential Neighbourhood	~145.0	45.9%
Gross Developable Area	209.0	66.1%



SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 3.3: POTENTIAL FUTURE LAND USES

3.3 Stormwater

3.3.1 Proposed Stormwater Servicing Concept

As described in the feasibility analysis of the study area, ISL recommends an urban gravity dual-drainage (major/minor) stormwater servicing concept that discharges through a lengthy off-site conveyance system into Opimihaw Creek. The system would contain the following three main components:

- an urban gravity dual-drainage, minor (storm sewer) and major (surface), conveyance system within the development area that routes all runoff to a SWMF (it should be noted that a rural (ditch/culvert) drainage system could also be implemented and provide essentially the same functionality);
- a SWMF distributed at approximately one per quarter section; and
- a downstream gravity conveyance system, consisting of an appropriate combination of pipe and ditch/culvert drainage that discharges into Opimihaw Creek at a downstream location.

The portions of the stormwater servicing concept proposed to be located within the study area are shown in **Figure 3.4.** The portions of the off-site conveyance system that discharge downstream of the study area into Opimihaw Creek are shown in **Figure 3.5.** The proposed stormwater servicing concept includes the following:

- two SWMFs – SWMF S-12 to service planning unit “R”, and SWMF S-16 to service planning unit “S”;
- gravity outlet storm sewers to service both SWMFs east along Township Road 384 (Mierau Road) to the east boundary of the study area at node N-41, continuing east past Highway 11 then south on Range Road 3050 to a location south of Township Road 382 (Lutheran Road) at node N-57 where the sewer would discharge into a roadway ditch; and
- a roadway ditch running south on Range Road 3050 then west on Township Road 381 where it would outfall into Opimihaw Creek at node N-76.

The outlet piping and ditch/culvert system would be sized to service the ultimate development areas that will eventually contribute. The peak unit discharge rate for the SWMFs will be 1.0 L/s/ha. The design flow for the off-site conveyance system (downstream of the study area) will be sized to convey runoff from the entire study area of 1,230 ha, and as a result will be sized to convey 1.23 m^3/s. A pipe size of 1,200 mm at 0.10% grade would have the capacity to convey these flows.

It should be noted that SWMF S-16 also has the potential to be upsized to service planning unit “T”, and that this concept was prepared with the assumption that Opimihaw Creek will have capacity to receive discharges from the study area at the selected location. Further analysis will be required to confirm this assumption.

3.3.2 Estimated Cost

Estimated off-site costs to provide stormwater servicing for the regional node are as follows:

- $5.4 million for SWMF S-12;
- $7.0 million for SWMF S-16; and
- $32.6 million for the downstream outlet conveyance systems from the SWMFs to Opimihaw Creek.

Estimated costs include a 15% allowance for engineering, a 30% contingency allowance, and an allowance of $300k/ha for land. Costs for SMWF S-16 assume oversizing to service planning unit “T” – should S-16 be developed to only service planning unit “S”, the estimated cost would decrease to approximately $5.4 million. Cost breakdown details are provided in **Appendix A** and include estimates of quantities, unit costs, design assumptions, etc.

The estimated costs outlined above exclude the costs to provide the local dual-drainage (major/minor) stormwater conveyance systems within the regional node site that will be required to discharge into the SWMFs. Those costs will vary depending on site specific developments proposed and incurred by the developer.

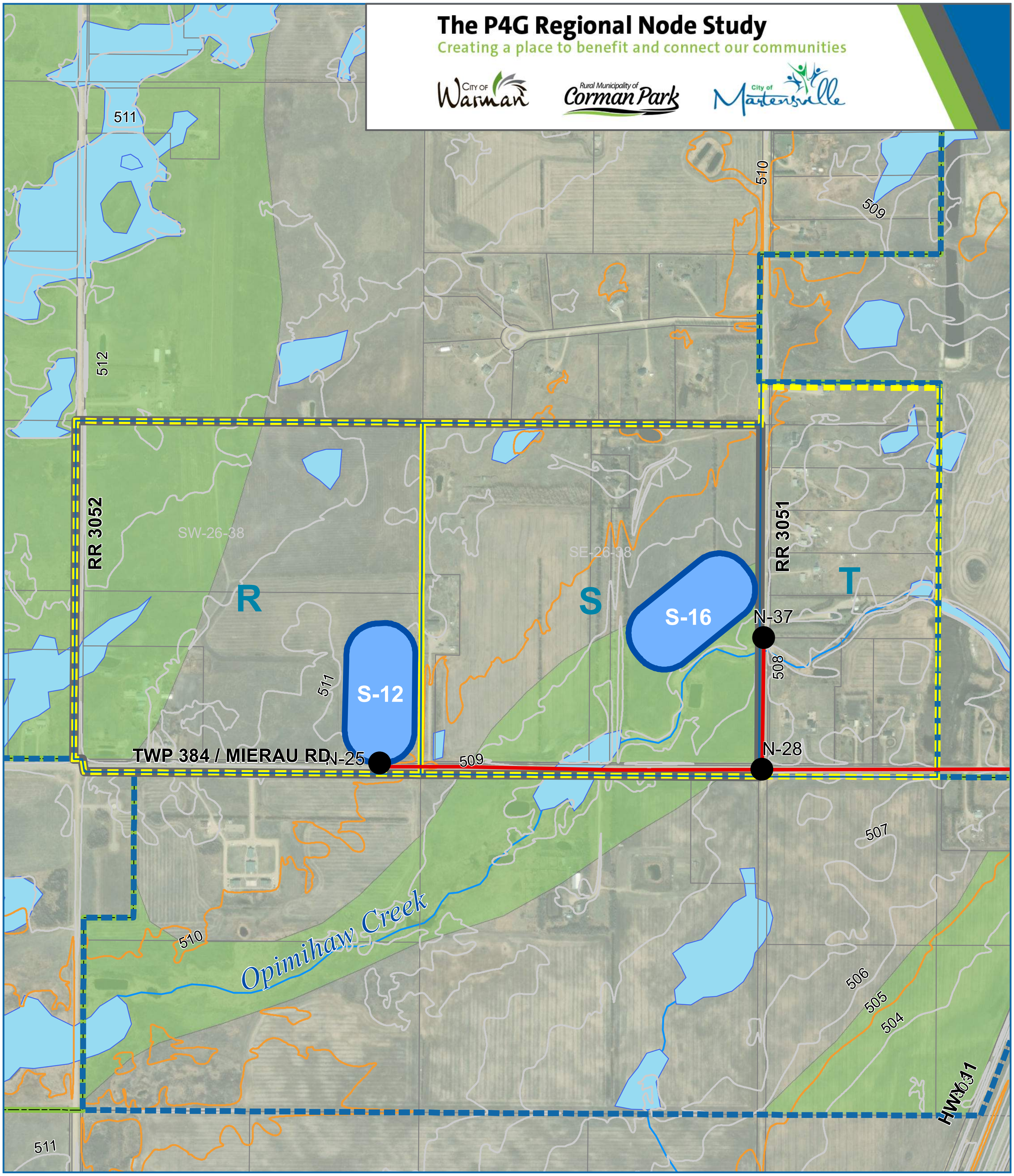
3.3.3 Potential Levy Charges

ISL recommends establishing two separate levies: one for on-site works (works within a SWMF catchment, including the local sewer systems and SWMF); and one for the off-site downstream outlet conveyance system.

The on-site levy will accommodate the typical scenario where an initial developer builds a subdivision/site including the SWMF required for the area and any downstream sewers or drainage systems that route stormwater to the SWMF. In this case, the developer is required to oversize the SWMF and the portions of the conveyance system from their development to the SWMF to provide capacity for subsequent developments within the catchment area. At a time when subsequent development occurs within the catchment area, future developers would pay levy charges back to the initial developer for use of the existing infrastructure. In this scenario, the original developer recovers the costs from future developers who benefit from the oversized infrastructure within the catchment.

The off-site levy would be established as a means for the municipality to recover costs from developers for constructing the downstream off-site outlet conveyance systems.

Levy charges for stormwater servicing are typically uniform area-based charges. As stormwater levy charges must be established to recover all costs of the required works, they can only be allocated to developable lands as only those lands have potential to generate revenue. Lands to be allocated to parks, environmental reserves, roadways, etc., must be excluded from the levy formula. In addition, levy charges should be adjusted regularly to reflect changing conditions to ensure adequate cost recovery. As the amount of undevelopable land within the regional node area is unknown at this time, ISL cannot provide an estimated levy rate.



Study Area
Planning Unit
Municipal Boundary
Recommended Node
Parcel
Water Body
Watercourse
Contour (1 m)
Contour (5 m)
Catchment Boundary
Stormwater Node
Storm Pipe
Stormwater Management Facility

ISL

0 65 130 260 390 520 m

NAD 1983 UTM Zone 13N 1:12,500

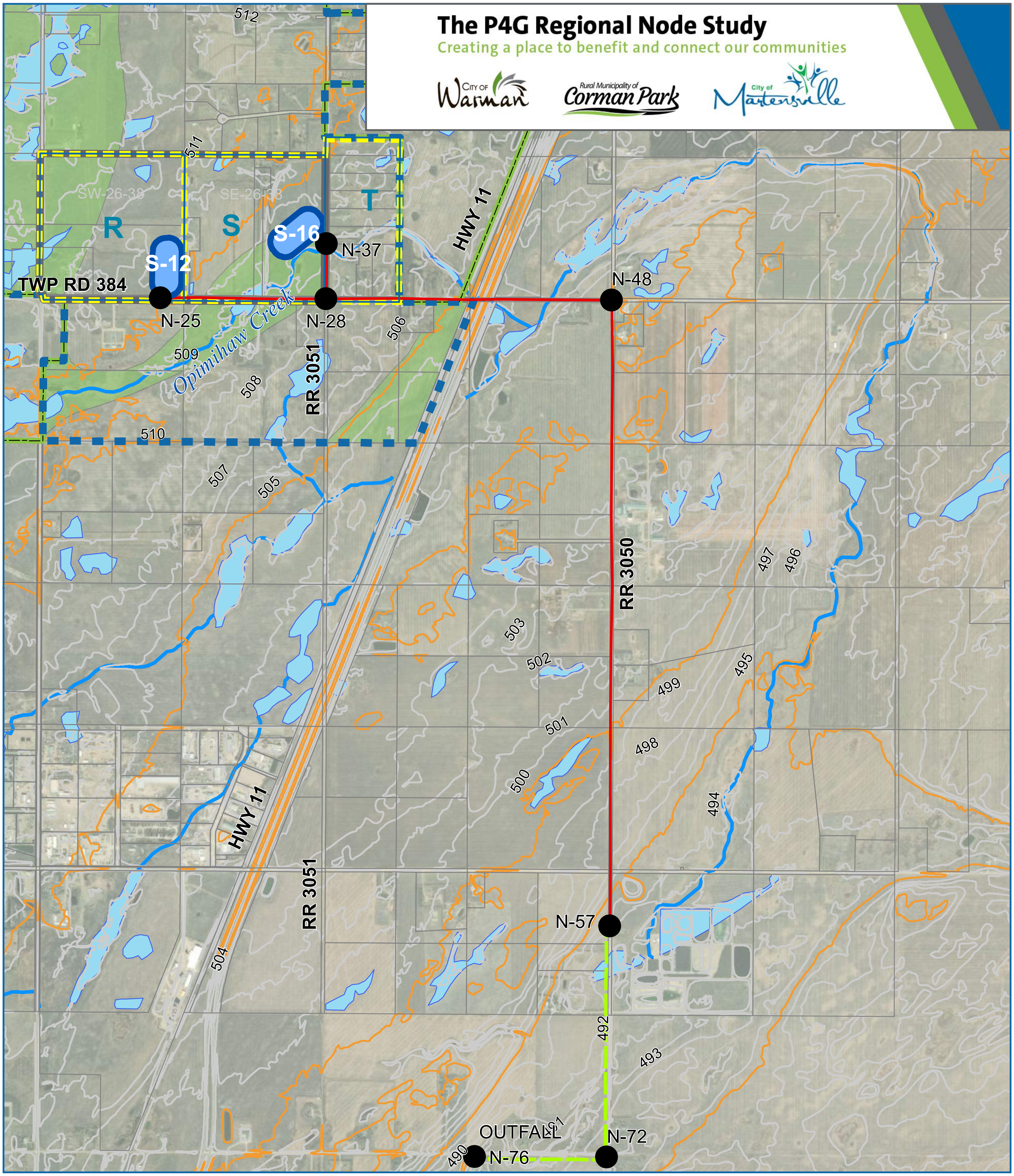
SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 3.4: PROPOSED REGIONAL NODE STORMWATER SERVICING CONCEPT – ON-SITE

Document: M:\16467_P4G_Regional_Node\25_GIS\251_Figures\16467_P4G_RNS_Fig_3-4_Onsite_Storm_Concept_240726.mxd

Date: 7/26/2024

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



Study Area
Planning Unit
Municipal Boundary
Recommended Node
Parcel
Water Body
Watercourse
Contour (1 m)
Contour (5 m)
Catchment Boundary
Stormwater Node
Storm Pipe
Ditch
Stormwater Management Facility

ISL

0 150 300 600 900 1,200 m

NAD 1983 UTM Zone 13N 1:30,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 3.5: PROPOSED REGIONAL NODE STORMWATER SERVICING CONCEPT – OFF-SITE

Date: 7/26/2024 Document: M:\16467_P4G_Regional_Node\25_GIS\251_Figures\16467_P4G_RNS_Fig_3-5_Offsite_Storm_Concept_240726.mxd

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

3.4 Water and Wastewater

3.4.1 Proposed Water Servicing Concept

As described in the feasibility analysis of the study area, ISL recommends an urban pressurized piped water servicing concept connecting to an adjacent urban system, with water servicing being provided by either Martensville or Warman. Potential alternatives are shown in **Figure 3.6** and assume the following:

- looped systems connecting to the adjacent municipal systems at two separate locations for purposes of security of supply;
  - this means that in the event of a watermain break or other disruption, supply to customers can be maintained from the other direction; and
  - looped systems provide improved fire flows, so fire flow availability may be temporarily reduced during service disruptions, but some protection will be maintained.
- all pipes are to be located along quarter section boundaries to minimize impacts on future land use planning and development;
- that municipal systems have capacity and water storage (reservoir) requirements to service future demands of the regional node, and that any required upgrades will not be charged to regional node developers;
- both options include the looped watermain system routing through the centre of the regional node, along the north/south roadway between planning units R and S, and that water system developments within the regional node can connect to that watermain; and
- that a 300 mm diameter line is sufficient for both options, however, further analysis and development planning will be required to confirm the required sizing of the watermain system.

3.4.2 Estimated Cost

Estimated off-site costs to provide water servicing for the regional node are as follows:

- $3.6 million if serviced to Martensville; or
- $4.2 million if serviced to Warman.

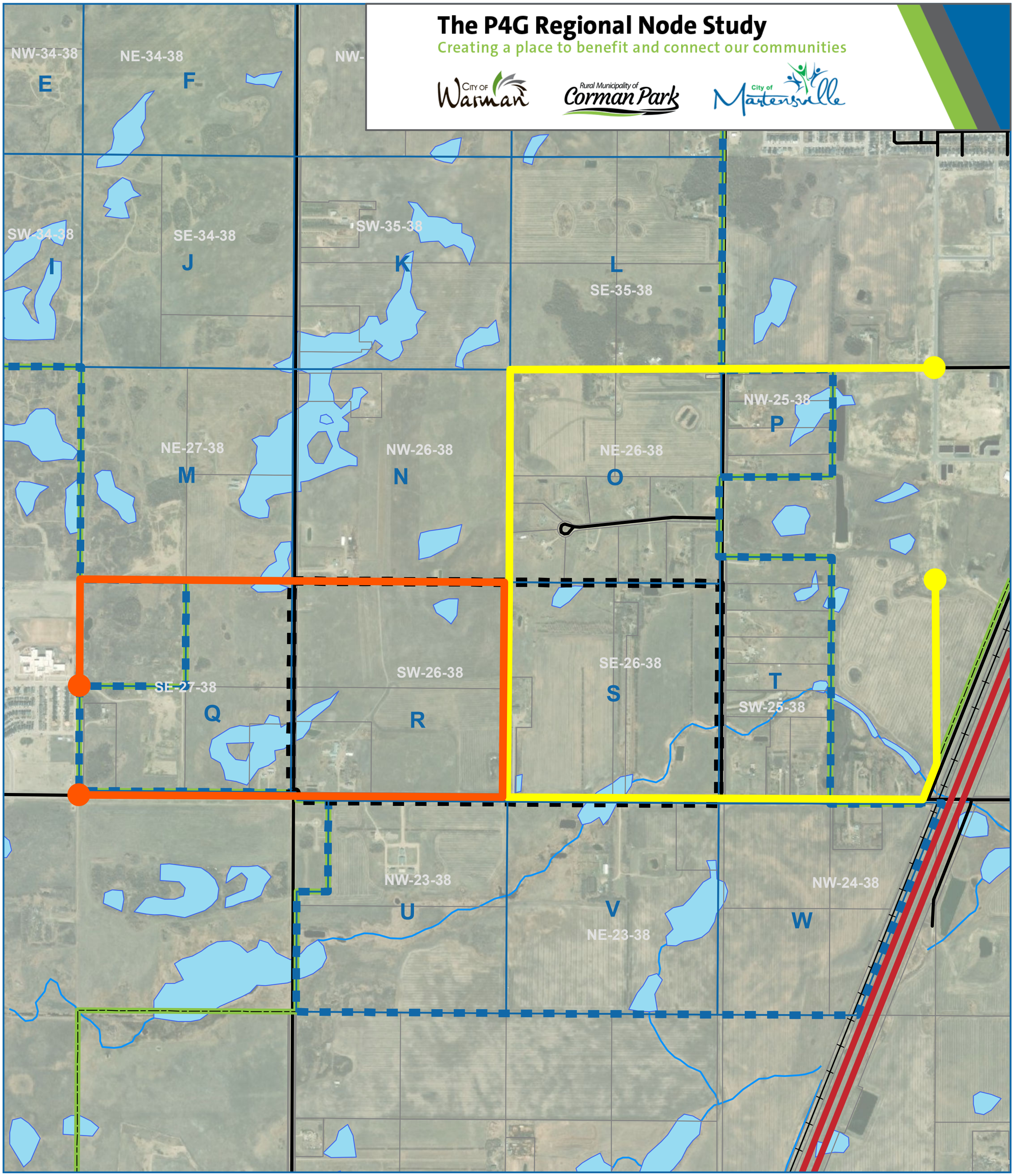
Estimated costs include a 15% allowance for engineering and a 30% contingency allowance. Cost breakdown details are provided in **Appendix A** and include estimates of quantities, unit costs, design assumptions, etc.

The estimated costs outlined above exclude the costs of providing water servicing within the regional node to connect to the off-site system. Those costs will vary depending on site specific developments proposed and incurred by the developer.

3.4.3 Potential Levy Charges

Potential levy charges for the proposed off-site water servicing concept can be a uniform per hectare charge throughout the regional node. This approach does not accurately represent actual use of the service as water use can vary significantly depending on land use. A better, more equitable way to allocate costs is based on land use (land zoning), where higher water consumers pay a higher per hectare charge than lower water consumers. This approach enables a varied rate per hectare depending on land use or zone, which better aligns with anticipated use of the system.

Lastly, the levy charges must be established to recover all costs of the off-site work and can only be allocated to developable lands as only those lands have potential to generate revenue. Lands to be allocated to parks, environmental reserves, roadways, etc., must be excluded from the levy formula. In addition, levy charges should be adjusted regularly to reflect changing conditions to ensure adequate cost recovery. As the amount of undevelopable land within the regional node area is unknown at this time and the preferred approach has not been determined, ISL cannot provide an estimated levy rate.



Study Area
Planning Unit
Municipal Boundary
Recommended Node
Parcel
Water Body
Watercourse
Highway
Roadway
Martensville Tie-In Option
Warman Tie-In Option
Martensville Pipe Option
Warman Pipe Option

ISL

0 100 200 400 600 800 m

NAD 1983 UTM Zone 13N 1:20,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 3.6: WATER SERVICING CONCEPT OPTIONS

Date: 7/26/2024 Document: M:\16467_P4G_Regional_Node\25_GIS\251_Figures\16467_P4G_RNS_Fig_3-6_Water_Concept_240726.mxd

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

3.4.4 Proposed Wastewater Servicing Concept

As described in the feasibility analysis of the study area, ISL recommends an urban gravity piped wastewater servicing concept connecting to an adjacent urban system, with wastewater servicing being provided by either Martensville or Warman. Potential alternatives are shown in **Figure 3.7** and assume the following:

- the servicing point for both options is to be located on TP Road 384 (Mierau Road) at the centre of the regional node, midway between planning units R and S, and assumes that wastewater system developments within the regional node can connect to that location by gravity;
- gravity servicing is possible to both Martensville or Warman from the servicing point;
- all pipes are to be located along quarter section boundaries to minimize impacts on future land use planning and development;
- that the receiving municipal systems have capacity to service the additional wastewater from the regional node, and that required upgrades will not be charged to regional node developers; and
- that a 450mm diameter line is sufficient for both options, however, further analysis and development planning will be required to confirm the sizing of the proposed off-site wastewater sewer system.

3.4.5 Estimated Cost

Estimated off-site costs to provide wastewater servicing for the regional node are as follows:

- $4.0 million if serviced to Martensville; or
- $6.0 million if serviced to Warman.

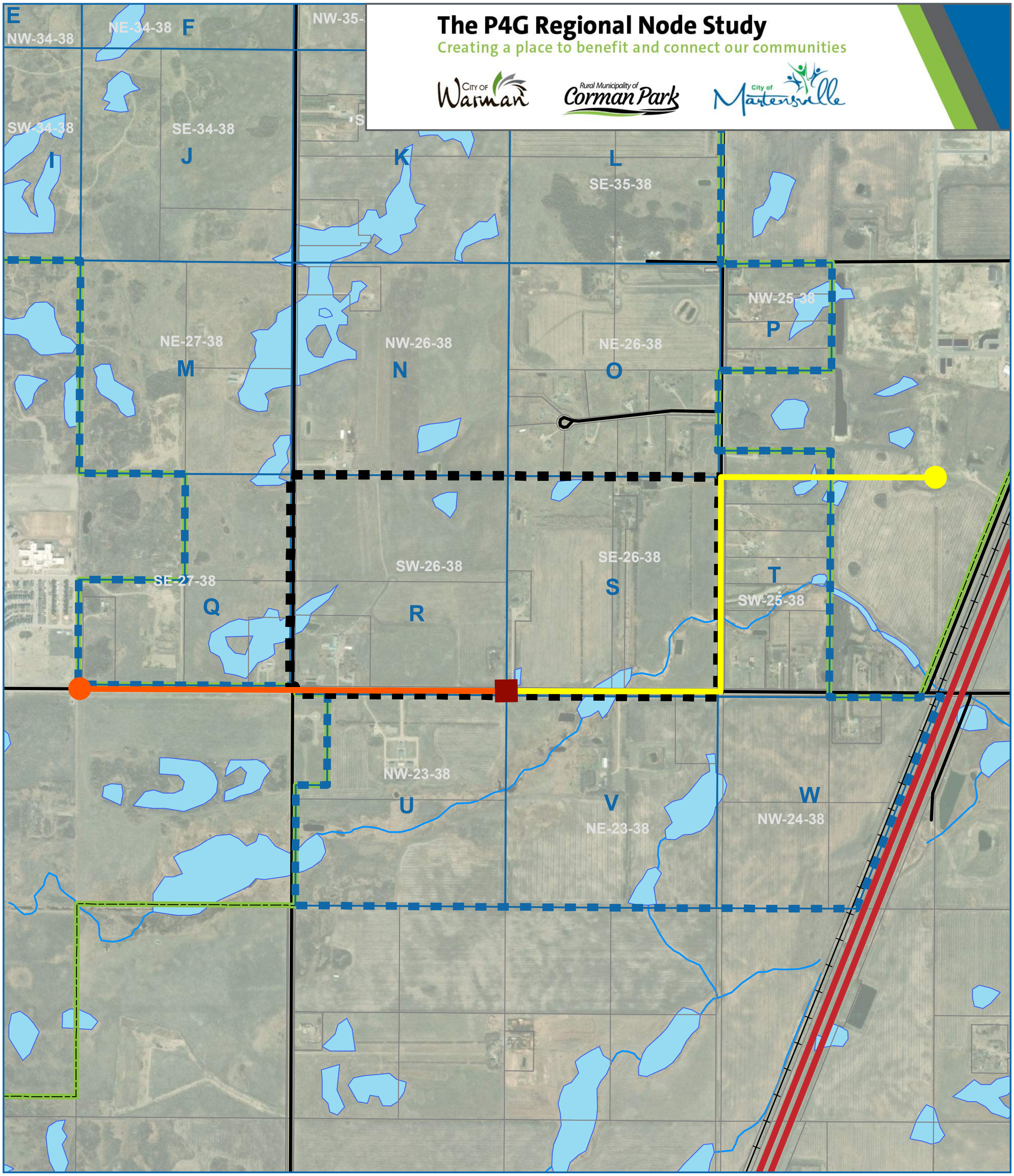
Estimated costs include a 15% allowance for engineering and a 30% contingency allowance. Cost breakdown details are provided in **Appendix A** and include estimates of quantities, unit costs, design assumptions, etc.

The estimated costs outlined above exclude the costs of providing wastewater servicing within the regional node to connect to the off-site system. Those costs will vary depending on site specific developments proposed and incurred by the developer.

3.4.6 Potential Levy Charges

Potential levy charges for the proposed off-site wastewater servicing concept can be a uniform per hectare charge throughout the regional node. This approach does not represent actual use of the service as wastewater generation can vary significantly depending on land use. A better, more equitable way to allocate costs is based on land use (land zoning), where higher wastewater generating consumers pay a higher per hectare charge than lower wastewater generators. This approach results in a varied per hectare rate depending on land use or zone, which is intended to be proportionate to their use of the system.

Lastly, the levy charges must be established to recover all costs of the off-site works and can only be allocated to developable lands (lands that have potential to generate revenue). Land being provided as municipal reserve, environmental reserves, roadways, etc., must be excluded from the levy formula. In addition, levy charges should be adjusted regularly to reflect changing conditions to ensure adequate cost recovery. As the amount of developable land within the regional node area is unknown at this time and the preferred levy approach has not been determined, ISL cannot provide an estimated levy rate.



Study Area
Planning Unit
Municipal Boundary
Recommended Node
Parcel
Water Body
Watercourse
Highway
Roadway
Servicing Point
Martensville Tie-In Option
Warman Tie-In Option
Martensville Pipe Option
Warman Pipe Option

0 100 200 400 600 800 m

NAD 1983 UTM Zone 13N 1:20,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 3.7: WASTEWATER SERVICING CONCEPT OPTIONS

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Date: 7/26/2024

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

3.5 Transportation

3.5.1 Proposed Transportation Servicing Concept

The recommended transportation servicing concept for the study area presented in **Figure 3.8** was designed to provide convenient connections for vehicles, pedestrians, and cyclists. It includes:

- Modified alignments of Range Road 3051 and 3052 to avoid water bodies, where possible;
- A proposed east-west arterial roadway to connect future Arterial A (City of Martensville TMP) to Township Road 385, which results in a strategic arterial roadway grid network that provides direct arterial access to most quarter sections within the study area (the new or extended collector roads from the City of Martensville TMP are not included in the concept, as noted in Section 2.3.2);
- A multi-use trail[2] network along one side of all arterial roadways within the plan area to follow the arterial roadway grid network; and
- Recreational trails[3] throughout the GNSA to take advantage of the natural area for leisure, while providing convenient active modes connectivity.

Figure 3.9 shows the recommended transportation servicing concept for the regional node in greater detail, including potential collector roadway alignments. All lands within the regional node are within 400 m of a collector roadway, resulting in ample access opportunities for future development. A direct collector connection between Mierau Road and Range Road 3053 was intentionally avoided in favour of a discontinuous route that serves as a form of traffic calming for the area, as the need to turn onto another street slows traffic and makes it a less convenient route for shortcutting between arterials. Trails are included along one side of all collector roadways, further enforcing the active modes grid network.

The proposed shared multi-use trail along the arterial roadways is consistent with the policies and strategic direction of all three municipalities and the P4G strategic direction. This includes:

- P4G North Concept Plan, which requires a 3.0 m multi-use path along both sides of arterial roadways, although it is shown with four and six lane cross sections while the regional node is expected to be serviced with two lane arterials currently;
- City of Martensville Development Standards, which requires a 2.4 m minimum width pathway for arterial roads based on the active transportation volume and Sector/Concept Plan; and
- City of Warman TMP, which encourages investment in the active mode network.

Including a shared use path along the collector roadway system is recommended to provide a well-connected active mode network but does not appear to be explicitly stated in any municipal policy at the time of writing this report.

[2] Multi-use trails are paved trails that follow an established roadway network, typically along but not limited to arterial roads.
[3] Recreational trails are paved or unpaved trails that are off an established roadway network, often through parks and open spaces.

3.5.2 Estimated Cost

Off-site transportation servicing costs for the regional node are estimated to be $4.52 million, which include:

- $3.29 million for upgrading Range Road 3052 and Range Road 3051 both from two-lane rural unpaved to two-lane rural paved;
- $1.14 million for multi-use trails along Range Road 3052, Range Road 3051, and Mierau Road; and
- $0.09 million for recreational trails within the GNSA.

This is the minimum recommendation to service the regional node, noting that estimated costs include a 15% allowance for engineering and a 30% contingency allowance. Detailed cost breakdowns are provided in **Appendix G** and include estimates of quantities, unit costs, design assumptions, etc. While an urban cross section may be appropriate in the future, this estimate assumes a paved rural cross section with a shared use path along one side of the arterial road. Roadway and path improvements are assumed to extend no further north than the east-west collector road in the regional node, as shown in **Appendix G**. This estimate excludes more extensive improvements that are not required to develop the regional node, such as the proposed Range Road realignment and new east-west arterial road. Levy costs should be revisited when/if other lands within the greater study area are anticipated to be developed.

3.5.3 Potential Levy Charges

Transportation infrastructure to be included in the off-site levy include:

- New or improvements to existing arterial roadways whether within or outside the subdivision lands;
- New or improvements to arterial-arterial intersections;
- Multi-use paths along arterial roadways; and
- Trails within the GNSA.

The proportion of cost sharing between the municipalities and the developer should be determined based on the extent to which each party benefits from the transportation improvement. Potential allocations by benefit include:

Range Road 3052 paving and multi-use trail:

- 100% regional node for the first stage of improvements (paving up to the collector road) because there is no other adjacent development that would benefit from the upgrade. Development to the west is limited by the GNSA.
- Ultimately upgraded as a regional arterial but benefit is outside of the regional node.

Range Road 3051 paving and multi-use trail:

- 70% regional node for the first stage of improvements (paving up to the collector road) as the arterial also provides access to City of Warman.
- Ultimately the proportion of benefit reduces as Warman increases in size and people connect to the future interchange. Ultimate volumes to/from Warman will be much larger than those generated from the regional node. As such, a lesser proportion of further future improvement should be allocated to the regional node.

Mierau Road multi-use trail:

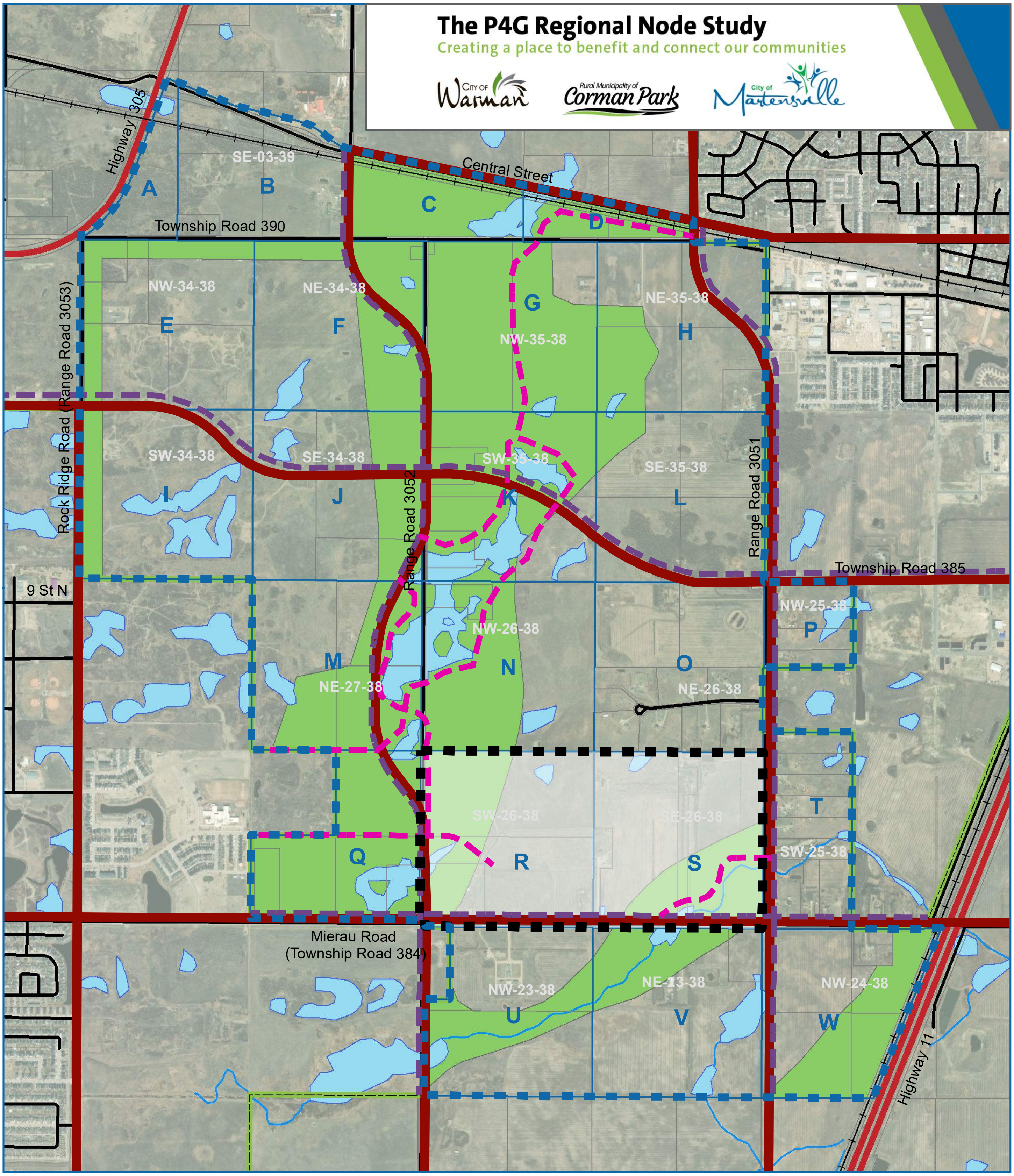
- 70% regional node, as the lands are adjacent to the trail.

Recreational trails within the GNSA:

- 50% regional node, as the recreational trails can be considered a regional asset.

Historical costs for upgrading Mierau Road:
Historical costs could be allocated to the regional node because it is directly benefiting from Mierau Road's improved condition. Potentially, a value of 70% of the historical improvement cost could be allocated to the regional node like Range Road 3051.

The costs of building roads, trails, or paths within the regional node are the responsibility of land developers. This applies to collector roads, local roads, and trails or paths in the lands that can be developed in the study area. Developers must also pay for improvements at intersections that connect the subdivision to other roads unless they are arterial-arterial intersections.



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Date: 8/29/2024

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ISL

N

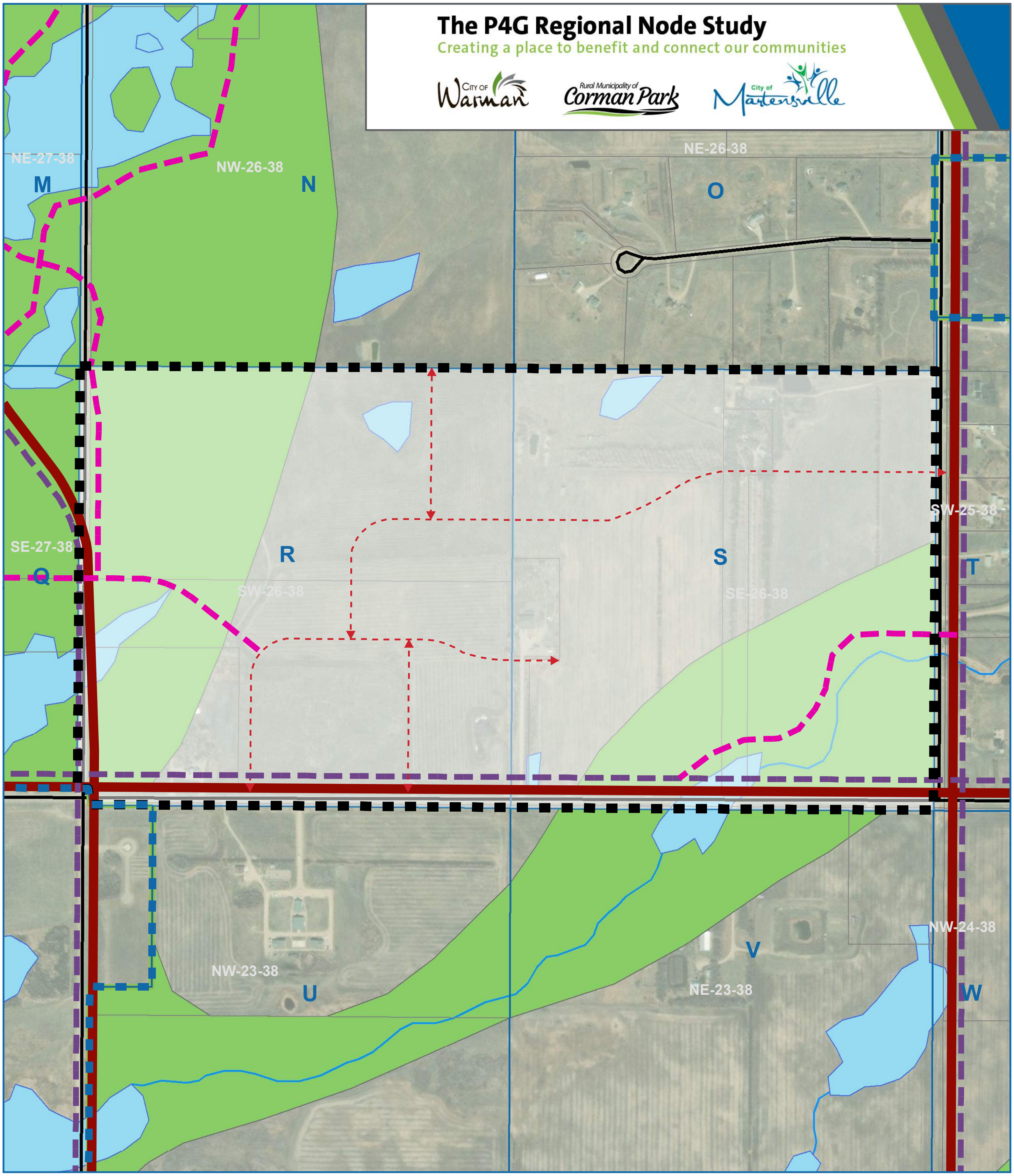
0 130 260 520 780 1,040 m

NAD 1983 UTM Zone 13N 1:25,000

- Study Area
- Planning Unit
- Municipal Boundary
- Parcel
- Water Body
- Watercourse
- Recommended Node
- Green Network Study Area
- Arterial
- Multi-Use Trail
- Recreational Trail

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 3.8: OVERALL TRANSPORTATION CONCEPT



Date: 8/29/2024 Document: Z:\Shared\GIS\Projects_CP\16467_P4G_Regional_Node\25_GIS\251_Figures\16467_P4G_RNS_Fig_3-9_RN_Transportation_Concept_240829.mxd

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ISL

N

0 50 100 200 300 400 m

NAD 1983 UTM Zone 13N 1:10,000

- Study Area
- Planning Unit
- Municipal Boundary
- Parcel
- Water Body
- Watercourse
- Recommended Node
- Green Network Study Area
- Arterial
- Potential Internal Collector
- Multi-Use Trail
- Recreational Trail

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

FIGURE 3.9: REGIONAL NODE TRANSPORTATION CONCEPT

3.6 Infrastructure Investment Options

Previous sections of this report have identified levy considerations for funding development in the study area. The following discussion explores alternative potential approaches for funding infrastructure to facilitate development of the regional node.

3.6.1 Funding by the Municipality

Municipalities will sometimes fund infrastructure improvements as a means of improving service for current residents and/or providing service to encourage development. One downside of this approach is that the funds are commonly obtained through tax increases for existing taxpayers who may not directly benefit from the expenditures.

3.6.2 Grant Funding

A second option is to explore provincial and federal infrastructure funding grant programs, which often have multiple opportunities available at any given time. Grant funding can be a significant source of funding that is often overlooked. A strong effort should always be made to investigate potential grant funding programs and apply to any that may be applicable.

3.6.3 Funding by Developers

Upfront financing by developers is often considered one of the most appropriate funding options as their developments are the direct beneficiaries of the infrastructure. For the most part, developers understand and accept their responsibility to pay their fair share of required infrastructure, however, the cost of required infrastructure often exceeds the financing capabilities of prospective developers. Additionally, developers may experience challenges with obtaining capital for required oversizing, or other development charges like off-site levies. As a result, upfront financing requirements can be a barrier to development that leads to developers taking their business elsewhere.

3.6.4 Levy Funding

Levy funding is the most common, effective, and appropriate method of funding off-site infrastructure required for developments, independent from how the municipality funds its day-to-day operations (e.g., tax based or utility based). The key benefits of levy funding include:

- developments pay their fair share of all infrastructure required to service their sites;
- developments tend not to incur excessive upfront costs that can encumber development;
- infrastructure is now in place to service other future developments nearby; and
- removing barriers that encourage development to occur.

However, levy funding requires the following from the municipality:

- upfront financing is typically required by the municipality;
  - municipalities tend to have greater capacity to finance infrastructure works upfront as they can borrow against the asset value of all the infrastructure in their system;
- the municipality must take responsibility of managing the levy rates and overall system to ensure proper accounting; and

- in cases where required infrastructure is to be deferred, the municipality may need to take on interim servicing costs, which would be recovered from the developer when development takes place.

In operating a levy, the municipality is essentially taking on the role of a bank, and as a result, is in the position to establish and continuously update developer levy rates to ensure cost recovery of all costs incurred, including administrative, capital, operating, inflation, and interest. In the end, the municipality takes on responsibility without incurring cost.

Infrastructure funding can be considered for three types of infrastructure:

1. On-site (within the proposed subdivision development)
   a. to be entirely funded by the developer
2. Within the greater development area (e.g., Sector Plan/Concept Plan)
   a. typically applies for stormwater infrastructure like SWMFs
   b. a “development levy” can be established
   c. developers typically pay upfront costs of infrastructure within the greater development area with those over-expenditures to be recovered from future developments within the greater development area as/when they occur – although municipalities can also choose to pay these upfront costs
   d. municipality operates the levy to ensure proper accounting
3. Off-Site
   a. includes off-site infrastructure required to service the proposed development to existing downstream municipal systems
   b. municipality builds and incurs the upfront costs of the required off-site infrastructure and recovers the expenditure (and all carrying costs) over time from future developments
   c. municipality operates the levy to ensure proper accounting and full cost recovery (inflation, interest, administrative costs, etc.)
   d. developers pay their fair share only

It should be noted that off-site water and wastewater treatment costs are typically incurred by the municipality and any upgrades required to service development are not charged directly to developments.

Levy funding is intended to bill developers in relation to their use of the infrastructure. For stormwater infrastructure, billing is in relation to contributing land area ($/ha). For water and wastewater infrastructure, billing is sometimes based on area, but a more equitable solution is based on water consumption/sewage generation expectations ($/m3/month), as it considers varying use/consumption rates associated with varying developments, and as a result, is in more direct proportion to use of the infrastructure.

A levy funding approach plays a fundamental role in the stormwater servicing concept for the regional node and surrounding developments within the study/service area. Levies are discussed in more detail in Section 3.3 of this report.

3.6.5 Utility Financing

Municipalities may develop utility financing as a means of funding their utility operations. The provisions require the utility to charge customers in relative proportion to their use of the municipal systems, and provides a superior funding approach to tax-based financing for the following reasons:

- utilities provide a dedicated, adequate and stable source of funding that does not compete with funding for other municipal services;
- utilities are operated like a business and include the ability to borrow against the asset value to meet peak needs;
- all funds collected for a service (e.g., water) are required to be spent on providing that service and cannot be used for other purposes, although, utilities do provide annual dividend payments to the municipality;
- utilities provide improved customer equity – those that use the system pay for it in relative proportion to their use of the system; and
- credits and incentives can be incorporated in the rate structure to encourage behavioural changes in property owners that reduce their impacts on the municipal systems, including:
  - variable rate structures that encourage water conservation;
  - usage reduction factors for wastewater users that can demonstrate some water used is not directed to sewer; and
  - billing reduction factors that account for reduced runoff from stormwater LID measures or on-lot storage.

Utility financing is an approach taken largely by urban municipalities, as compared to rural municipalities, but can be considered appropriate for more densely populated areas within rural municipalities. There continue to be many examples of municipal services being extended from an urban municipality to more dense developments within rural areas.

Utility financing is most common in Canadian urban municipalities as a means of funding potable water and wastewater systems, and more recently has become a popular way of funding stormwater systems.

As the regional node begins to develop, there is potential for development to expand up to Martensville and Warman and result in a larger singular urban development area. When development in the area progresses to that stage, implementation of a water utility, wastewater utility, and stormwater utility may be a feasible and beneficial option.

Potable Water

Potable water utilities are the most common form of financing municipal water systems for communities that provide potable water service to each property. Today, water meters record water consumption for customers in most municipalities, allowing billing to be in close approximation to use of the municipal water services.

Wastewater Utility

Wastewater utilities are the most common form of financing municipal wastewater systems for communities that provide a potable water service to each property and water metering. Wastewater charges are based on potable water consumption records from the water meters. This billing method is considered appropriate as it can be considered in relative proportion to use of the system, even though some water consumed through a season is not directed to sewer (e.g., lawn watering). For larger industrial customers who can demonstrate a significant portion of water used is not discharged to sewer, wastewater charges can be reduced accordingly.

Stormwater Utility

Properties contribute stormwater runoff to the municipal stormwater systems at rates relative to the size of the lot and its hydrologic characteristics. Lot sizes are a matter of public record with data kept by the Information Services Corporation (ISC). Property zoning can be considered a reasonable proxy that represents the hydrologic characteristics (runoff potential) of lots, which is also a matter of public record. When considering these two key lot characteristics, a stormwater utility billing system can be developed that is in relative proportion to use of the system.

Most municipalities traditionally fund their storm drainage systems through the tax base – a funding approach that is not related to use of the system. As tax dollars tend to be distributed more heavily to public services that are more top-of-mind to the voting public, funding allocations for operating and maintaining storm drainage systems can tend to fall short of meeting all funding needs.

The funding shortfall problems for storm drainage is an ever-increasing need due to:

- an increased need for rehabilitation of aging storm drainage infrastructure;
- an increased need for upgrading/upsizing existing storm drainage infrastructure as customer service expectations increase and higher density infill developments take place that generate more runoff; and
- increased stormwater quality treatment requirements of provincial and federal regulators towards the protection of the ecosystems in downstream environments:
  - it is much more understood today that urban stormwater runoff contains contaminants that can have deleterious impacts on the environment and that stormwater quality treatment measures are required to mitigate those impacts; and
  - this is a relatively new level of understanding that brings water quality treatment requirements to municipalities that did not previously exist.

In addition to a chronic funding shortfall problem, municipalities are faced with an unstable funding source and with limited ability to borrow the required amount to meet spending peaks. To address these concerns, an increasing number of communities are turning to a utility financing model.

Today, dozens of Canadian urban municipalities have developed a stormwater utility as a more feasible way to finance their stormwater systems, and many more municipalities are expected to move to a stormwater utility in the coming years. Some key examples include:

- Regina, Saskatchewan
- Edmonton, Alberta
- Calgary, Alberta
- Victoria, British Columbia

ISL's stormwater lead for this project played a key role in the development, public acceptance, council approval, and implementation of Edmonton's stormwater utility in 2001/2002. Another good source of information on the benefits of a stormwater utility and on municipalities across the United States that have implemented a stormwater utility can be found in the following document that can be downloaded online: *Stormwater Utility Survey, Black and Veatch, 2021.*

3.6.6 Regional/District Systems

The responsibilities involved in owning, operating, and maintaining municipal services like water, wastewater, and stormwater can be quite significant. Many smaller communities have opted to form separate entities called regional or district boards to manage this responsibility for their community and surrounding communities. This is most common in rural areas as these boards can provide reliable urban servicing standards to rural areas that would otherwise only be serviced to a rural standard (e.g., potable water piped to each home versus water trucked to each home). For wastewater servicing, it can mean gravity servicing versus low pressure or septic field servicing.

3.6.7 Recommended Approach

To facilitate development of the regional node, ISL recommends the following:

1. Investigate potential grant funding options and apply for applicable grants.
2. Establish levies for off-site water, wastewater, and stormwater infrastructure requirements. This includes considering the need for separate levies for infrastructure within a greater development area (e.g., Sector Plan/Concept Plan) and infrastructure beyond the greater development area.
3. A discussion between the RM, Martensville, and Warman to address the potential benefits of utility financing and/or combining each of their individual utilities into one (i.e., one regional water utility, one regional wastewater utility, and one regional stormwater utility). In addition to the superior benefits of utility financing, single regional utilities would make decisions that are coordinated and in the best interests of all residents in all communities.

3.7 Policy Recommendation

ISL prepared a policy recommendation that identifies necessary changes to the DOCP to effectively integrate and implement the regional node. The recommendations will:

- Introduce the Regional Community Services Node and its desired uses;
- Provide objectives for what the Regional Community Services Node is trying to achieve; and
- Present policies to guide future development of the Regional Community Services Node.

Although policy recommendations are identified through this work, any updates to the DOCP will occur through a separate planning process.

If the Partners pursue policy changes to integrate and implement the regional node, the following steps are recommended to support and enable future development:

1. Prepare a Comprehensive Development Review (CDR) for the two quarter sections that contain the Recommended Node location. The CDR should outline specific land uses, densities, transportation network, parks system, and community facilities intended for the Regional Community Services Node.
2. Amend the DOCP to show the new location of the Regional Community Services Node.

The steps above outline the preferred implementation process; however, the Partners may require a nuanced approach to capitalize on development opportunities that arise before the overarching land use planning framework is in place. The detailed policy recommendations are included in **Appendix H**.

4.0 Summary and Conclusions

4.1 Summary of Findings by Phase

The following is a summary of the major takeaways from each phase of the Regional Node Study.

Phase 1: Introduction

- The RNS is joint initiative between the RM of Corman Park and the cities of Warman and Martensville to use a methodical process to select the best location for a regional node that maximizes benefits to the surrounding communities.
- The study area contains approximately 20 quarter sections of land and is generally bound by the City of Martensville and Range Road 3053 to the west, Highway 305 and Central Street to the north, the City of Warman and Highway 11 to the east, and the quarter section line that is a half-mile south of Mierau Road (Township Road 384).
- This report reflects the results of various technical analyses, considers complex servicing limitations between the cities, and presents potential land uses that will facilitate future development of community services within the regional node.

Phase 2: Feasibility Analysis of the Study Area

- A feasibility analysis was completed to identify the best areas to develop from the perspectives of stormwater drainage, water, wastewater, and transportation infrastructure, and land use influences. A key consideration of this work included adequate stormwater servicing as the lands within the study area are prone to flooding.
- The team reviewed servicing for each of the 23 planning units within the study area. The planning units were provided with a ranking based on serviceability criteria.

Phase 3: Conceptualizing the Regional Node

- An aggregated rating developed by combining the servicing rankings and land use considerations identified that the southern and northeastern potions of the study area were more suitable options for locating the regional node based on the opportunities and constraints identified through each analysis.
- A recommended regional node location was identified using the aggregated rating and evaluating locations that maximized support and benefit for all three municipalities.
- Potential future land uses identified for the regional node included assisted living developments, firehalls, healthcare/medical facilities, education facilities, police stations, and religious assemblies.
- To provide stormwater servicing for the regional node, an urban gravity dual-drainage (major/minor) stormwater servicing concept was recommended that discharges through a lengthy off-site conveyance system into Opimihaw Creek.
- To provide water servicing for the regional node, an urban pressurized piped water servicing concept was recommended that connects to an adjacent urban system, with water servicing being provided by either Martensville or Warman.
- To provide wastewater servicing for the regional node, an urban gravity piped wastewater servicing concept was recommended that connects to an adjacent urban system, with wastewater servicing being provided by either Martensville or Warman.

- To provide transportation servicing and access for the regional node, a transportation concept was designed to provide convenient connections for vehicles, pedestrians, and cyclists. The design includes proposed modified road alignments, an east-west arterial roadway grid network, multi-use trails along one side of arterial roads, and recreational trails through the Green Network Study Area.

4.2 Next Steps

To facilitate development of the Regional Node, ISL recommends the following next steps:

1. Policy changes to the District Official Community Plan to effectively integrate and implement the regional node, which include:
    a. Introducing the Regional Community Services Node and its desired uses;
    b. Providing objectives for what the Regional Community Services Node is trying to achieve; and
    c. Presenting policies to guide future development of the Regional Community Services Node.
2. Investigate potential grant funding options and apply for applicable grants.
3. Establish levies for off-site water, wastewater, and stormwater infrastructure requirements.
    a. Consider the need for separate levies for infrastructure within a greater development area (e.g., Sector Plan/Concept Plan) and infrastructure beyond the greater development area.

4.3 Conclusion

The P4G Regional Node Study represents a significant collaborative effort between the RM of Corman Park and the cities of Warman and Martensville to enhance regional connectivity and serviceability. Through methodical analysis and stakeholder engagement, the Project Partners have identified the optimal location for a regional node that will support community services and future development. By addressing critical factors such as stormwater management, infrastructure servicing requirements, and land use considerations, the Project Partners have identified a clear and actionable plan for the development of a regional node that benefits all P4G partners, fostering stronger regional integration and improved quality of life for the communities involved.

APPENDIX
Stormwater Quantity and Cost Estimates

A

Table A.1 Typical Development Area Drainage Servicing Costs

Typical Development Area (ha)	On-Site Drainage Servicing Costs
10	$0.7M to $0.9M
20	$1.4M to $1.8M
30	$2.1M to $2.7M

Note:
1. Cost is estimated based on a sample development project of 25.67ha, with a total storm on-site servicing cost of $1.7M.

Table A.2 Estimated SWMF Cost (5ha)

Item	Description	Quantity	Unit	Unit Price	Total
1	Excavate SWMF	65,000	cu.m	$ 15.00	$ 975,000.00
2	Clay liner on bottom of SWMF	32,800	sq.m	$ 20.00	$ 656,000.00
3	Outlet Control Structure	1	each	$ 10,000.00	$ 10,000.00
4	Topsoil and Sod	50,000	sq.m	$ 15.00	$ 750,000.00
5	Landscaping	17,000	sq.m	$ 20.00	$ 340,000.00
				Subtotal	**$ 2,731,000.00**
				Engineering (10%)	$ 273,100.00
				Subtotal	$ 3,004,100.00
				Contingency (30%)	$ 901,230.00
				Total	**$ 3,905,330.00**
				Land Cost	**$ 1,500,000.00**

Total SWMF Cost = $5.4M / 5 ha pond

Note:

1. Excavation volume is based on assumed storage volume of 50,000 m3 with a 30% additional excavation volume to freeboard.
2. Pond area is based on assumed length to width ratio of 2:1.
3. Land cost is based on $300K/ha, this was estimated based on review of land praicing of acreage lots in general proximity.

Table A.3 Estimated Costs for SWMFs

SWMF	Catchment Area (ha)	Multiplier	Estimated Cost ($ million)
S-1	61.7676	1	5.4
S-2	67.4663	1	5.4
S-3	68.386	1	5.4
S-4	99.0266	1.5	8.1
S-5	70.6506	1	5.4
S-6	64.3323	1	5.4
S-7	66.3894	1	5.4
S-8	64.3384	1	5.4
S-9	65.118	1	5.4
S-10	63.4321	1	5.4
S-11	50.4927	0.8	4.32
S-12	64.7977	1	5.4
S-13	39.1398	0.6	3.24
S-14	65.6328	1	5.4
S-15	81.4934	1.3	7.02
S-16	81.6846	1.3	7.02
S-17	90.1513	1.4	7.56
S-18	67.8644	1	5.4

Note:
1. Multiplier is calculated based on the assumption that a 65ha catchment area (quarter section) requires a 5ha pond.

Table A.4 Outlet Piping and Downstream Stormwater Servicing Costs

From Node	To Node	Type	Pipe Size (mm) / Ditch Bottom Width (m)	U/S Depth (m)	D/S Depth (m)	Length (m)	UNIT PRICE ($) [Excavate & Backfill]	UNIT PRICE ($) [Supply & Install Pipe]	COST ($) [Pipe]	UNIT PRICE ($) [Manhole]	Manhole Quantity (vt.m.)	COST ($) [Manhole]	COST ($) [Surface Restoration]	Grading Quantity (sq.m.)	COST ($) [Ditch Grading & Seeding]	Subtotal	10% Engineering	Subtotal + Engineering	30% Contingency	TOTAL
N-1	N-2	Pipe	525	3.1	3.2	438.4	$ 480	$ 550	$ 451,507	$ 3,500	6.3	$ 21,877				$ 473,384	$ 47,338	$ 520,722	156216.6307	676938.733
N-2	N-4	Pipe	525	3.3	3.3	390.2	$ 480	$ 550	$ 401,899	$ 3,500	6.6	$ 23,187				$ 425,086	$ 42,509	$ 467,594	140278.2507	607872.4197
N-4	N-5	Pipe	525	3.4	3.6	433.6	$ 480	$ 550	$ 446,570	$ 3,500	7.0	$ 24,508				$ 471,078	$ 47,108	$ 518,186	155455.8591	673642.0561
N-7	N-8	Pipe	525	2.8	3.1	411.1	$ 480	$ 550	$ 423,441	$ 3,500	6.0	$ 20,953				$ 444,393	$ 44,439	$ 488,833	146649.8213	635482.559
N-8	N-5	Pipe	525	3.5	3.8	419.3	$ 480	$ 550	$ 431,880	$ 3,500	7.3	$ 25,541				$ 457,420	$ 45,742	$ 503,162	150948.6801	654110.947
N-9	N-10	Pipe	525	3.6	4.7	129.3	$ 650	$ 550	$ 155,135	$ 3,500	4.1	$ 14,404				$ 169,540	$ 16,954	$ 186,494	55948.07266	242441.6482
N-10	N-11	Pipe	525	4.7	4.0	250.6	$ 650	$ 550	$ 300,684	$ 3,500	4.4	$ 15,259				$ 315,943	$ 31,594	$ 347,537	104261.1722	451798.4127
N-11	N-12	Pipe	525	4.1	3.5	303.6	$ 650	$ 550	$ 364,292	$ 3,500	7.6	$ 26,520				$ 390,813	$ 39,081	$ 429,894	128968.246	558862.3994
N-12	N-5	Pipe	600	3.6	5.5	488.0	$ 900	$ 650	$ 756,446	$ 3,500	13.6	$ 47,575				$ 804,021	$ 80,402	$ 884,423	265326.9037	1149749.916
N-5	N-14	Pipe	900	5.8	4.7	512.5	$ 1,100	$ 950	$ 1,050,591	$ 5,500	15.7	$ 86,523				$ 1,137,114	$ 113,711	$ 1,250,825	375247.5681	1626072.795
N-14	N-15	Pipe	900	4.8	5.0	271.1	$ 1,100	$ 950	$ 555,663	$ 5,500	4.9	$ 26,882				$ 582,544	$ 58,254	$ 640,799	192239.6652	833038.549
N-16	N-17	Pipe	525	3.0	3.8	215.0	$ 480	$ 550	$ 221,450	$ 3,500	3.4	$ 11,915				$ 233,365	$ 23,337	$ 256,702	77010.51089	333712.2139
N-17	N-15	Pipe	525	3.8	2.5	839.3	$ 450	$ 550	$ 839,253	$ 3,500	15.9	$ 55,489				$ 894,741	$ 89,474	$ 984,216	295264.6594	1279480.191
N-18	N-15	Pipe	525	3.8	3.7	331.5	$ 480	$ 550	$ 341,455	$ 3,500	7.6	$ 26,436				$ 367,891	$ 36,789	$ 404,680	121404.0911	526084.3946
N-15	N-19	Pipe	900	5.0	5.2	345.3	$ 1,250	$ 950	$ 759,591	$ 5,500	10.2	$ 56,275				$ 815,866	$ 81,587	$ 897,453	269235.8147	1166688.53
N-19	N-20	Pipe	1050	5.4	5.8	450.9	$ 1,350	$ 1,100	$ 1,104,717	$ 6,500	16.7	$ 108,737				$ 1,213,454	$ 121,345	$ 1,334,800	400439.9065	1735239.595
N-21	N-20	Pipe	525	3.5	3.6	483.7	$ 480	$ 550	$ 498,178	$ 3,500	10.8	$ 37,643				$ 535,821	$ 53,582	$ 589,403	176820.9643	766224.1788
N-20	N-22	Pipe	1050	5.9	6.1	388.5	$ 1,350	$ 1,100	$ 951,864	$ 6,500	12.0	$ 78,277				$ 1,030,141	$ 103,014	$ 1,133,155	339946.5584	1473101.753
N-22	N-23	Pipe	1050	6.2	7.5	424.0	$ 1,800	$ 1,100	$ 1,229,523	$ 6,500	13.7	$ 89,143				$ 1,318,666	$ 131,867	$ 1,450,532	435159.7053	1885692.056
N-24	N-23	Pipe	450	3.3	4.0	202.2	$ 450	$ 400	$ 171,857	$ 3,500	3.7	$ 12,840				$ 184,696	$ 18,470	$ 203,166	60949.80458	264115.8199
N-23	N-25	Pipe	1050	7.6	7.7	668.7	$ 2,100	$ 1,100	$ 2,139,736	$ 6,500	30.6	$ 198,805				$ 2,338,541	$ 233,854	$ 2,572,395	771718.6295	3344114.061
N-25	N-26	Pipe	1050	7.9	7.1	223.4	$ 2,100	$ 1,100	$ 714,763	$ 6,500	7.5	$ 48,542				$ 763,305	$ 76,331	$ 839,636	251890.7103	1091526.411
N-26	N-27	Pipe	1050	7.1	6.4	370.4	$ 1,650	$ 1,100	$ 1,018,723	$ 6,500	13.5	$ 87,655				$ 1,106,378	$ 110,638	$ 1,217,016	365104.6721	1582120.246
N-27	N-28	Pipe	1050	6.4	7.0	345.7	$ 1,650	$ 1,100	$ 950,745	$ 6,500	13.4	$ 87,349				$ 1,038,093	$ 103,809	$ 1,141,903	342570.7957	1484473.448
N-29	N-30	Pipe	450	3.2	3.1	271.7	$ 450	$ 400	$ 230,905	$ 3,500	3.1	$ 10,916				$ 241,821	$ 24,182	$ 266,003	79800.96579	345804.1851
N-30	N-32	Pipe	450	3.1	3.4	401.0	$ 450	$ 400	$ 340,841	$ 3,500	6.5	$ 22,753				$ 363,594	$ 36,359	$ 399,953	119986.0026	519939.3448
N-34	N-32	Pipe	525	4.8	4.5	210.4	$ 650	$ 550	$ 252,537	$ 3,500	4.7	$ 16,292				$ 268,829	$ 26,883	$ 295,712	88713.47368	384425.0526
N-32	N-35	Pipe	600	4.6	5.8	395.8	$ 900	$ 650	$ 613,552	$ 3,500	10.4	$ 36,302				$ 649,853	$ 64,985	$ 714,839	214451.6424	929290.4504
N-35	N-37	Pipe	600	5.8	4.0	501.2	$ 900	$ 650	$ 776,843	$ 3,500	14.7	$ 51,510				$ 828,353	$ 82,835	$ 911,188	273356.4636	1184544.676
N-37	N-28	Pipe	600	4.1	5.0	311.7	$ 750	$ 650	$ 436,399	$ 3,500	9.1	$ 31,759				$ 468,159	$ 46,816	$ 514,975	154492.4394	669467.2374
N-39	N-40	Pipe	525	4.2	4.0	356.4	$ 650	$ 550	$ 427,634	$ 3,500	8.3	$ 28,887				$ 456,521	$ 45,652	$ 502,173	$ 150,652	$ 652,825
N-40	N-28	Pipe	525	4.1	5.9	346.0	$ 750	$ 550	$ 449,827	$ 3,500	10.1	$ 35,229				$ 485,056	$ 48,506	$ 533,562	$ 160,069	$ 693,630
N-28	N-41	Pipe	1200	7.1	7.0	415.0	$ 1,800	$ 1,400	$ 1,328,013	$ 10,000	14.1	$ 141,422				$ 1,469,436	$ 146,944	$ 1,616,379	$ 484,914	$ 2,101,293
N-41	N-43	Pipe	1200	7.1	5.0	400.1	$ 1,650	$ 1,400	$ 1,220,210	$ 10,000	12.1	$ 121,349				$ 1,341,559	$ 134,156	$ 1,475,715	$ 442,715	$ 1,918,430
N-44	N-45	Pipe	525	3.6	4.2	330.0	$ 480	$ 550	$ 339,872	$ 3,500	7.8	$ 27,128				$ 367,000	$ 36,700	$ 403,700	$ 121,110	$ 524,811
N-45	N-43	Pipe	525	4.3	6.3	352.6	$ 750	$ 550	$ 458,367	$ 3,500	10.5	$ 36,877				$ 495,245	$ 49,524	$ 544,769	$ 163,431	$ 708,200
N-43	N-46	Pipe	1200	6.9	5.5	163.5	$ 1,650	$ 1,400	$ 498,582	$ 10,000	6.2	$ 62,298	$ 6,277			$ 567,157	$ 56,716	$ 623,873	$ 187,162	$ 811,035
N-46	N-47	Pipe	1200	5.6	5.1	300.0	$ 1,500	$ 1,400	$ 869,939	$ 10,000	5.3	$ 53,332	$ 11,519			$ 934,790	$ 93,479	$ 1,028,269	$ 308,481	$ 1,336,750
N-47	N-48	Pipe	1200	5.1	7.8	344.2	$ 1,800	$ 1,400	$ 1,101,433	$ 10,000	12.9	$ 129,354	$ 13,217			$ 1,244,004	$ 124,400	$ 1,368,404	$ 410,521	$ 1,778,926
N-48	N-49	Pipe	1200	7.9	8.3	392.9	$ 2,200	$ 1,400	$ 1,414,427	$ 10,000	16.2	$ 162,222	$ 15,087			$ 1,591,736	$ 159,174	$ 1,750,910	$ 525,273	$ 2,276,183
N-49	N-50	Pipe	1200	8.4	8.8	417.1	$ 2,500	$ 1,400	$ 1,626,514	$ 10,000	17.2	$ 171,810	$ 16,015			$ 1,814,338	$ 181,434	$ 1,995,772	$ 598,732	$ 2,594,504
N-50	N-51	Pipe	1200	8.8	8.7	416.9	$ 2,500	$ 1,400	$ 1,625,910	$ 10,000	17.5	$ 175,016	$ 16,009			$ 1,816,935	$ 181,694	$ 1,998,629	$ 599,589	$ 2,598,217
N-51	N-52	Pipe	1200	8.7	7.6	399.2	$ 2,350	$ 1,400	$ 1,497,116	$ 10,000	16.3	$ 163,183	$ 15,330			$ 1,675,629	$ 167,563	$ 1,843,192	$ 552,958	$ 2,396,150
N-52	N-53	Pipe	1200	7.7	7.9	400.0	$ 2,200	$ 1,400	$ 1,440,000	$ 10,000	15.5	$ 155,367	$ 15,360			$ 1,610,727	$ 161,073	$ 1,771,800	$ 531,540	$ 2,303,339
N-53	N-54	Pipe	1200	8.0	6.1	400.0	$ 2,000	$ 1,400	$ 1,360,000	$ 10,000	14.1	$ 140,997	$ 15,360			$ 1,516,357	$ 151,636	$ 1,667,993	$ 500,398	$ 2,168,390
N-54	N-55	Pipe	1200	6.2	4.5	400.0	$ 1,350	$ 1,400	$ 1,100,000	$ 10,000	10.7	$ 107,224	$ 15,360			$ 1,222,584	$ 122,258	$ 1,344,842	$ 403,453	$ 1,748,295
N-55	N-56	Pipe	1200	4.6	3.8	400.0	$ 1,000	$ 1,400	$ 960,000	$ 10,000	8.4	$ 84,276	$ 15,360			$ 1,059,636	$ 105,964	$ 1,165,599	$ 349,680	$ 1,515,279
N-56	N-57	Pipe	1200	3.9	0.5	325.2	$ 650	$ 1,400	$ 666,736	$ 10,000	4.5	$ 44,741	$ 12,489			$ 723,966	$ 72,397	$ 796,363	$ 238,909	$ 1,035,271
N-64	N-65	Ditch	2	0.9	0.7	471.7								3218.4	$ 74,022	$ 74,022	$ 7,402	$ 81,424	$ 24,427	$ 105,852
N-65	N-66	Culvert	1100	0.7	0.9	11.2	$ 525	$ 900	$ 15,960				$ 273			$ 16,233	$ 1,623	$ 17,856	$ 5,357	$ 23,213
N-66	N-67	Ditch	3	0.9	0.6	172.2								1271.5	$ 29,244	$ 29,244	$ 2,924	$ 32,168	$ 9,650	$ 41,818
N-67	N-68	Culvert	1100	0.6	0.6	9.8	$ 525	$ 900	$ 14,018				$ 240			$ 14,258	$ 1,426	$ 15,684	$ 4,705	$ 20,389
N-68	N-70	Ditch	3	0.6	0.7	208.0								1445.3	$ 33,243	$ 33,243	$ 3,324	$ 36,567	$ 10,970	$ 47,538
N-70	N-71	Ditch	1	0.7	3.4	408.7								5457.6	$ 125,525	$ 125,525	$ 12,553	$ 138,078	$ 41,423	$ 179,501

Table A.4 Outlet Piping and Downstream Stormwater Servicing Costs

From Node	To Node	Type	Pipe Size (mm) / Ditch Bottom Width (m)	U/S Depth (m)	D/S Depth (m)	Length (m)	UNIT PRICE ($) [Excavate & Backfill]	UNIT PRICE ($) [Supply & Install Pipe]	COST ($) [Pipe]	UNIT PRICE ($) [Manhole]	Manhole Quantity (vt.m.)	COST ($) [Manhole]	COST ($) [Surface Restoration]	Grading Quantity (sq.m.)	COST ($) [Ditch Grading & Seeding]	Subtotal	10% Engineering	Subtotal + Engineering	30% Contingency	TOTAL
N-71	N-72	Culvert	1100	3.4	3.6	27.3	$ 675	$ 900	$ 42,956				$ 665			$ 43,621	$ 4,362	$ 47,983	$ 14,395	$ 62,378
N-72	N-73	Ditch	1	3.6	2.8	625.9								12626.4	$ 290,407	$ 290,407	$ 29,041	$ 319,448	$ 95,834	$ 415,282
N-73	N-74	Culvert	1100	2.8	2.9	18.3	$ 600	$ 900	$ 27,378				$ 445			$ 27,824	$ 2,782	$ 30,606	$ 9,182	$ 39,788
N-74	N-75	Ditch	1	2.9	2.6	54.7								943.1	$ 21,692	$ 21,692	$ 2,169	$ 23,861	$ 7,158	$ 31,020
N-75	N-76	Culvert	1100	2.6	0.1	51.9	$ 600	$ 900	$ 77,796			$ 25,000	$ 1,265			$ 104,061	$ 10,406	$ 114,467	$ 34,340	$ 148,807

Notes:
1. Pipes are assumed to be PVC up to 900mm, and Concrete for 1050mm and higher. Culverts are assumed to be CSP.
2. Manholes are assumed to be spaced at a maximum distance of 150m along pipes.
3. Surface Restoration costs are only included for work outside the study area, and is based on a unit price of $12/sqm.
4. Ditch costs are based on unit price of $15/sqm for grading and $8/sqm for seeding.
5. The "manhole" cost from nodes N-75 to N-76 represents estimated cost of outlet structure to the creek.

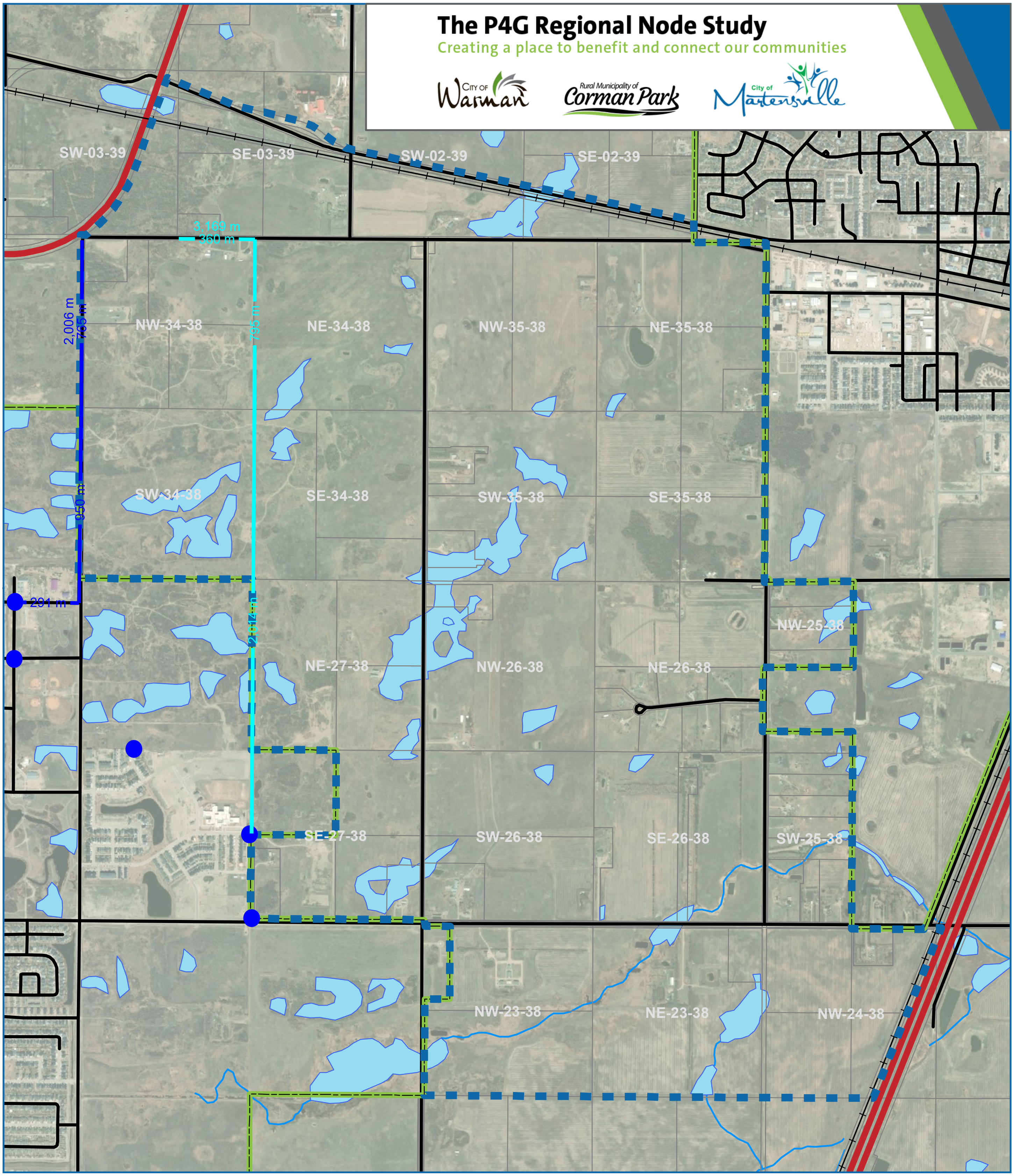
Table A.5 Off-Site Levy Breakdown

From Node	To Node	Total U/S Catchment Area (ha)	Estimated Cost	SWMF S-1 Portion of Total (%)	61.77 ha Portion of Cost ($)	SWMF S-2 Portion of Total (%)	67.47 ha Portion of Cost ($)	SWMF S-3 Portion of Total (%)	68.39 ha Portion of Cost ($)	SWMF S-4 Portion of Total (%)	99.03 ha Portion of Cost ($)	SWMF S-5 Portion of Total (%)	70.65 ha Portion of Cost ($)	SWMF S-6 Portion of Total (%)	64.33 ha Portion of Cost ($)	SWMF S-7 Portion of Total (%)	66.39 ha Portion of Cost ($)	SWMF S-8 Portion of Total (%)	64.34 ha Portion of Cost ($)	SWMF S-9 Portion of Total (%)	65.12 ha Portion of Cost ($)
N-1	N-2	61.77	$ 676,939	100%	$ 676,939																
N-2	N-4	61.77	$ 607,872	100%	$ 607,872																
N-4	N-5	61.77	$ 673,642	100%	$ 673,642																
N-7	N-8	67.47	$ 635,483			100%	$ 635,483														
N-8	N-5	135.85	$ 654,111			50%	$ 324,841	50%	$ 329,270												
N-9	N-10	70.65	$ 242,442									100%	$ 242,442								
N-10	N-11	70.65	$ 451,798									100%	$ 451,798								
N-11	N-12	70.65	$ 558,862									100%	$ 558,862								
N-12	N-5	169.68	$ 1,149,750							58%	$ 671,014	42%	$ 478,736								
N-5	N-14	367.30	$ 1,626,073	17%	$ 273,453	18%	$ 298,682	19%	$ 302,754	27%	$ 438,404	19%	$ 312,780								
N-14	N-15	433.69	$ 833,039	14%	$ 118,645	16%	$ 129,591	16%	$ 131,358	23%	$ 190,213	16%	$ 135,708			15%	$ 127,523				
N-16	N-17	64.33	$ 333,712											100%	$ 333,712						
N-17	N-15	64.33	$ 1,279,480											100%	$ 1,279,480						
N-18	N-15	64.34	$ 526,084															100%	$ 526,084		
N-15	N-19	562.36	$ 1,166,689	11%	$ 128,146	12%	$ 139,968	12%	$ 141,876	18%	$ 205,445	13%	$ 146,575	11%	$ 133,466	12%	$ 137,734	11%	$ 133,479		
N-19	N-20	627.48	$ 1,735,240	10%	$ 170,814	11%	$ 186,573	11%	$ 189,117	16%	$ 273,851	11%	$ 195,379	10%	$ 177,907	11%	$ 183,595	10%	$ 177,923	10%	$ 180,079
N-21	N-20	63.43	$ 766,224																		
N-20	N-22	690.91	$ 1,473,102	9%	$ 131,696	10%	$ 143,847	10%	$ 145,808	14%	$ 211,137	10%	$ 150,636	9%	$ 137,165	10%	$ 141,551	9%	$ 137,178	9%	$ 138,840
N-22	N-23	690.91	$ 1,885,692	9%	$ 168,582	10%	$ 184,136	10%	$ 186,646	14%	$ 270,273	10%	$ 192,827	9%	$ 175,582	10%	$ 181,196	9%	$ 175,599	9%	$ 177,726
N-24	N-23	50.49	$ 264,116																		
N-23	N-25	741.40	$ 3,344,114	8%	$ 278,605	9%	$ 304,309	9%	$ 308,458	13%	$ 446,663	10%	$ 318,672	9%	$ 290,173	9%	$ 299,452	9%	$ 290,201	9%	$ 293,717
N-25	N-26	806.20	$ 1,091,526	8%	$ 83,628	8%	$ 91,344	8%	$ 92,589	12%	$ 134,074	9%	$ 95,655	8%	$ 87,101	8%	$ 89,886	8%	$ 87,109	8%	$ 88,164
N-26	N-27	845.34	$ 1,582,120	7%	$ 115,603	8%	$ 126,269	8%	$ 127,990	12%	$ 185,337	8%	$ 132,229	8%	$ 120,403	8%	$ 124,253	8%	$ 120,415	8%	$ 121,874
N-27	N-28	845.34	$ 1,484,473	7%	$ 108,468	8%	$ 118,476	8%	$ 120,091	12%	$ 173,898	8%	$ 124,068	8%	$ 112,972	8%	$ 116,585	8%	$ 112,983	8%	$ 114,352
N-29	N-30	65.63	$ 345,804																		
N-30	N-32	65.63	$ 519,939																		
N-34	N-32	81.49	$ 384,425																		
N-32	N-35	147.13	$ 929,290																		
N-35	N-37	147.13	$ 1,184,545																		
N-37	N-28	228.81	$ 669,467																		
N-39	N-40	90.15	$ 652,825																		
N-40	N-28	90.15	$ 693,630																		
N-28	N-41	1164.30	$ 2,101,293	5%	$ 111,476	6%	$ 121,761	6%	$ 123,421	9%	$ 178,720	6%	$ 127,508	6%	$ 116,105	6%	$ 119,818	6%	$ 116,116	6%	$ 117,523
N-41	N-43	1164.30	$ 1,918,430	5%	$ 101,775	6%	$ 111,165	6%	$ 112,680	9%	$ 163,167	6%	$ 116,412	6%	$ 106,001	6%	$ 109,391	6%	$ 106,011	6%	$ 107,296
N-44	N-45	67.86	$ 524,811																		
N-45	N-43	67.86	$ 708,200																		
N-43	N-57	1232.16	$ 22,562,339	5%	$ 1,131,036	5%	$ 1,235,385	6%	$ 1,252,226	8%	$ 1,813,291	6%	$ 1,293,694	5%	$ 1,177,998	5%	$ 1,215,666	5%	$ 1,178,110	5%	$ 1,192,385
N-64	N-76	1232.16	$ 1,115,586	5%	$ 55,924	5%	$ 61,083	6%	$ 61,916	8%	$ 89,657	6%	$ 63,966	5%	$ 58,246	5%	$ 60,108	5%	$ 58,251	5%	$ 58,957
				S-1:	**$ 4,936,306**	**S-2:**	**$ 4,212,914**	**S-3:**	**$ 3,626,199**	**S-4:**	**$ 5,445,145**	**S-5:**	**$ 5,137,945**	**S-6:**	**$ 4,306,312**	**S-7:**	**$ 2,906,758**	**S-8:**	**$ 3,219,459**	**S-9:**	**$ 2,590,914**

Table A.5 Off-Site Levy Breakdown

From Node	To Node	Total U/S Catchment Area (ha)	Estimated Cost	SWMF S-10 Portion of Total (%)	63.43 ha Portion of Cost ($)	SWMF S-11 Portion of Total (%)	50.49 ha Portion of Cost ($)	SWMF S-12 Portion of Total (%)	64.8 ha Portion of Cost ($)	SWMF S-13 Portion of Total (%)	39.14 ha Portion of Cost ($)	SWMF S-14 Portion of Total (%)	65.63 ha Portion of Cost ($)	SWMF S-15 Portion of Total (%)	81.49 ha Portion of Cost ($)	SWMF S-16 Portion of Total (%)	81.68 ha Portion of Cost ($)	SWMF S-17 Portion of Total (%)	90.15 ha Portion of Cost ($)	SWMF S-18 Portion of Total (%)	67.86 ha Portion of Cost ($)
N-1	N-2	61.77	$ 676,939																		
N-2	N-4	61.77	$ 607,872																		
N-4	N-5	61.77	$ 673,642																		
N-7	N-8	67.47	$ 635,483																		
N-8	N-5	135.85	$ 654,111																		
N-9	N-10	70.65	$ 242,442																		
N-10	N-11	70.65	$ 451,798																		
N-11	N-12	70.65	$ 558,862																		
N-12	N-5	169.68	$ 1,149,750																		
N-5	N-14	367.30	$ 1,626,073																		
N-14	N-15	433.69	$ 833,039																		
N-16	N-17	64.33	$ 333,712																		
N-17	N-15	64.33	$ 1,279,480																		
N-18	N-15	64.34	$ 526,084																		
N-15	N-19	562.36	$ 1,166,689																		
N-19	N-20	627.48	$ 1,735,240																		
N-21	N-20	63.43	$ 766,224	100%	$ 766,224																
N-20	N-22	690.91	$ 1,473,102	9%	$ 135,245																
N-22	N-23	690.91	$ 1,885,692	9%	$ 173,125																
N-24	N-23	50.49	$ 264,116			100%	$ 264,116														
N-23	N-25	741.40	$ 3,344,114	9%	$ 286,113	7%	$ 227,749														
N-25	N-26	806.20	$ 1,091,526	8%	$ 85,882	6%	$ 68,363	8%	$ 87,731												
N-26	N-27	845.34	$ 1,582,120	8%	$ 118,719	6%	$ 94,501	8%	$ 121,274	5%	$ 73,253										
N-27	N-28	845.34	$ 1,484,473	8%	$ 111,391	6%	$ 88,669	8%	$ 113,789	5%	$ 68,732										
N-29	N-30	65.63	$ 345,804									100%	$ 345,804								
N-30	N-32	65.63	$ 519,939									100%	$ 519,939								
N-34	N-32	81.49	$ 384,425											100%	$ 384,425						
N-32	N-35	147.13	$ 929,290									45%	$ 414,555	55%	$ 514,735						
N-35	N-37	147.13	$ 1,184,545									45%	$ 528,424	55%	$ 656,121						
N-37	N-28	228.81	$ 669,467									29%	$ 192,032	36%	$ 238,438	36%	$ 238,997				
N-39	N-40	90.15	$ 652,825															100%	$ 652,825		
N-40	N-28	90.15	$ 693,630															100%	$ 693,630		
N-28	N-41	1164.30	$ 2,101,293	5%	$ 114,480	4%	$ 91,128	6%	$ 116,945	3%	$ 70,638	6%	$ 118,452	7%	$ 147,077	7%	$ 147,422	8%	$ 162,702		
N-41	N-43	1164.30	$ 1,918,430	5%	$ 104,518	4%	$ 83,197	6%	$ 106,768	3%	$ 64,491	6%	$ 108,144	7%	$ 134,278	7%	$ 134,593	8%	$ 148,543		
N-44	N-45	67.86	$ 524,811																	100%	$ 524,811
N-45	N-43	67.86	$ 708,200																	100%	$ 708,200
N-43	N-57	1232.16	$ 22,562,339	5%	$ 1,161,515	4%	$ 924,579	5%	$ 1,186,520	3%	$ 716,695	5%	$ 1,201,812	7%	$ 1,492,238	7%	$ 1,495,739	7%	$ 1,650,774	6%	$ 1,242,675
N-64	N-76	1232.16	$ 1,115,586	5%	$ 57,431	4%	$ 45,715	5%	$ 58,667	3%	$ 35,437	5%	$ 59,423	7%	$ 73,783	7%	$ 73,956	7%	$ 81,622	6%	$ 61,444
				S-10:	**$ 3,114,643**	**S-11:**	**$ 1,888,018**	**S-12:**	**$ 1,791,695**	**S-13:**	**$ 1,029,247**	**S-14:**	**$ 3,488,586**	**S-15:**	**$ 3,641,094**	**S-16:**	**$ 2,090,707**	**S-17:**	**$ 3,390,096**	**S-18:**	**$ 2,537,129**

APPENDIX B
Martensville Water Servicing by Planning Unit



Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

ISL

N

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX B: MARTENSVILLE WATER SERVICING BY PLANNING UNIT

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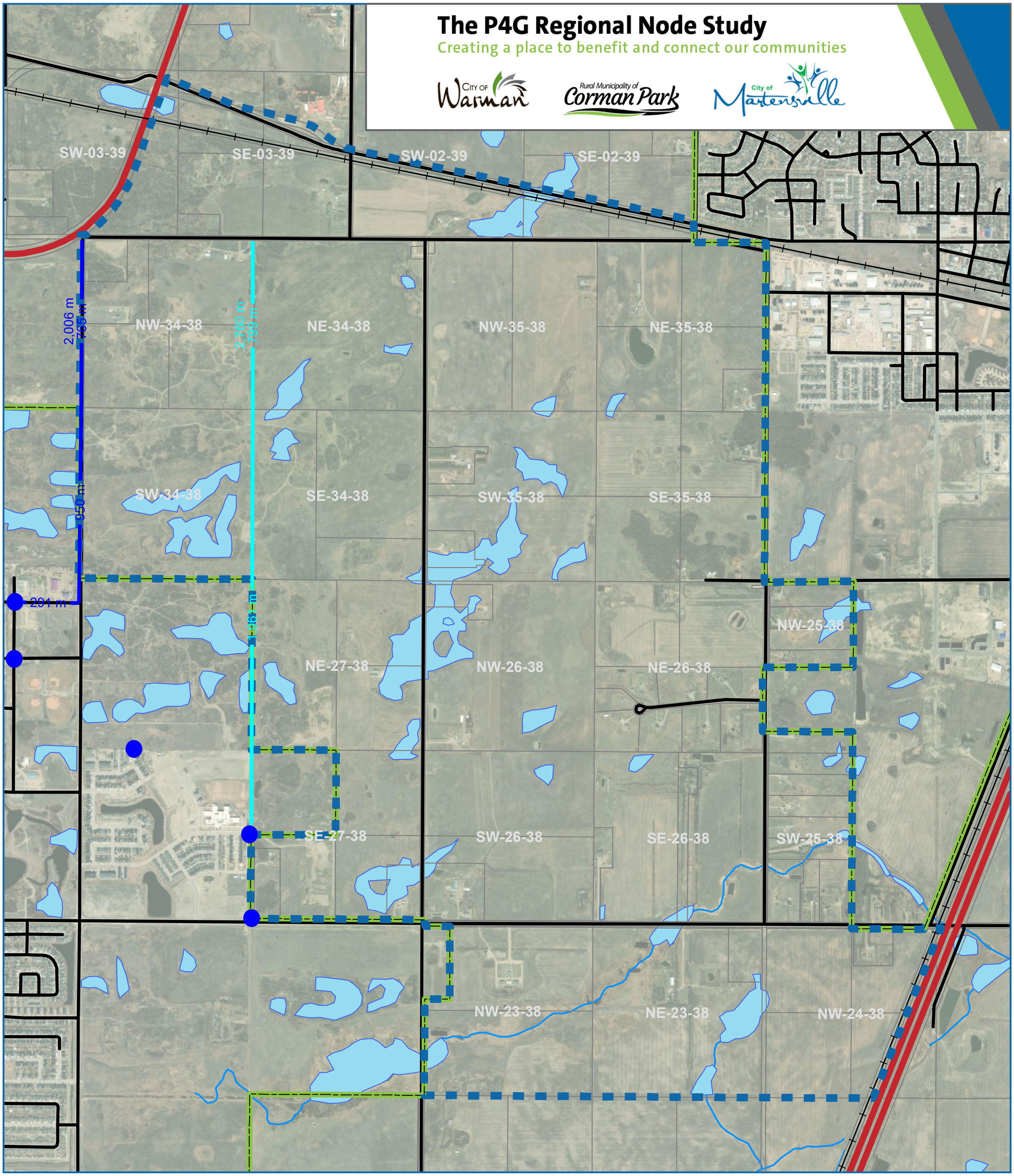
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



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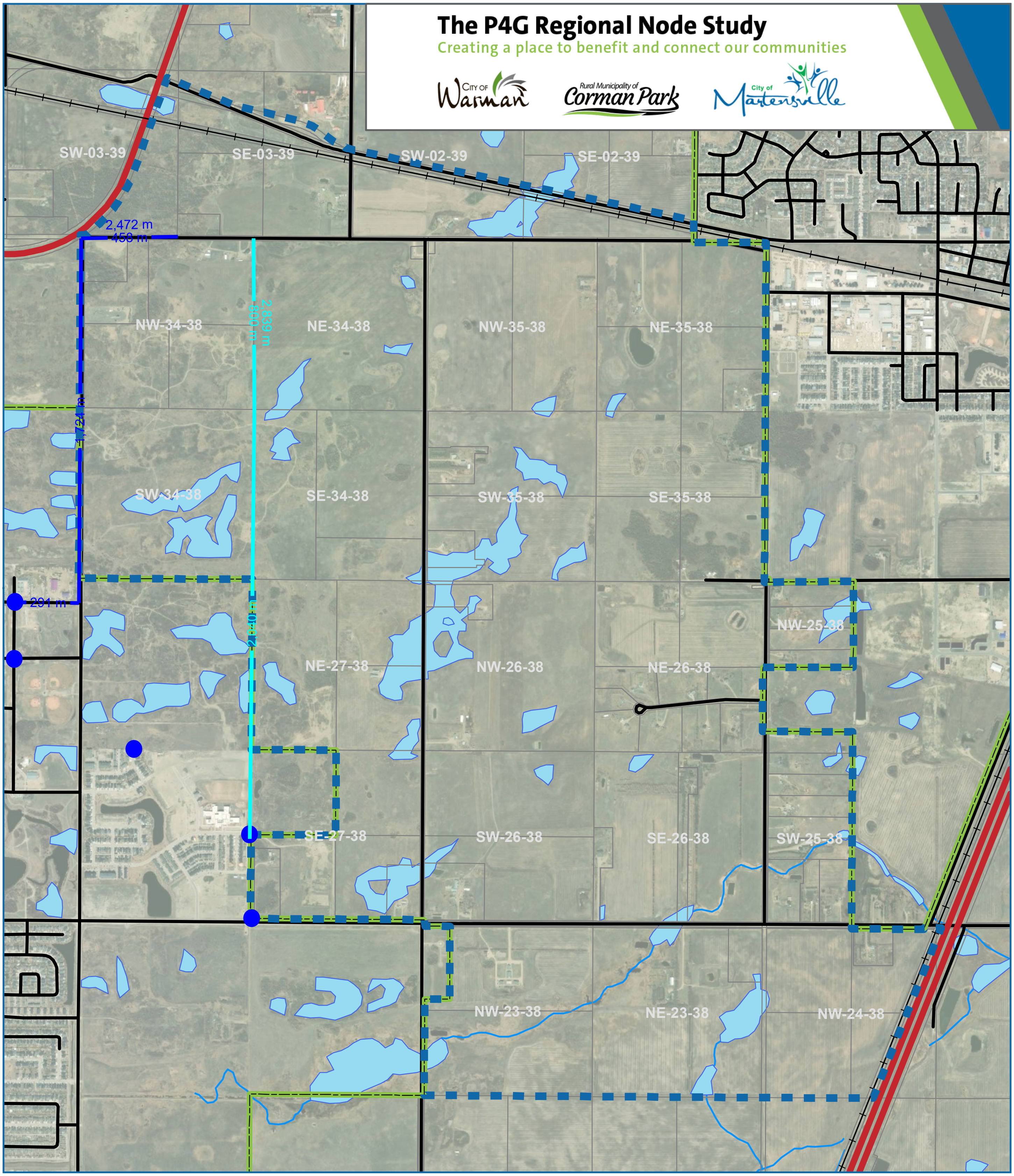

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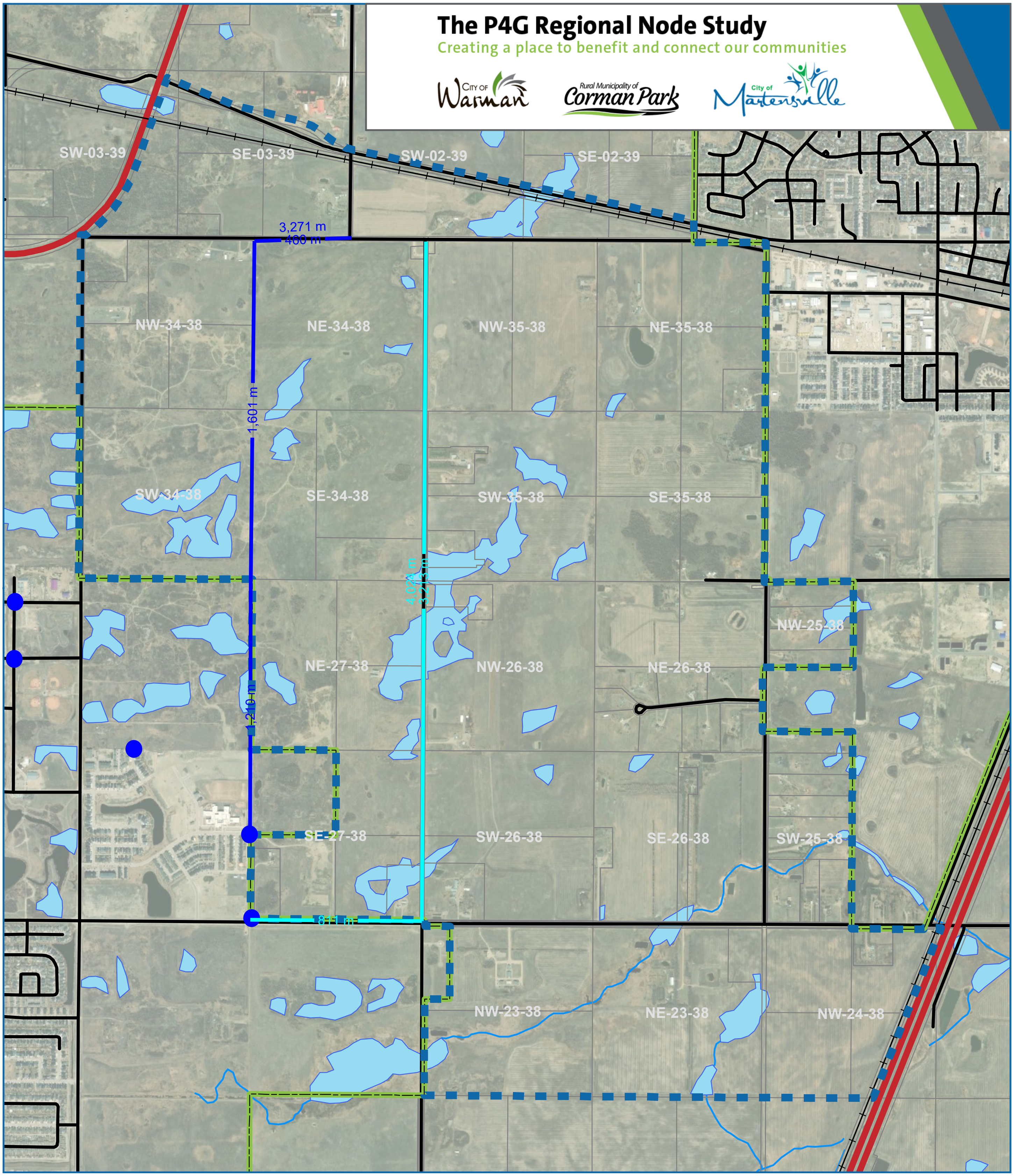

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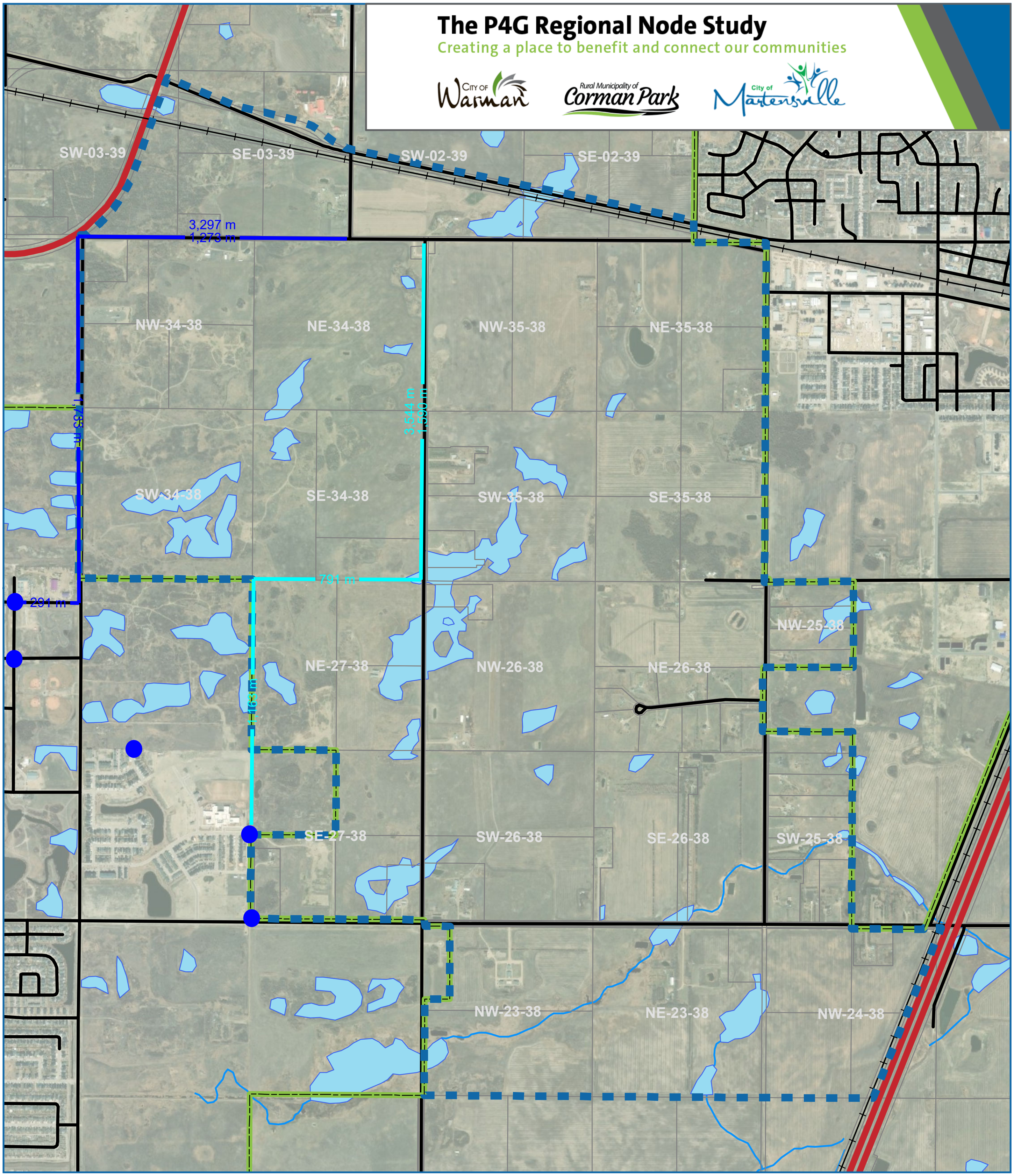

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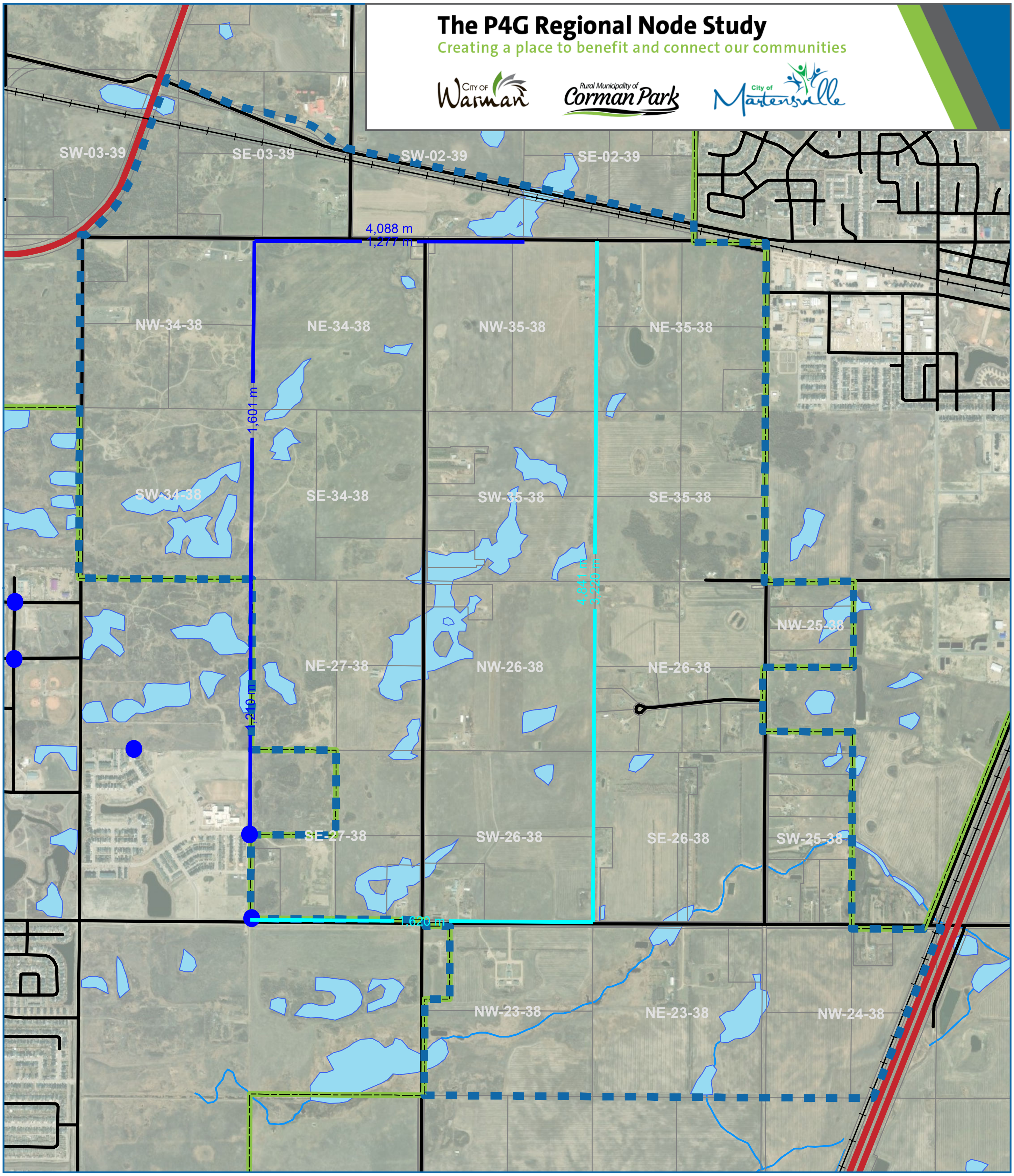

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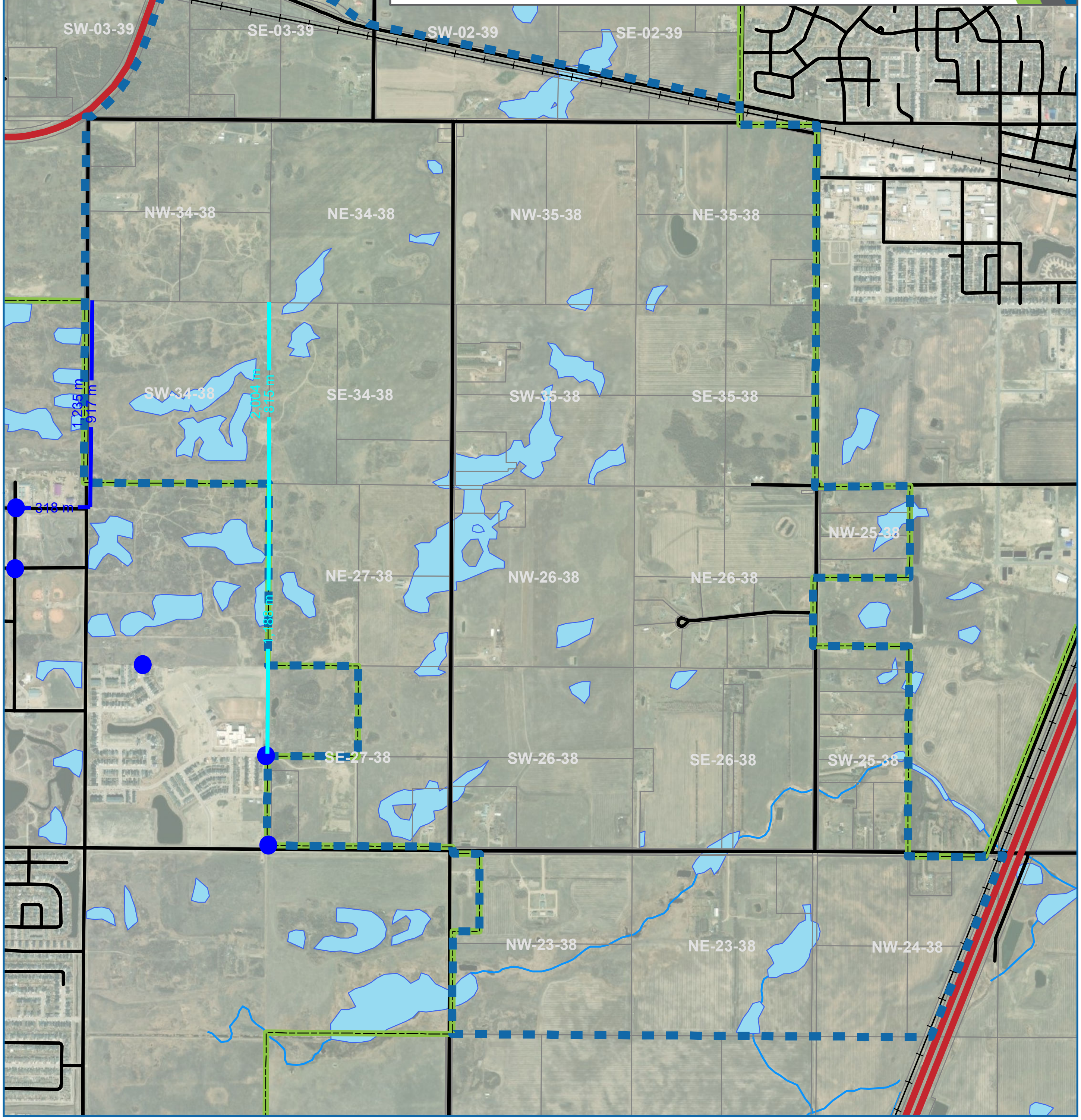

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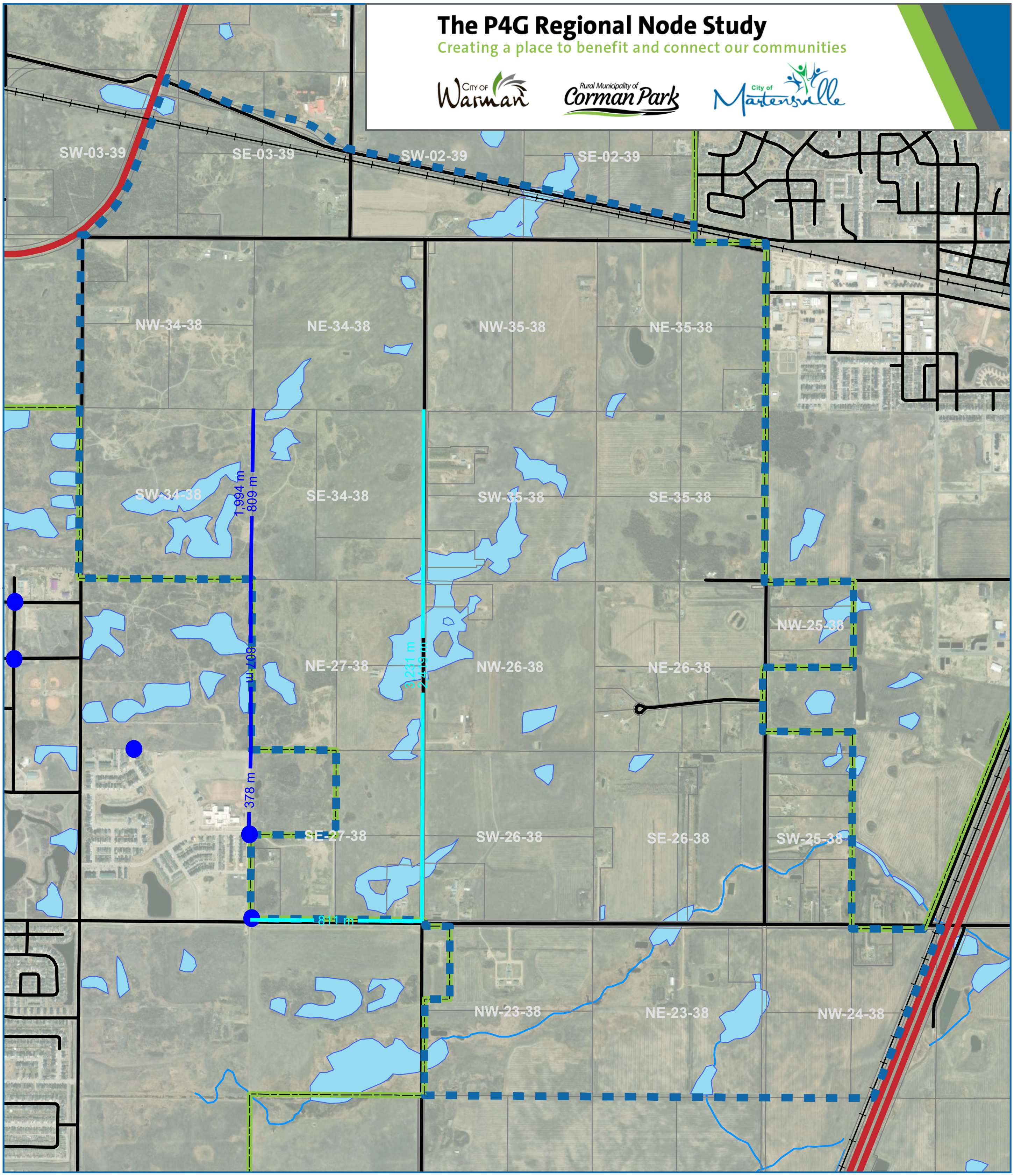

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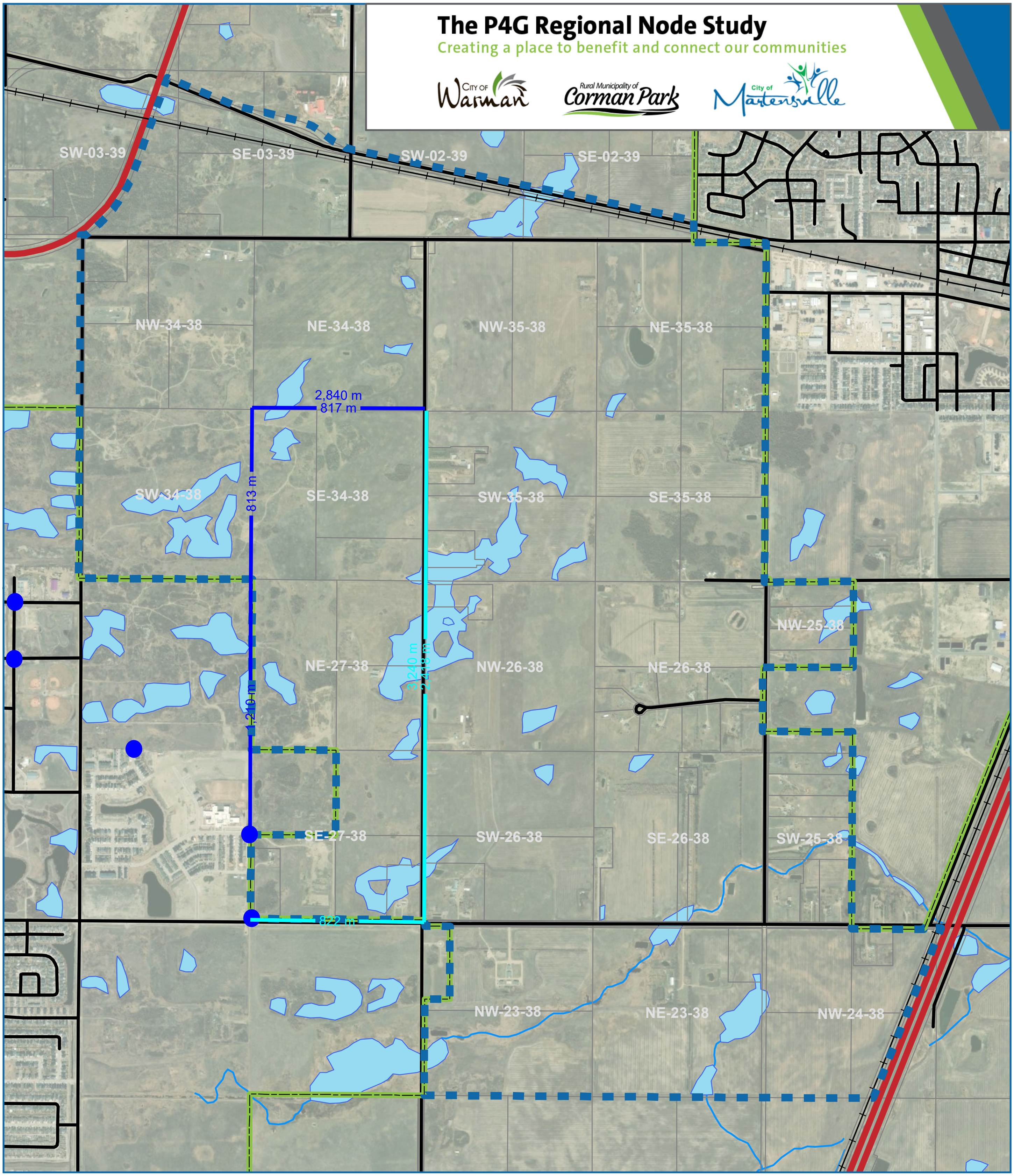

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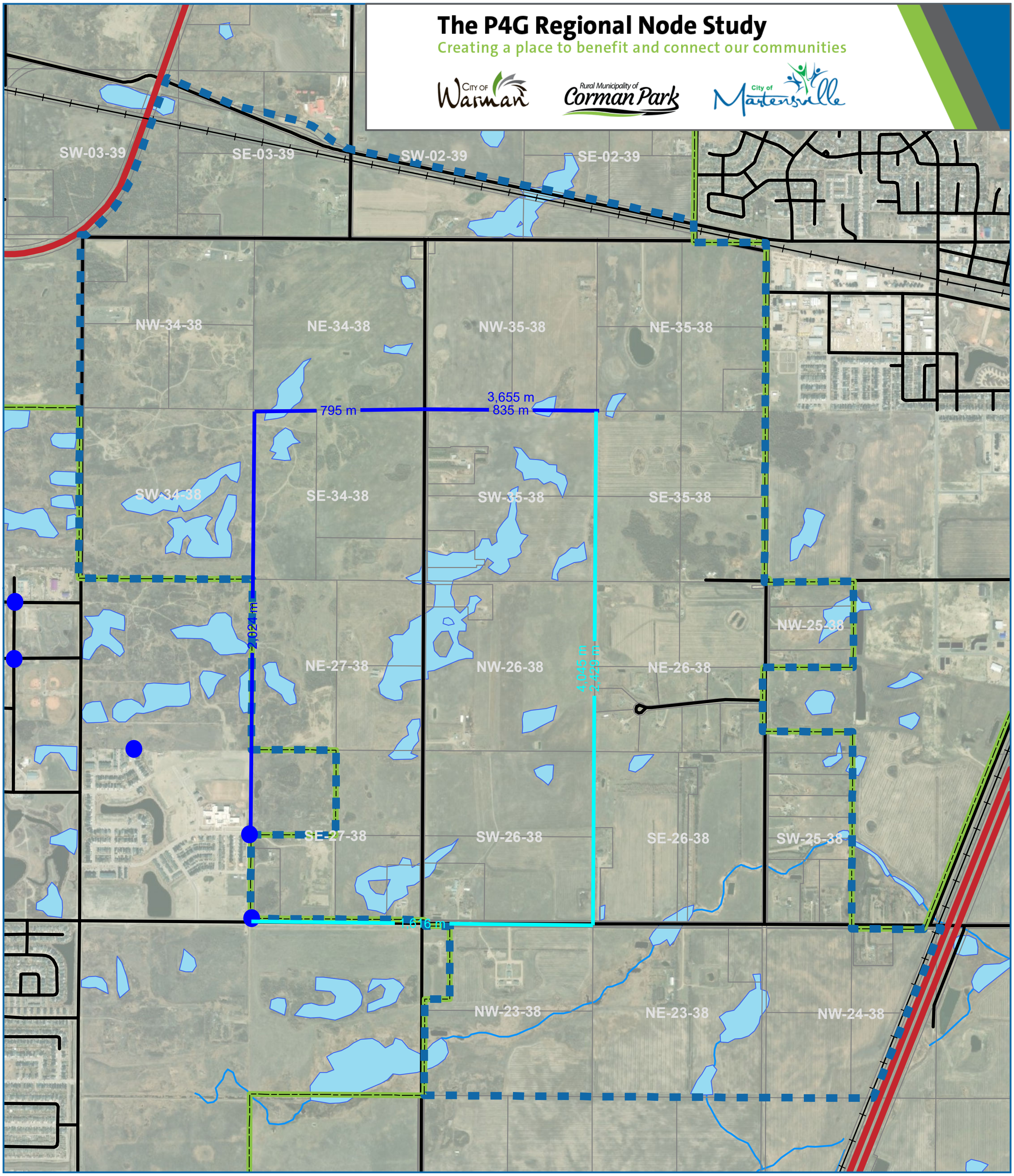

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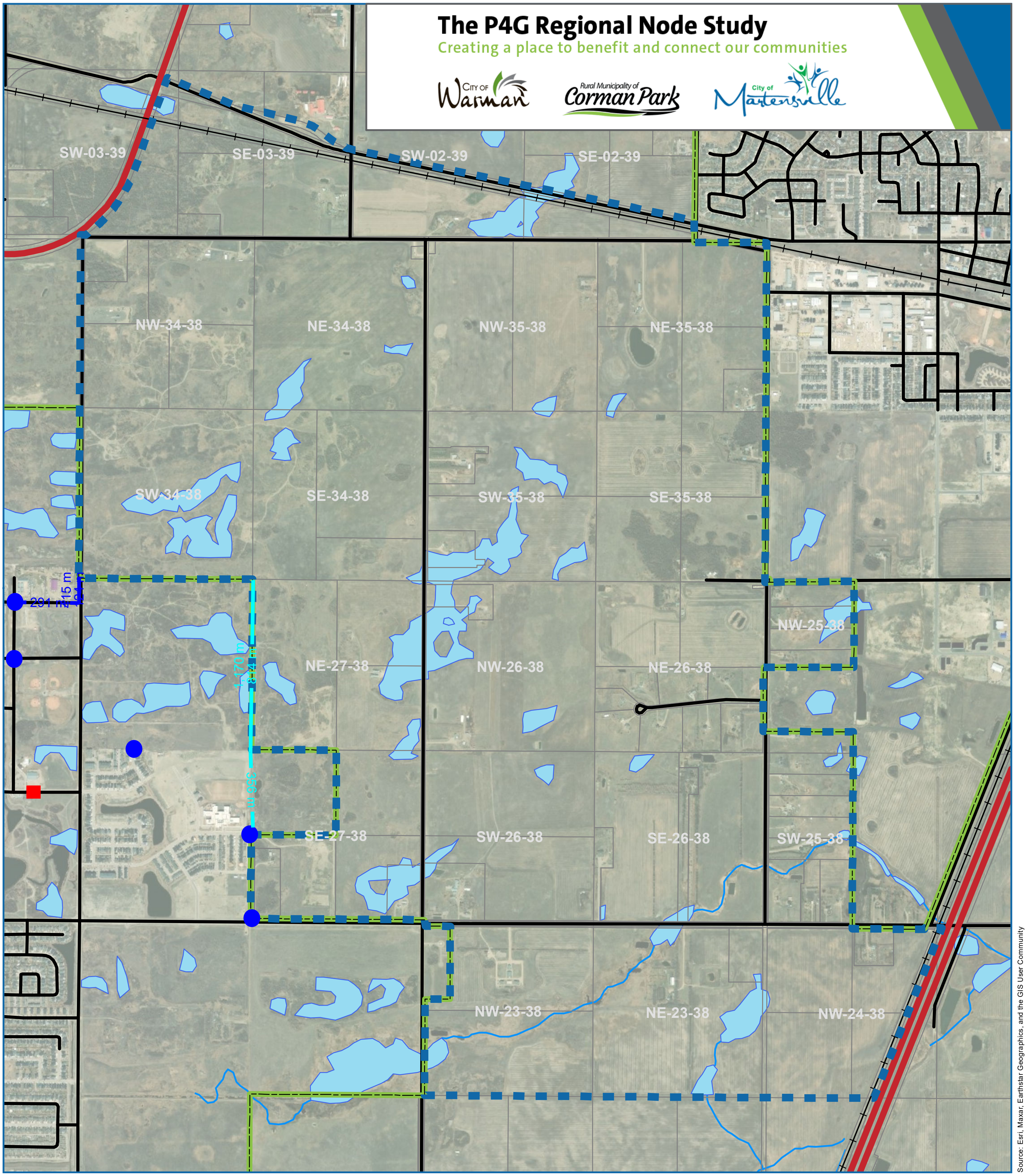

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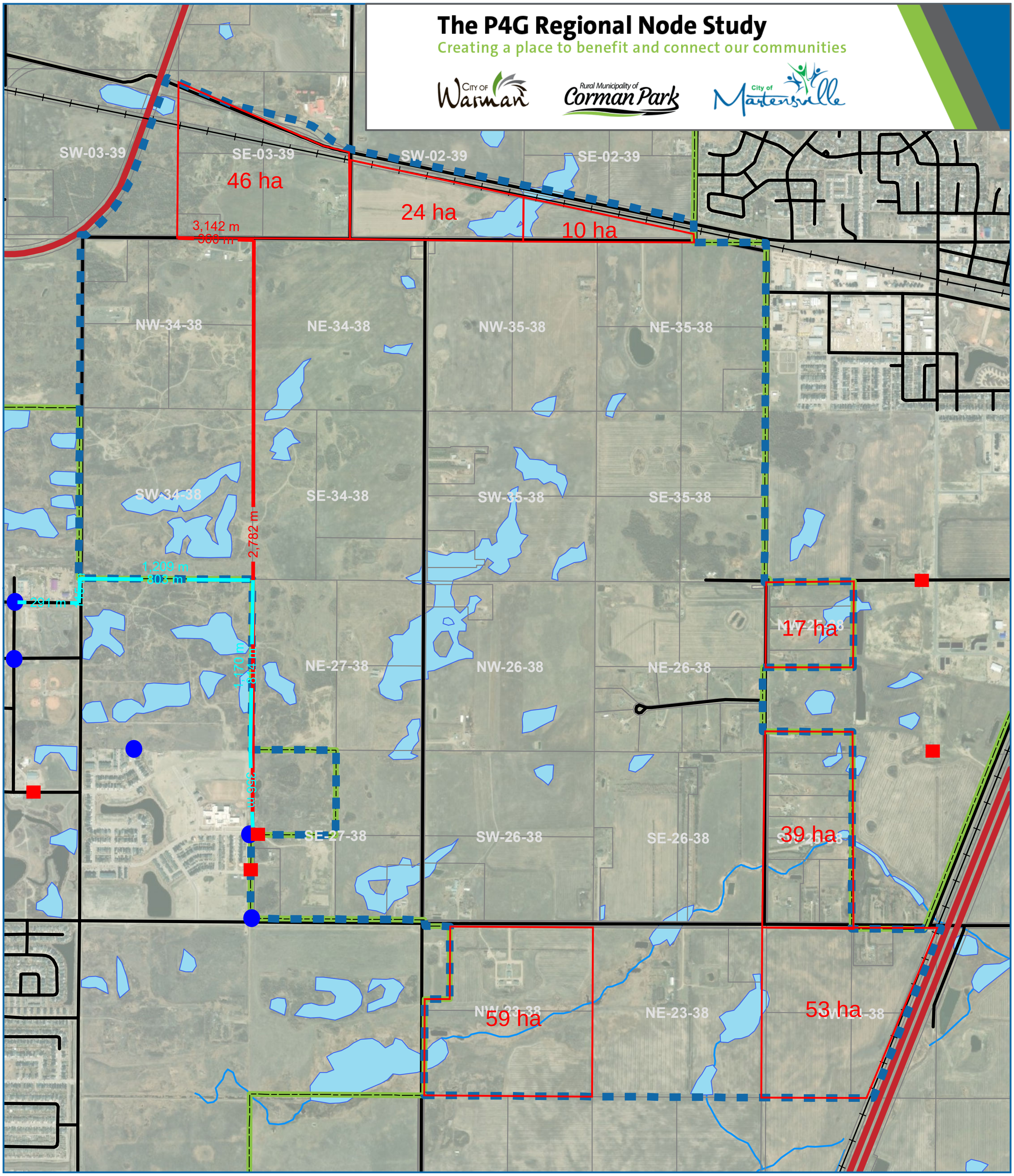

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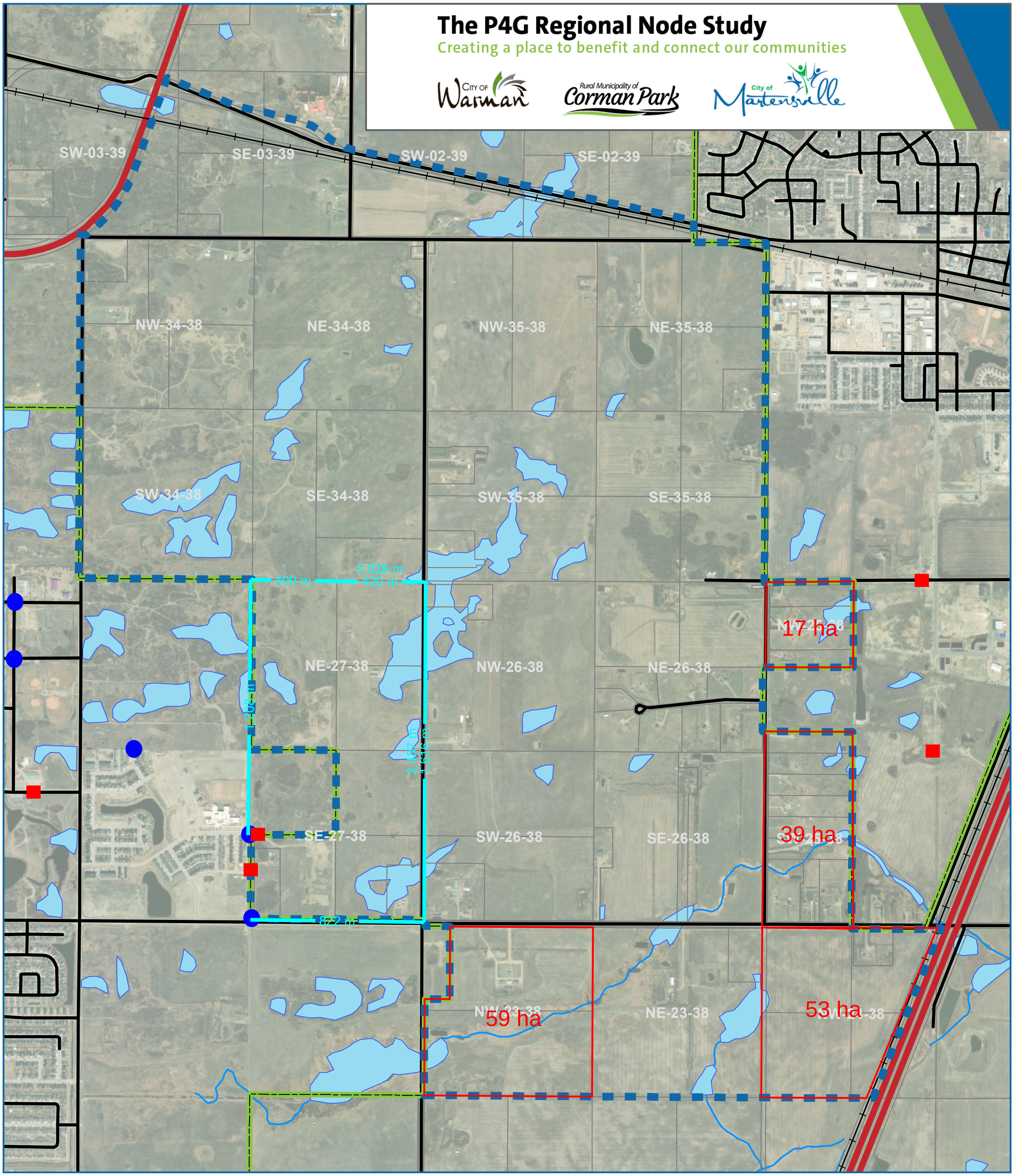

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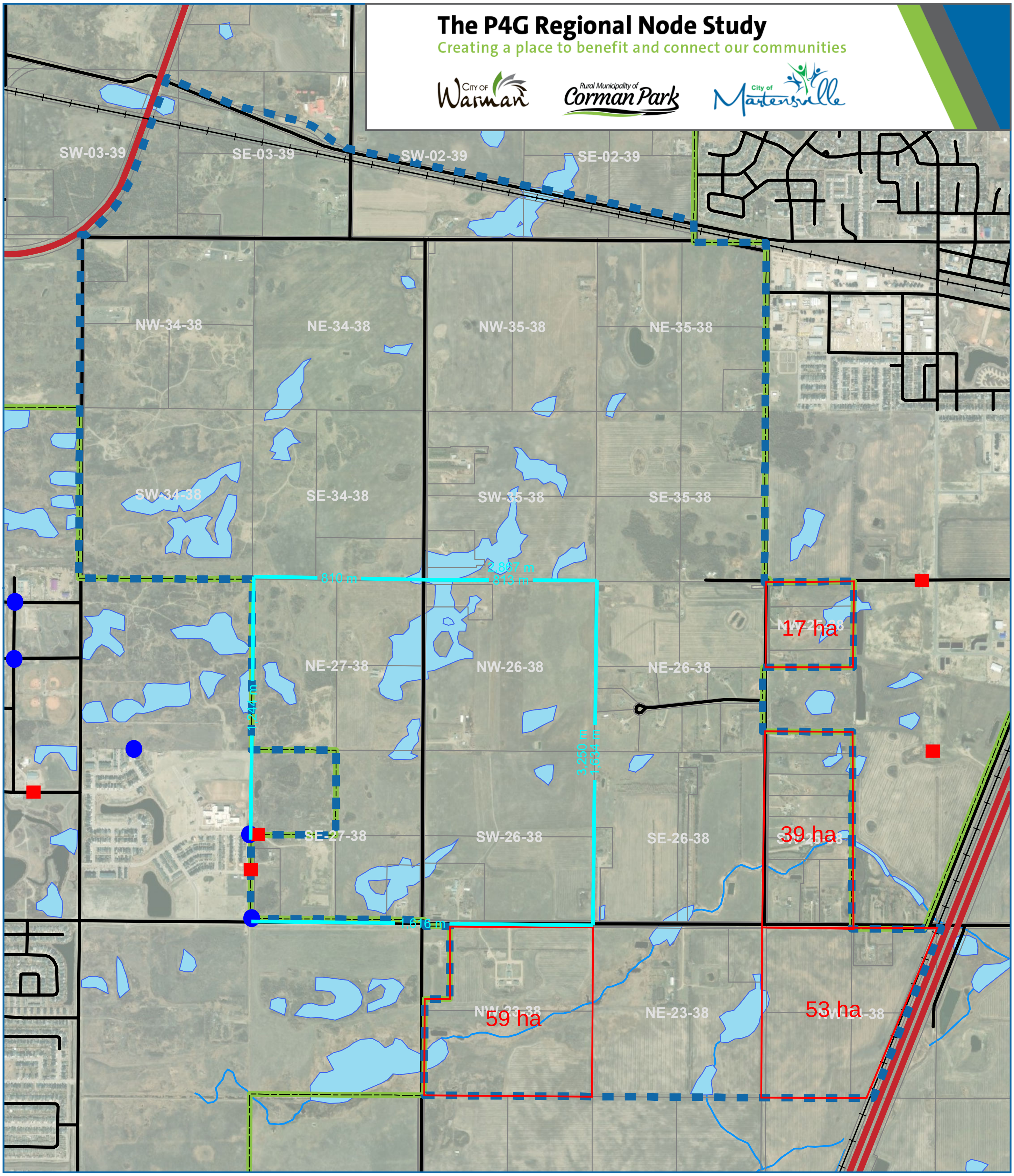

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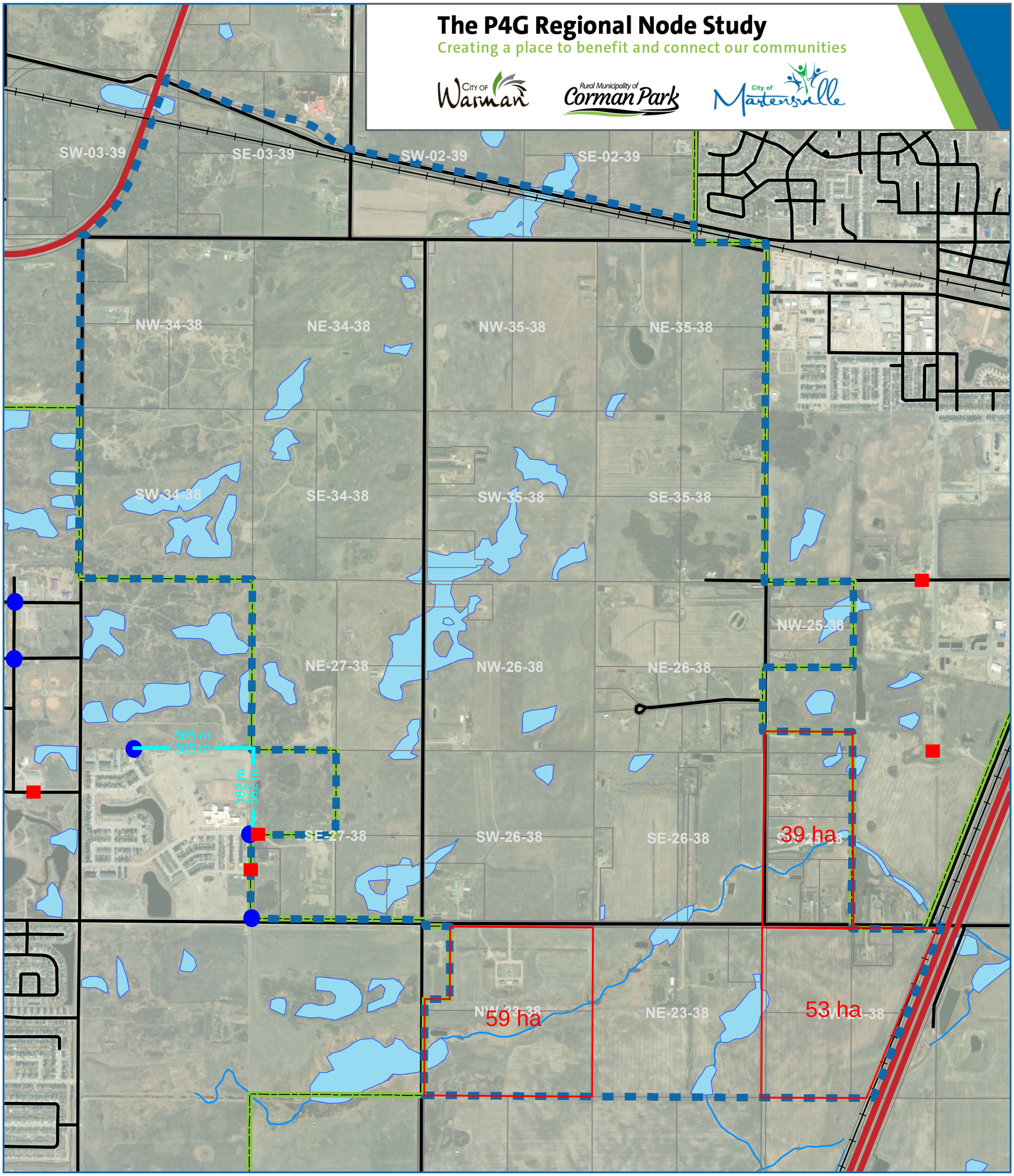

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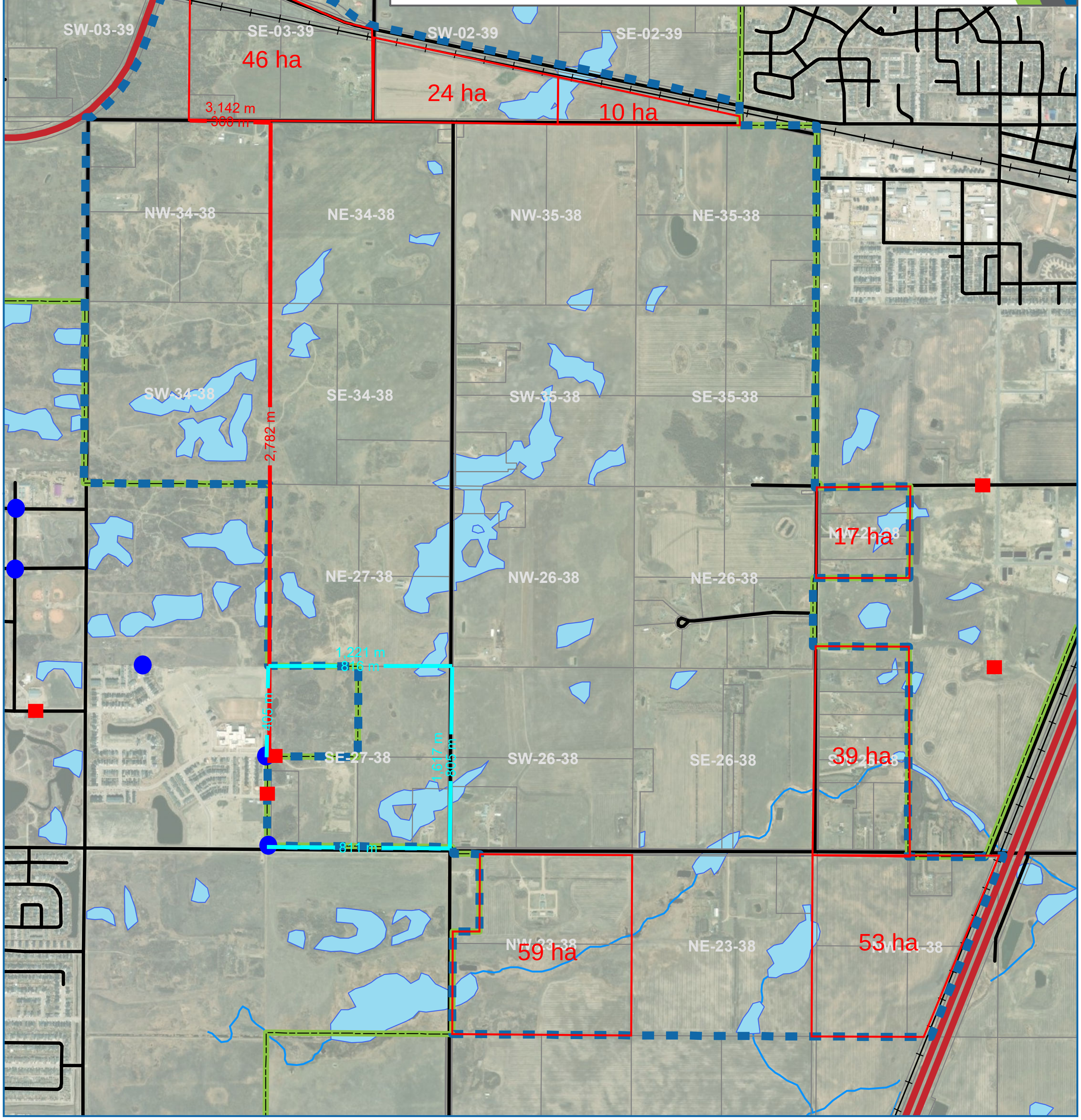

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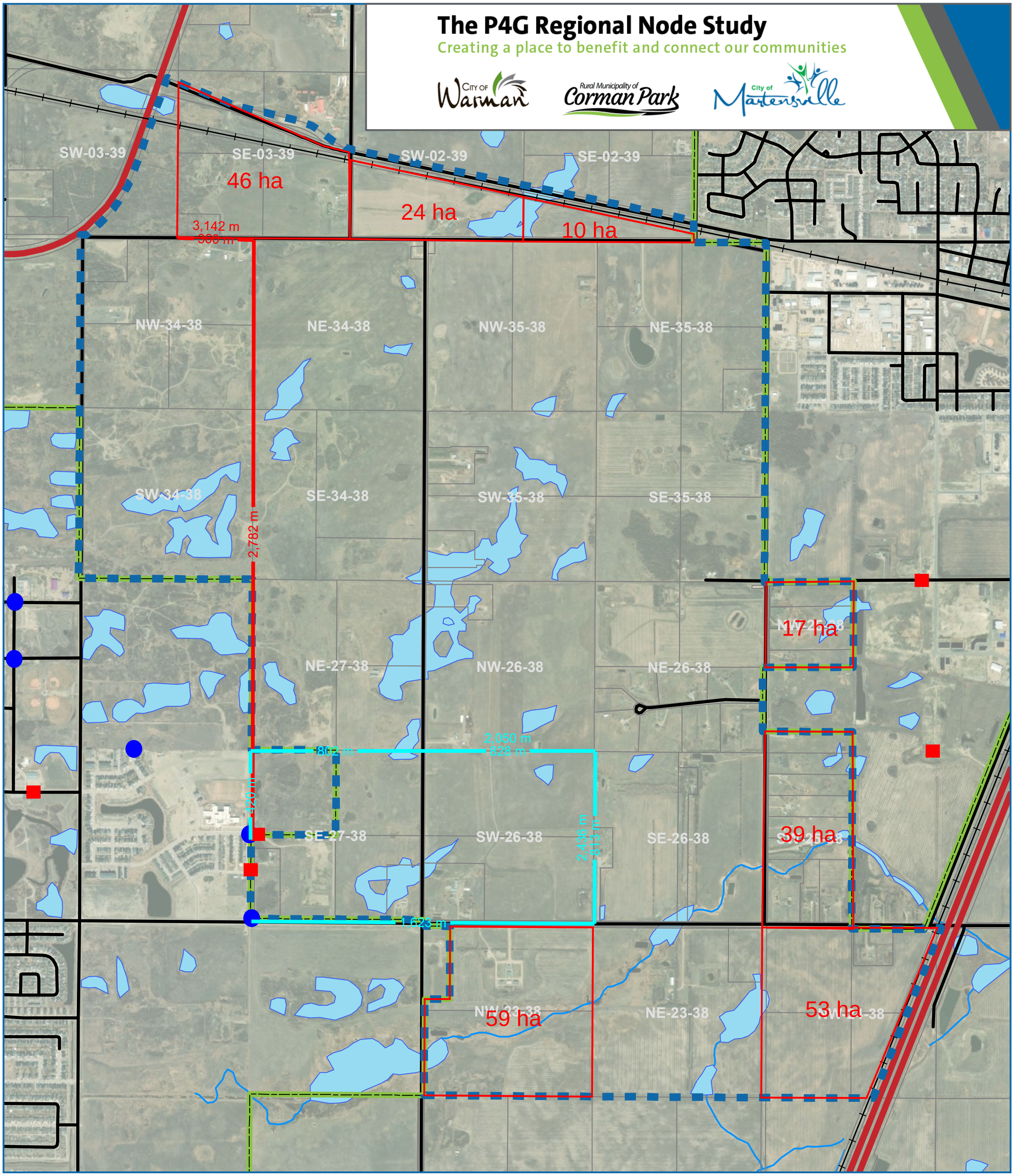

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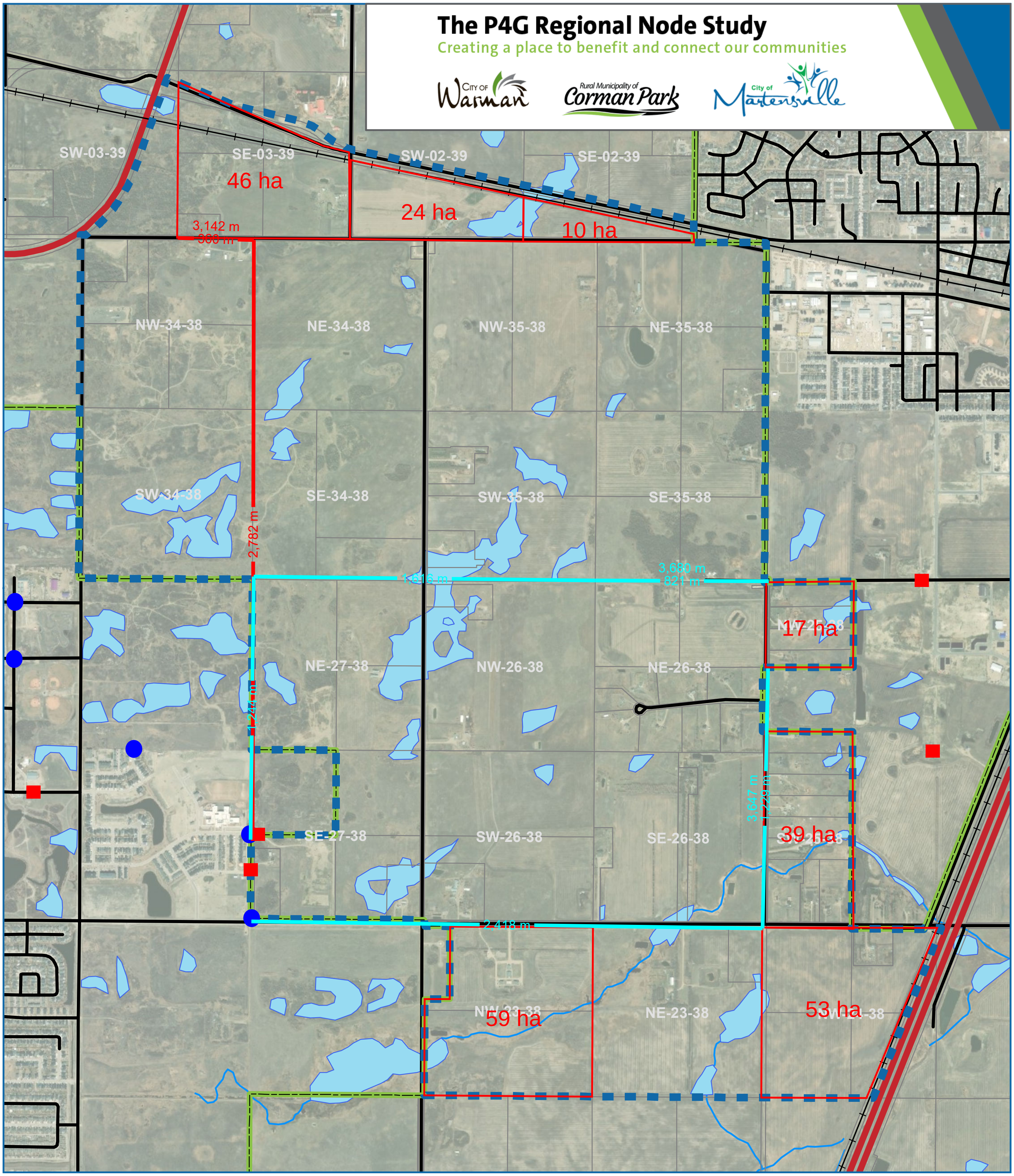

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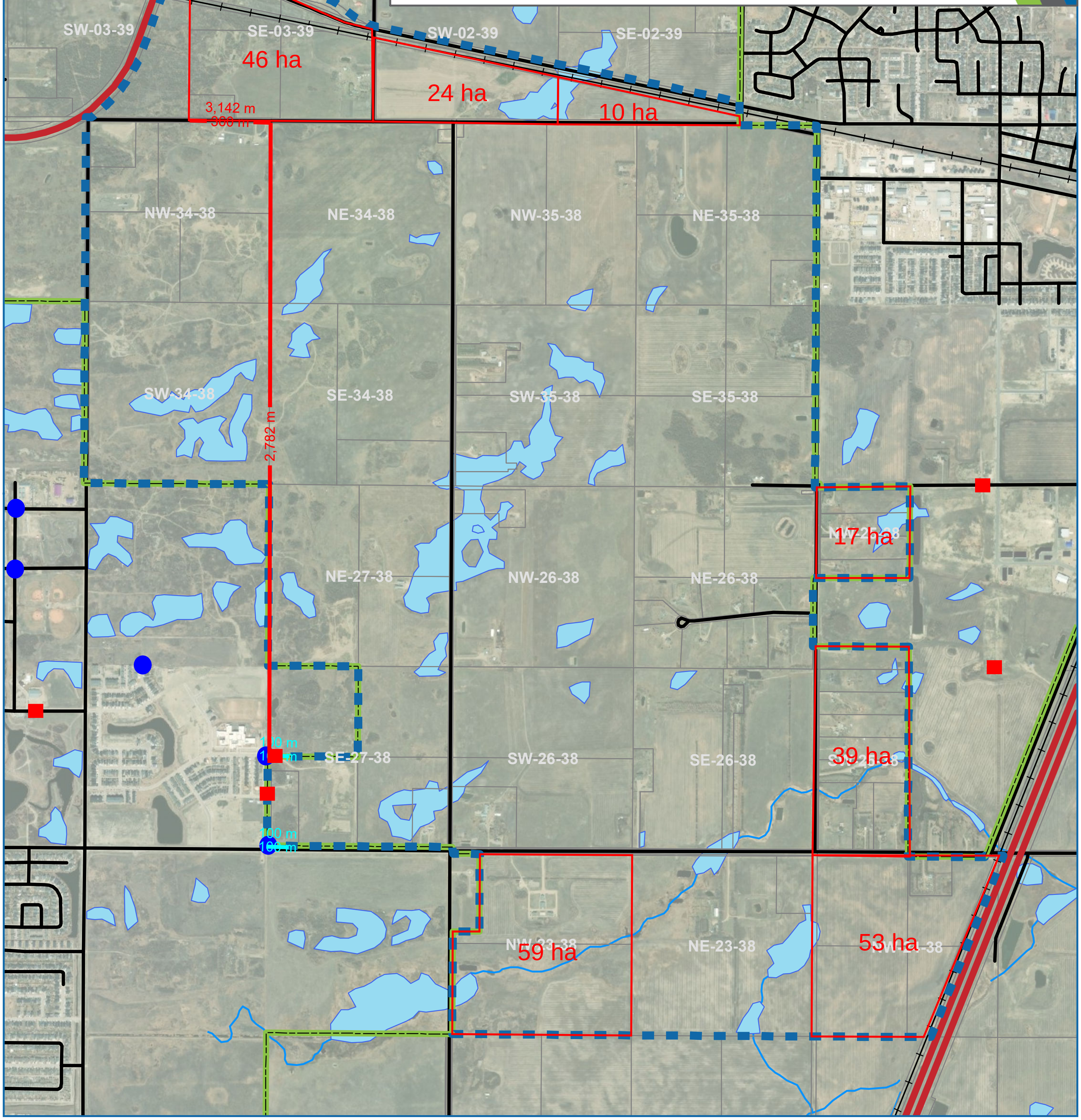

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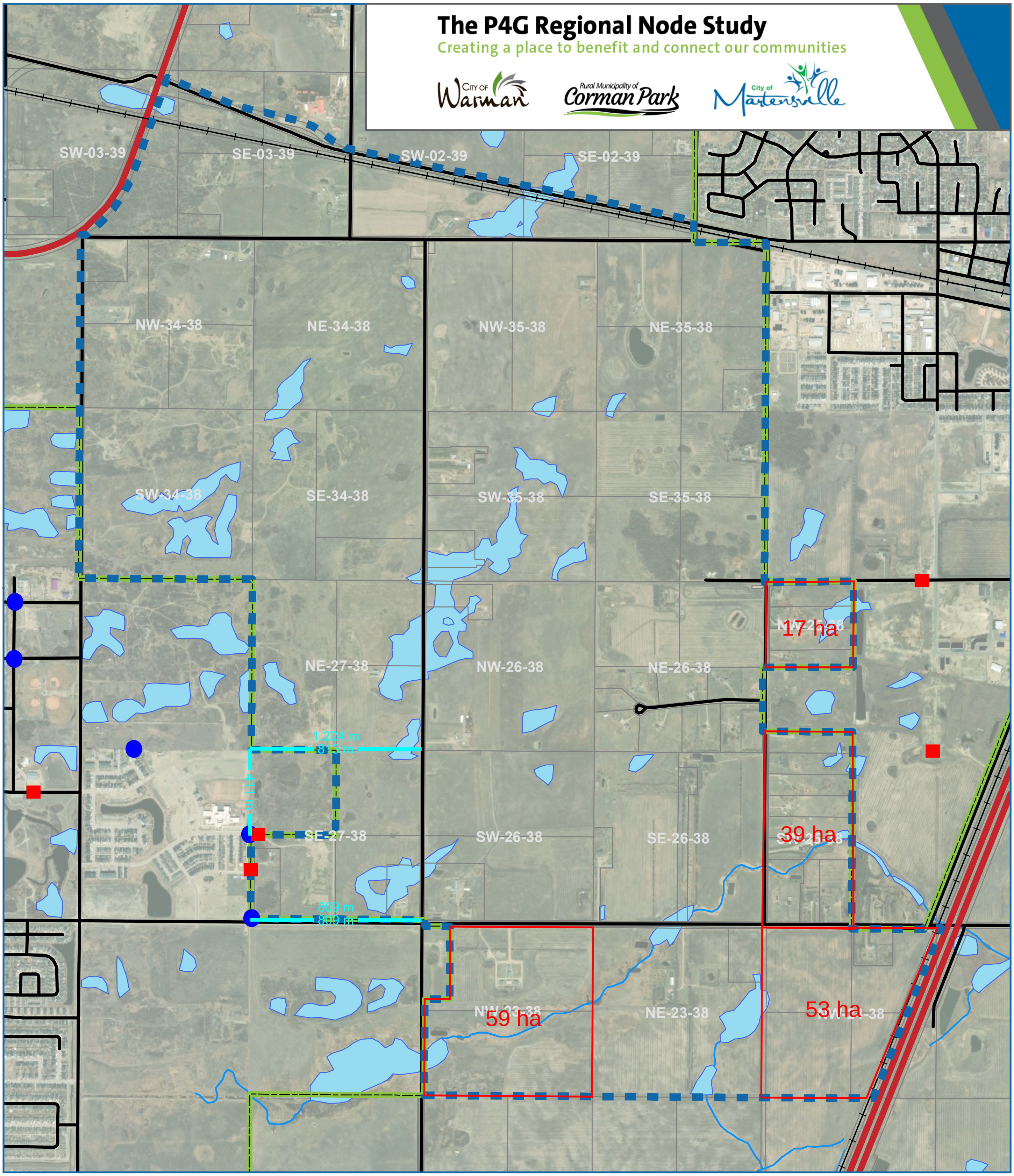

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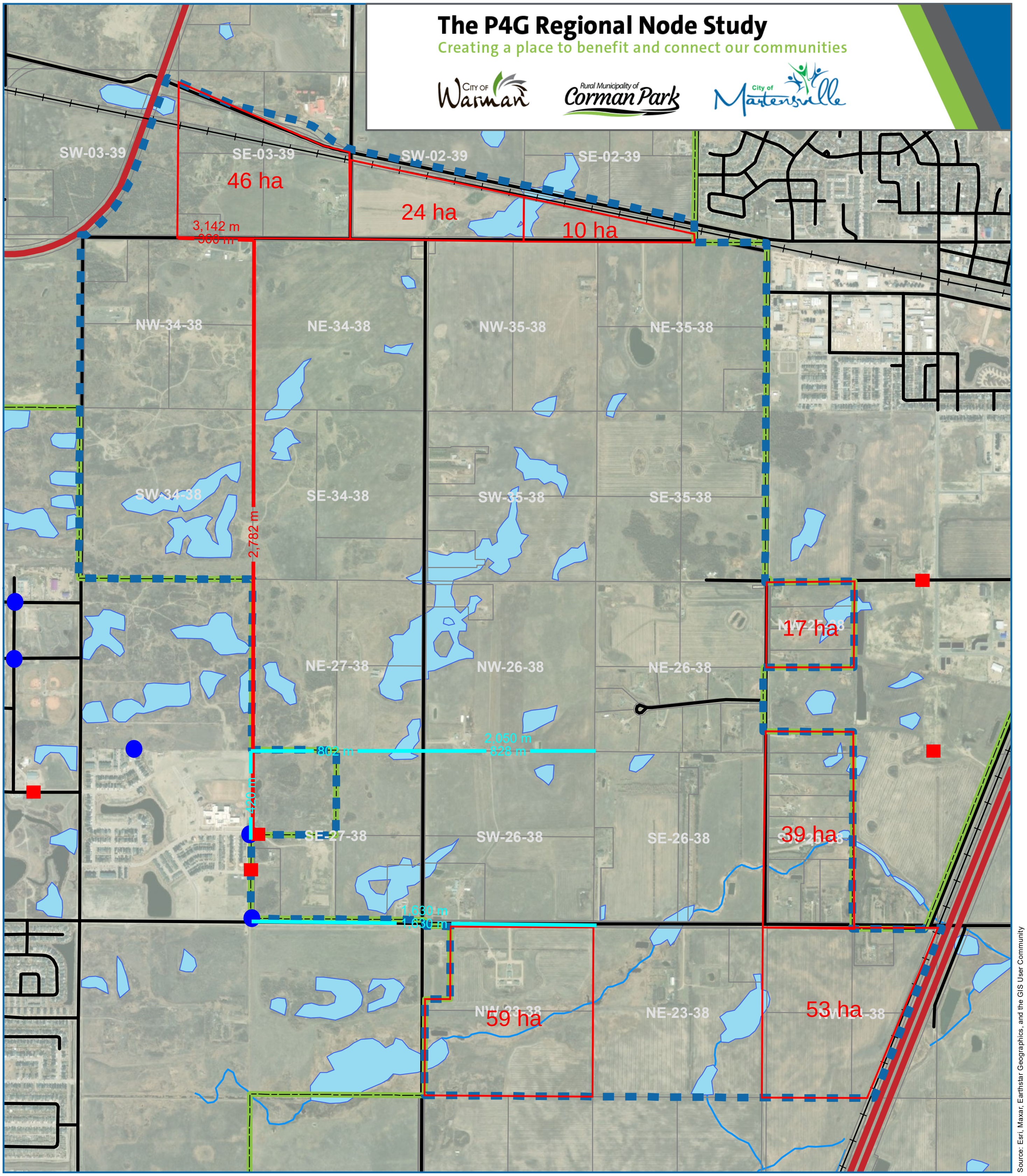

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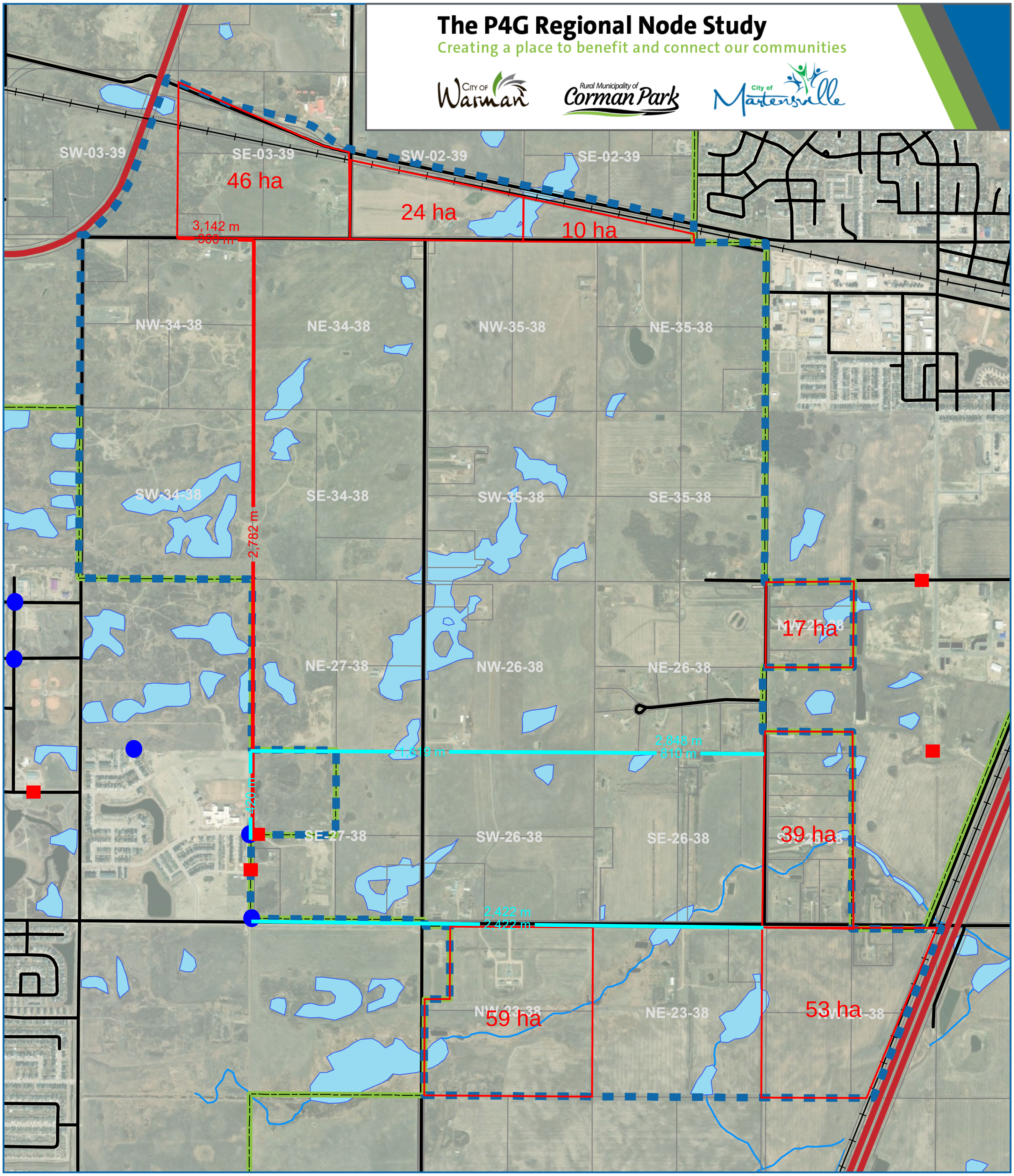

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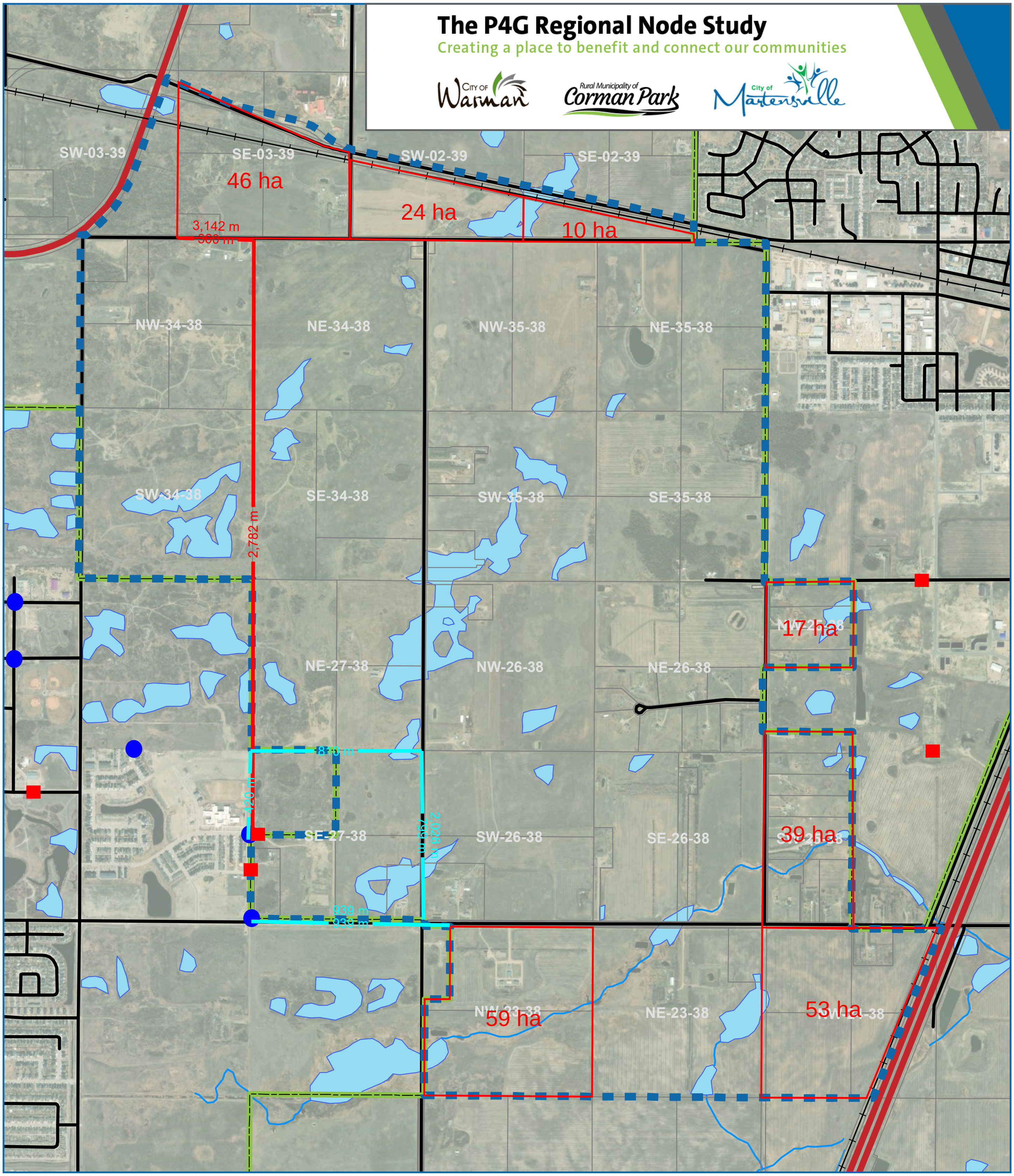

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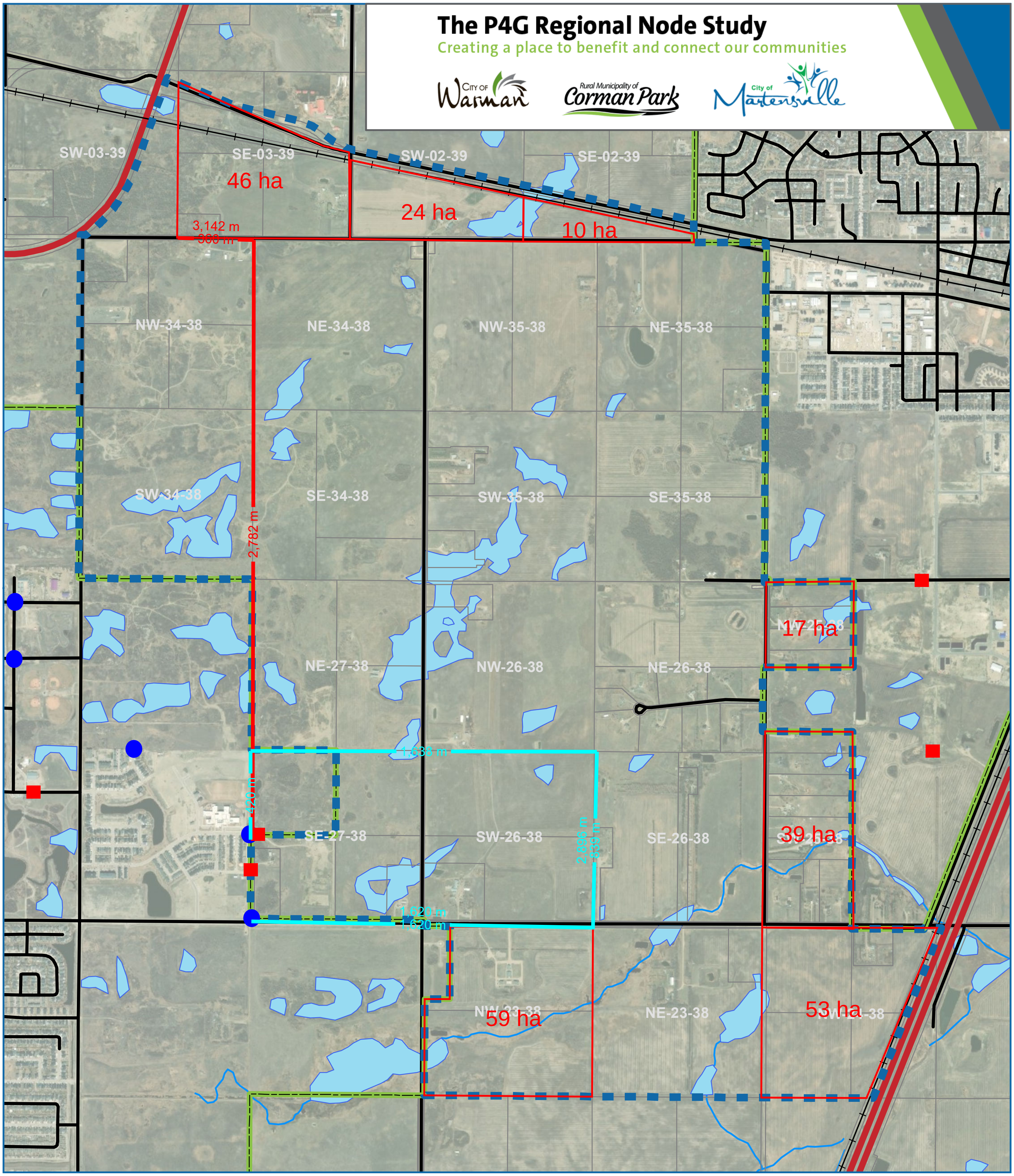

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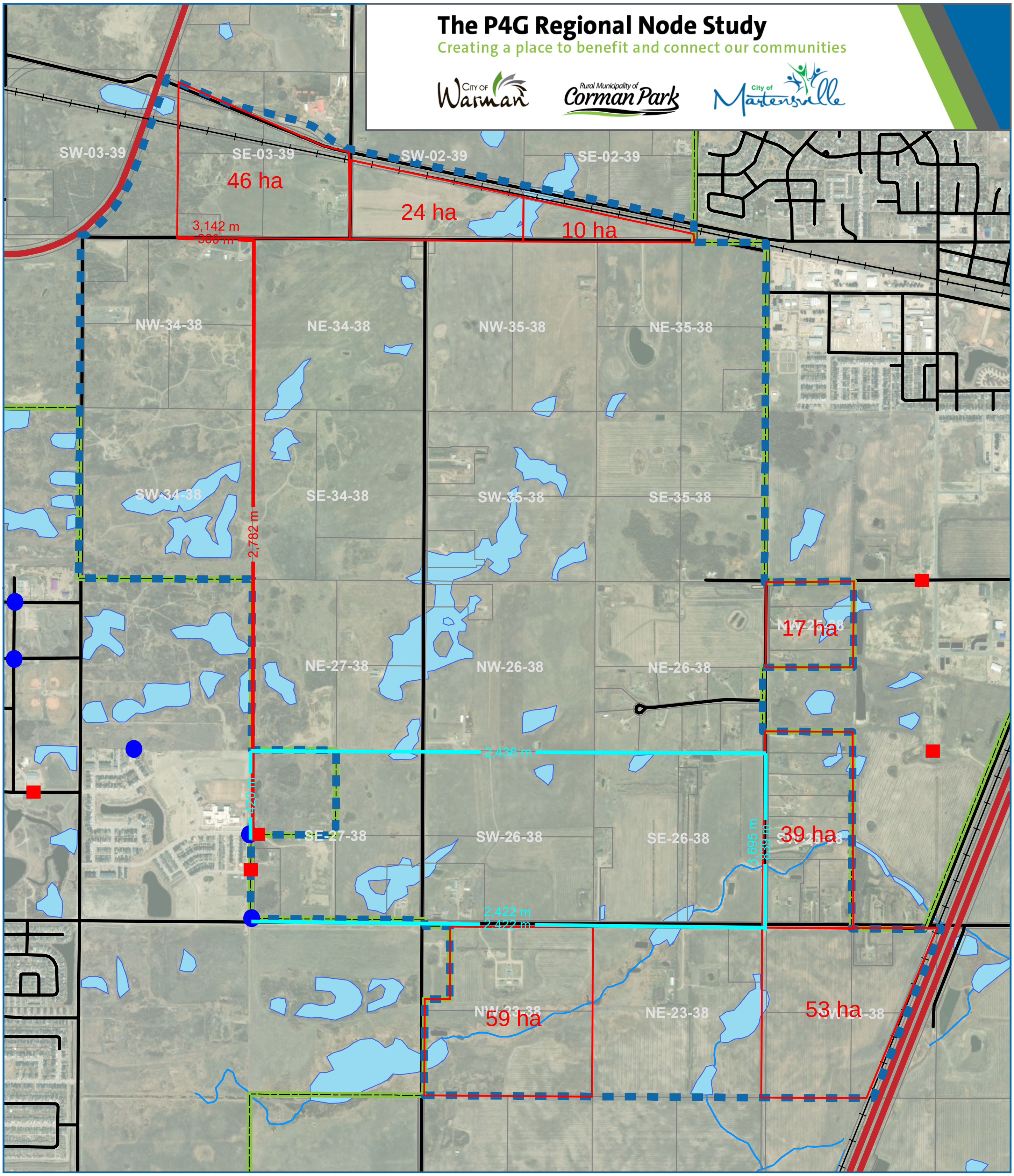
SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX B: MARTENSVILLE WATER SERVICING BY PLANNING UNIT



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Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ISL

N

- Study Area
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
- Watercourse
- Water Body

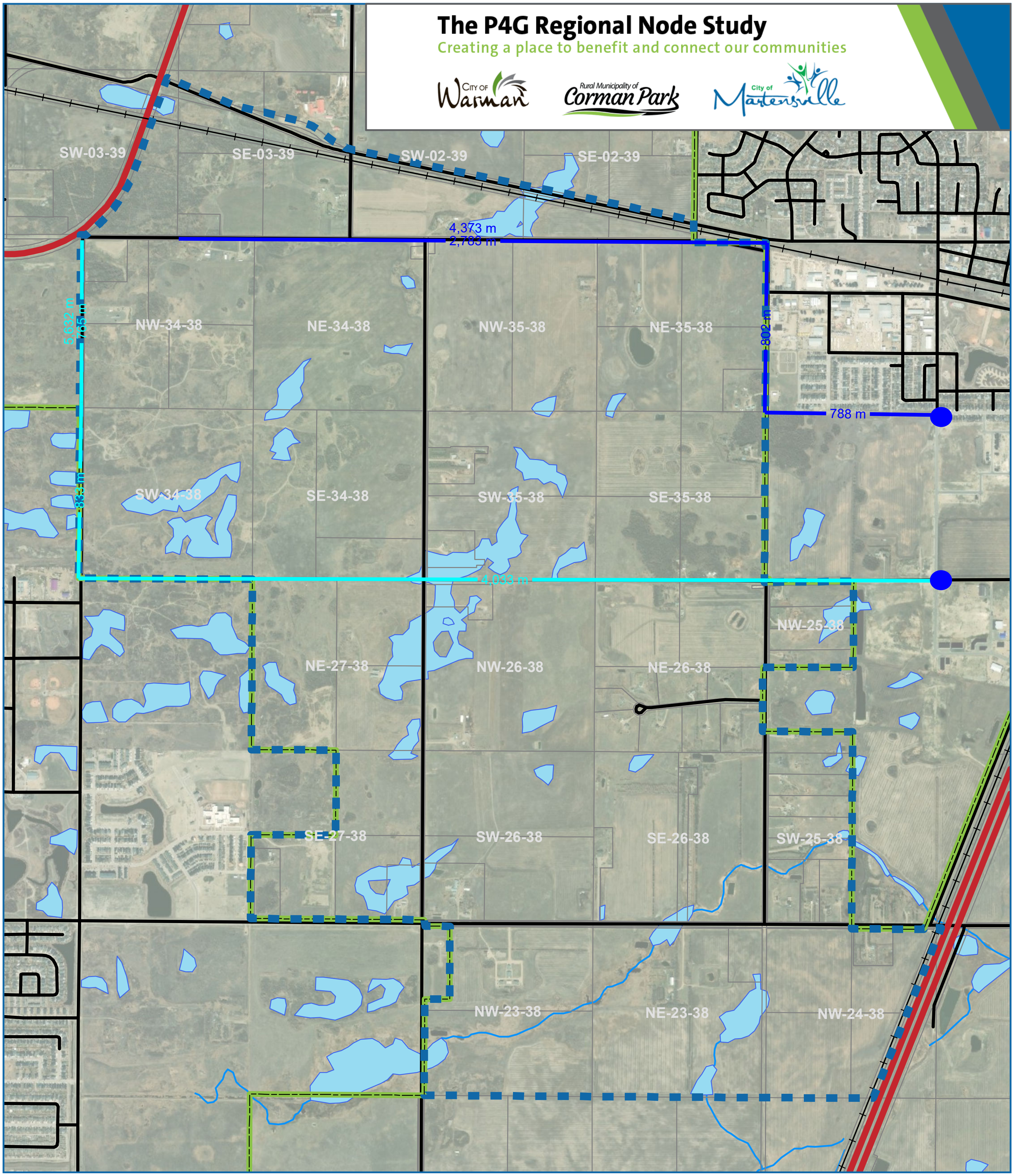
0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX B: MARTENSVILLE WATER SERVICING BY PLANNING UNIT

APPENDIX C
Warman Water Servicing by Planning Unit



Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

ISL

N

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX C:
WARMAN
WATER SERVICING
BY PLANNING UNIT

Date: 7/30/2024

Document: M:\16467_P4G_Regional_Node\25_GIS\251_Figures\Appendix_Basemaps\16467_P4G_RNS_Appendix C_Base.mxd

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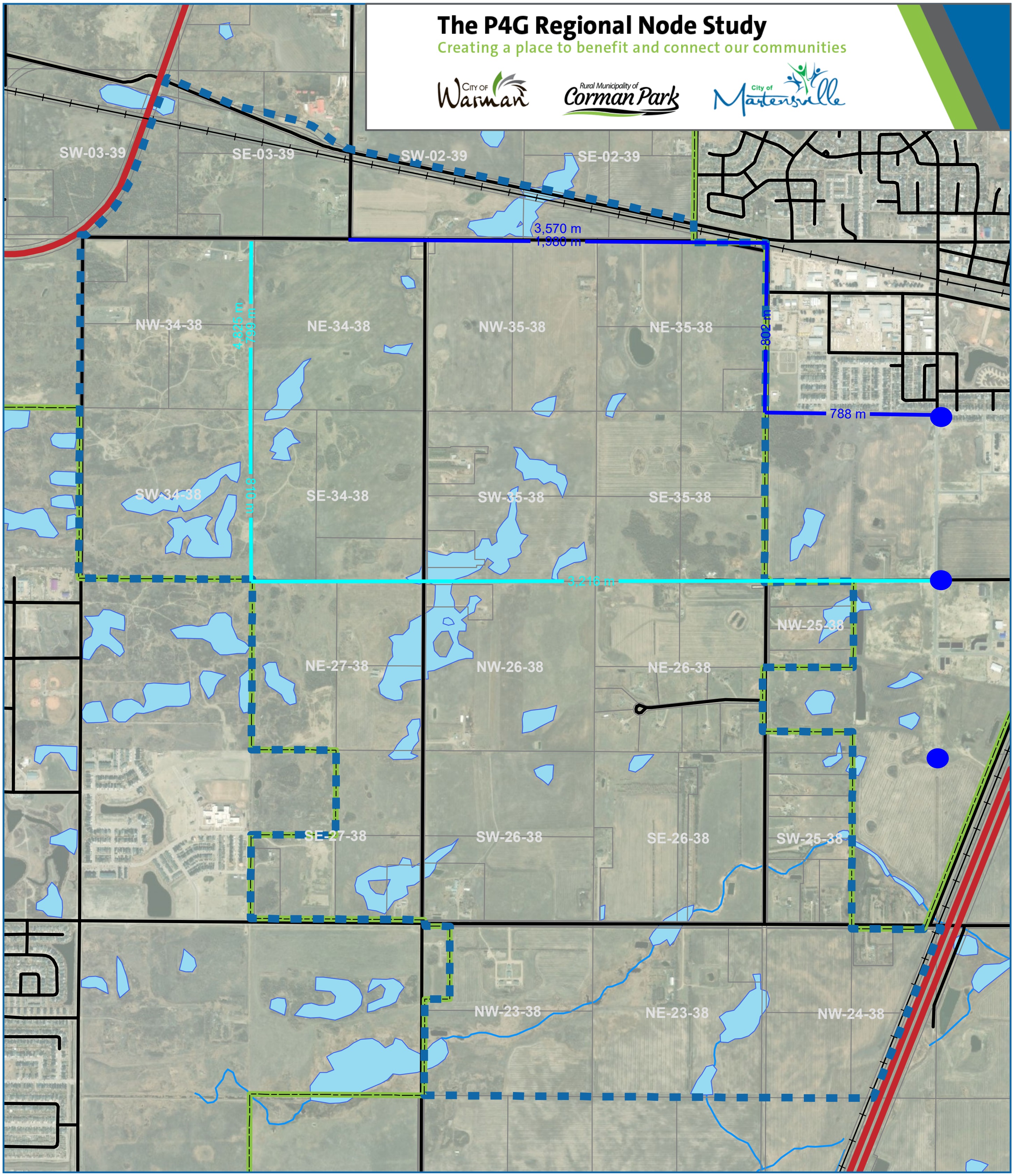

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX C: WARMAN WATER SERVICING BY PLANNING UNIT

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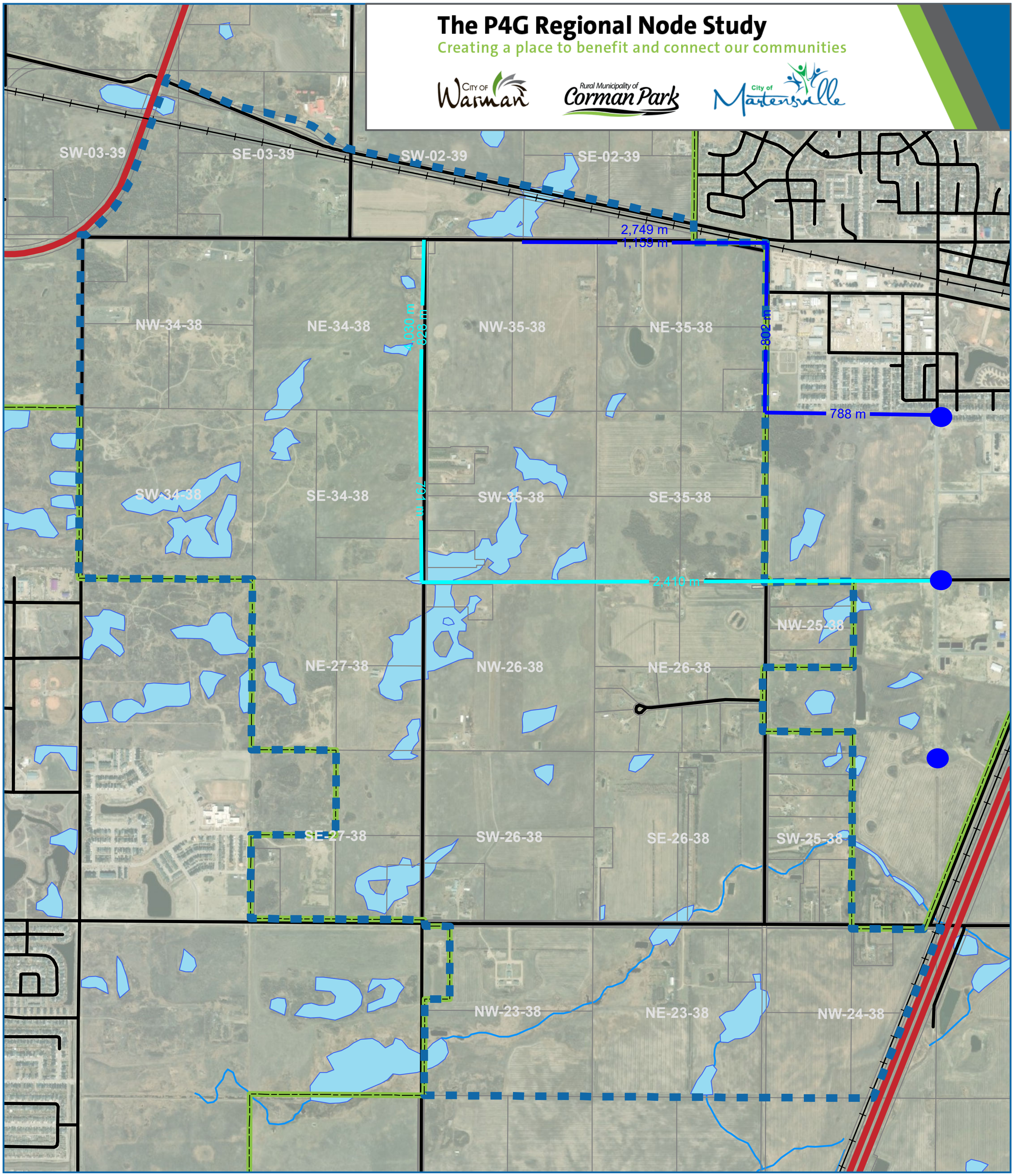

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX C: WARMAN WATER SERVICING BY PLANNING UNIT

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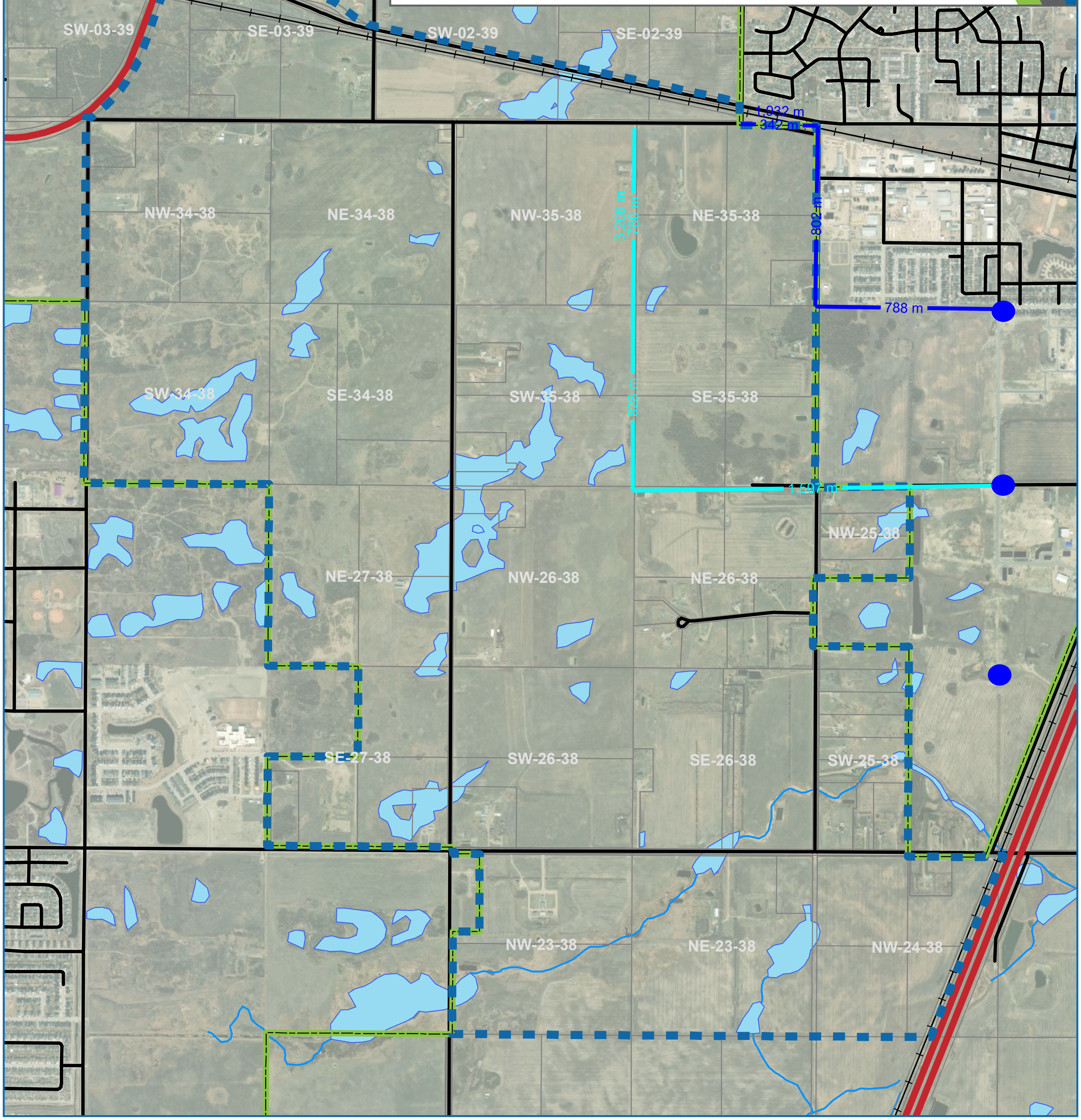

ISL

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX C: WARMAN WATER SERVICING BY PLANNING UNIT

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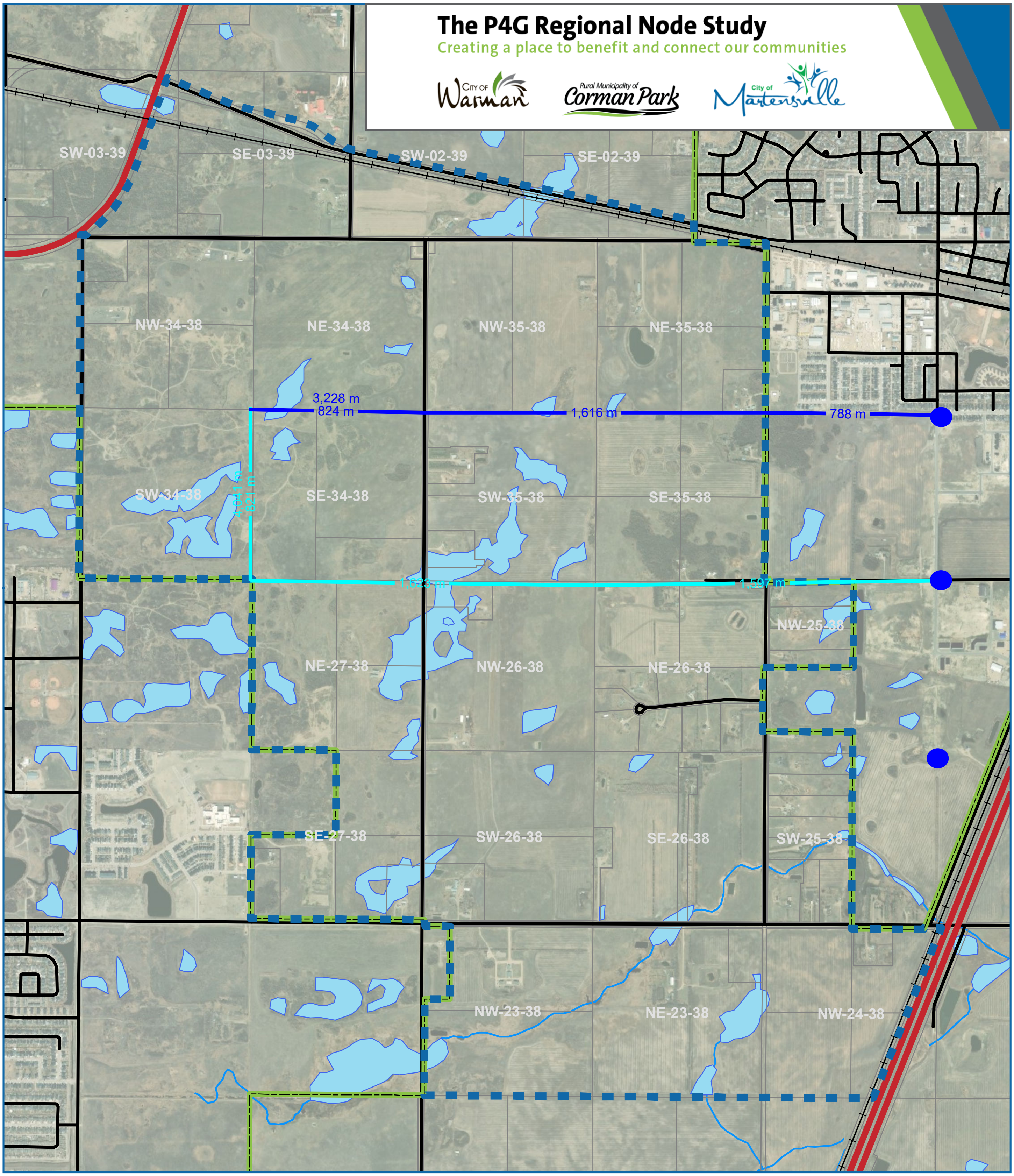

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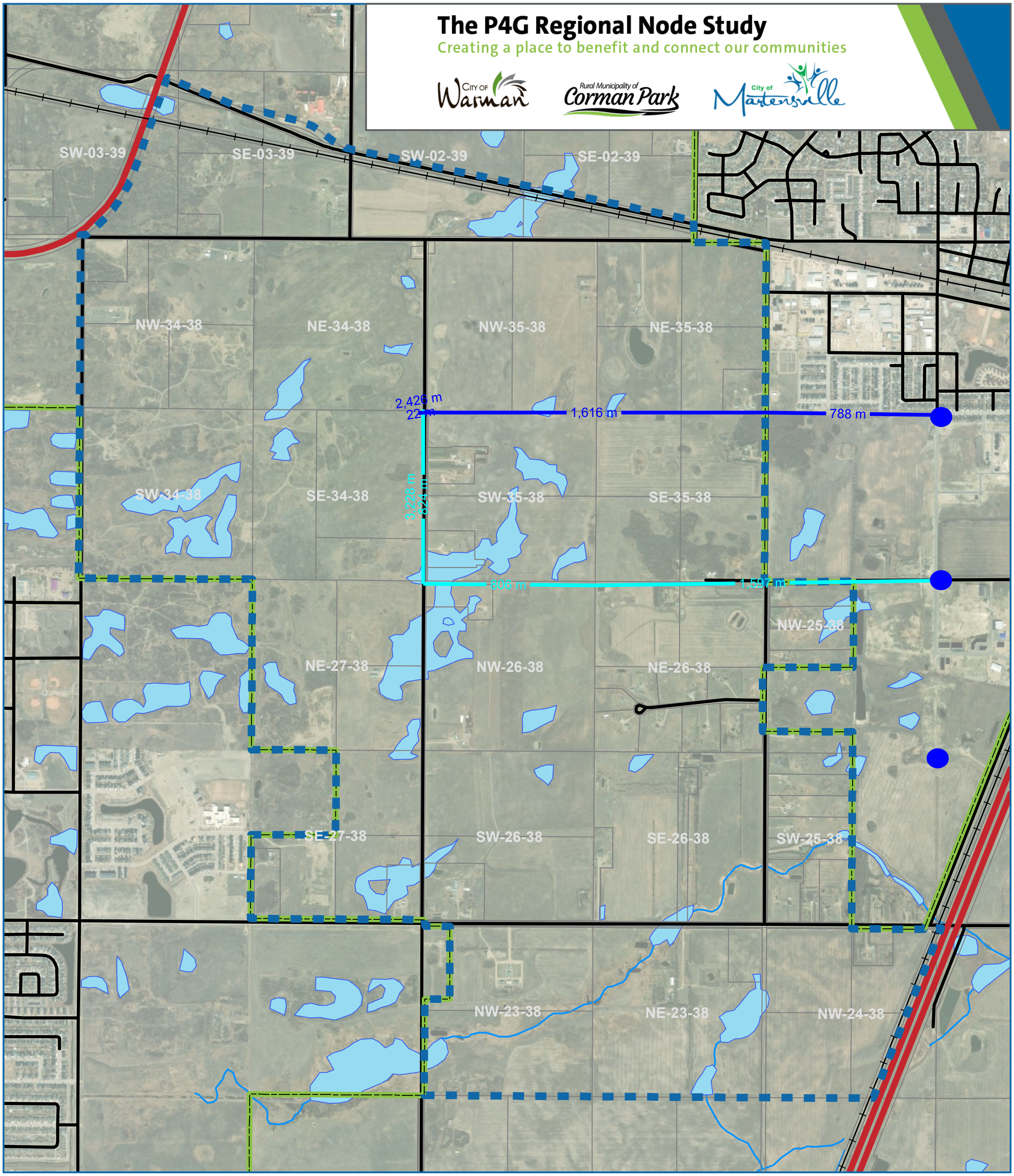
ISL

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX C: WARMAN WATER SERVICING BY PLANNING UNIT



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ISL

N

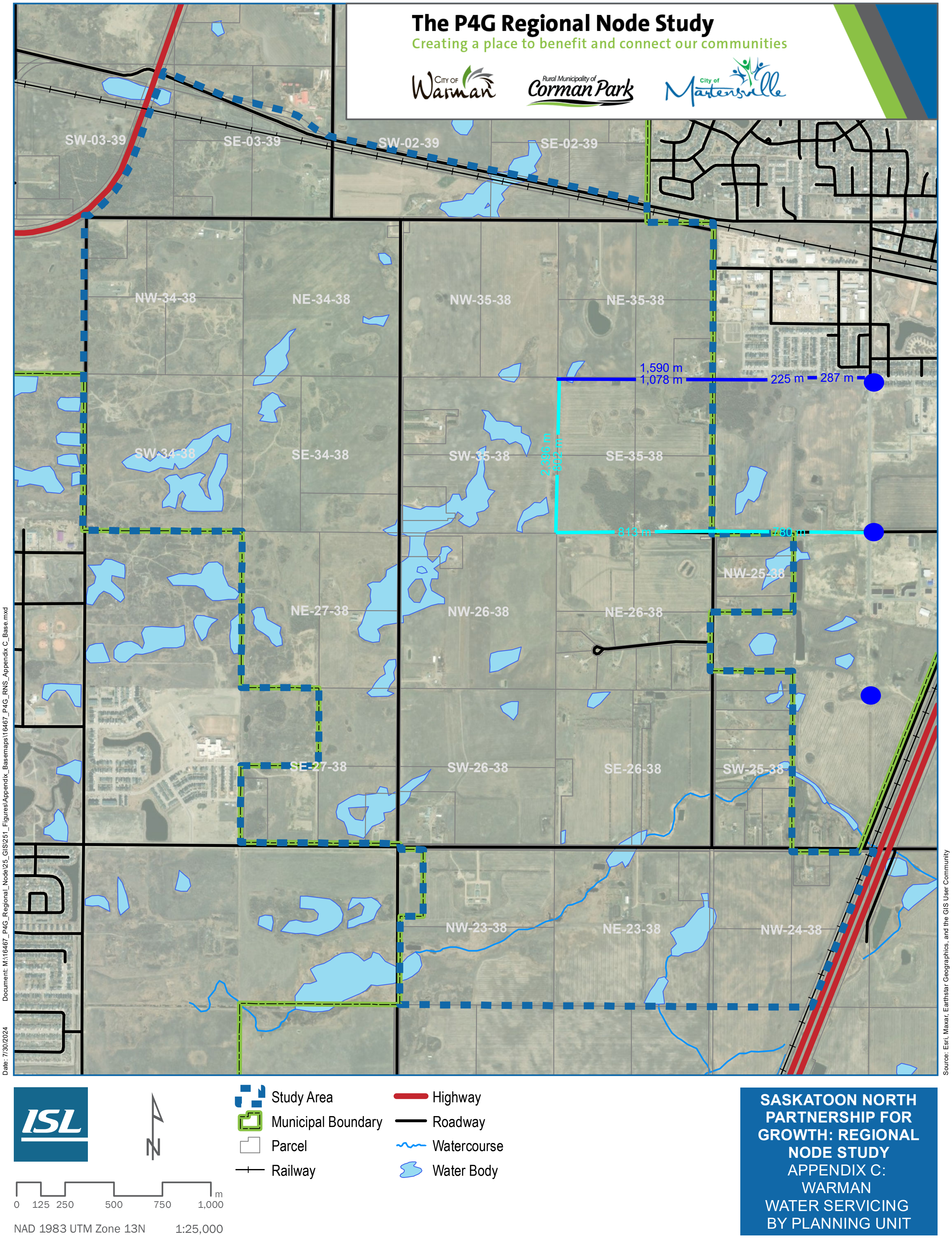
0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

- Study Area
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
- Watercourse
- Water Body

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX C: WARMAN WATER SERVICING BY PLANNING UNIT



SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX C: WARMAN WATER SERVICING BY PLANNING UNIT

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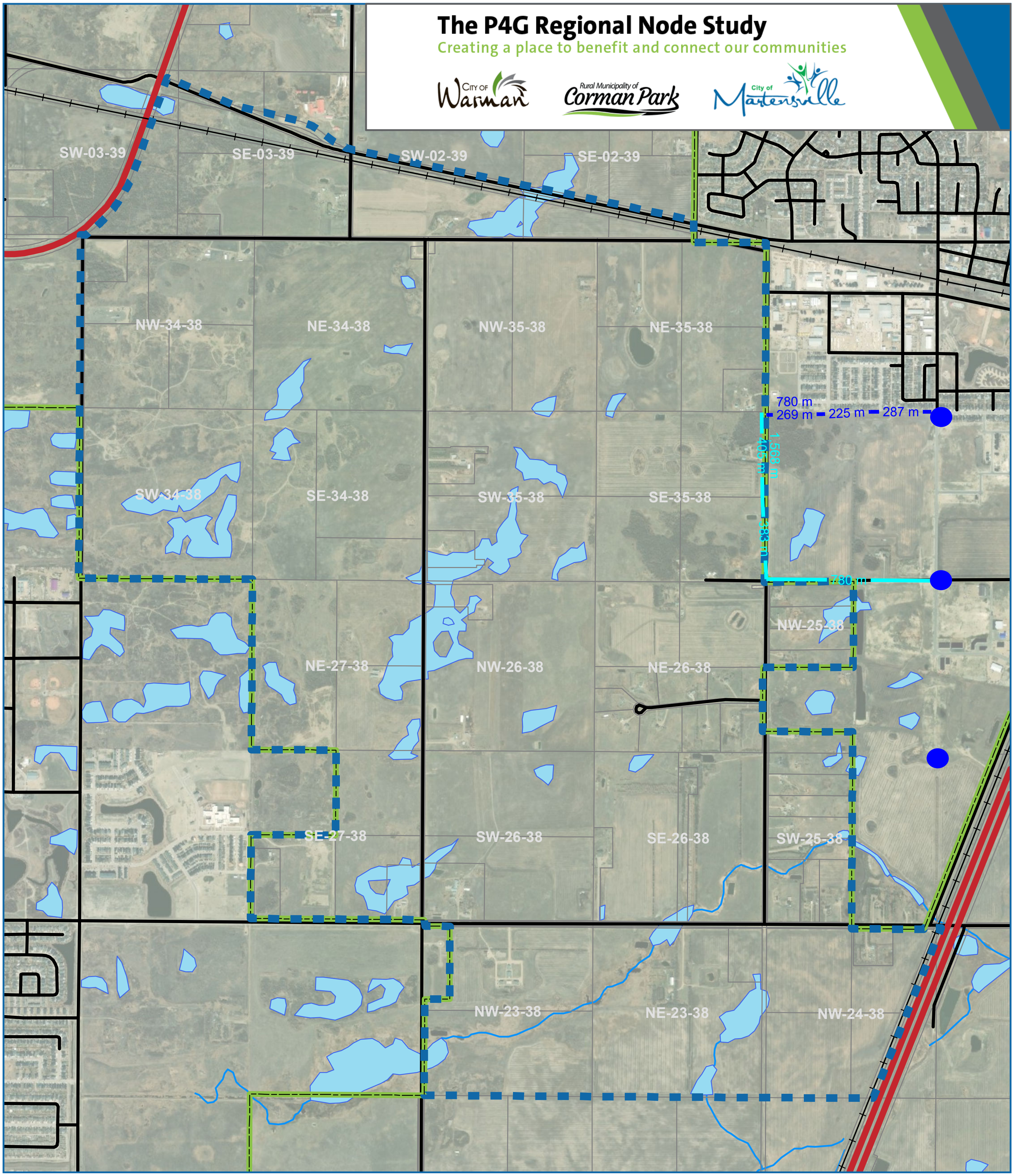

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ISL

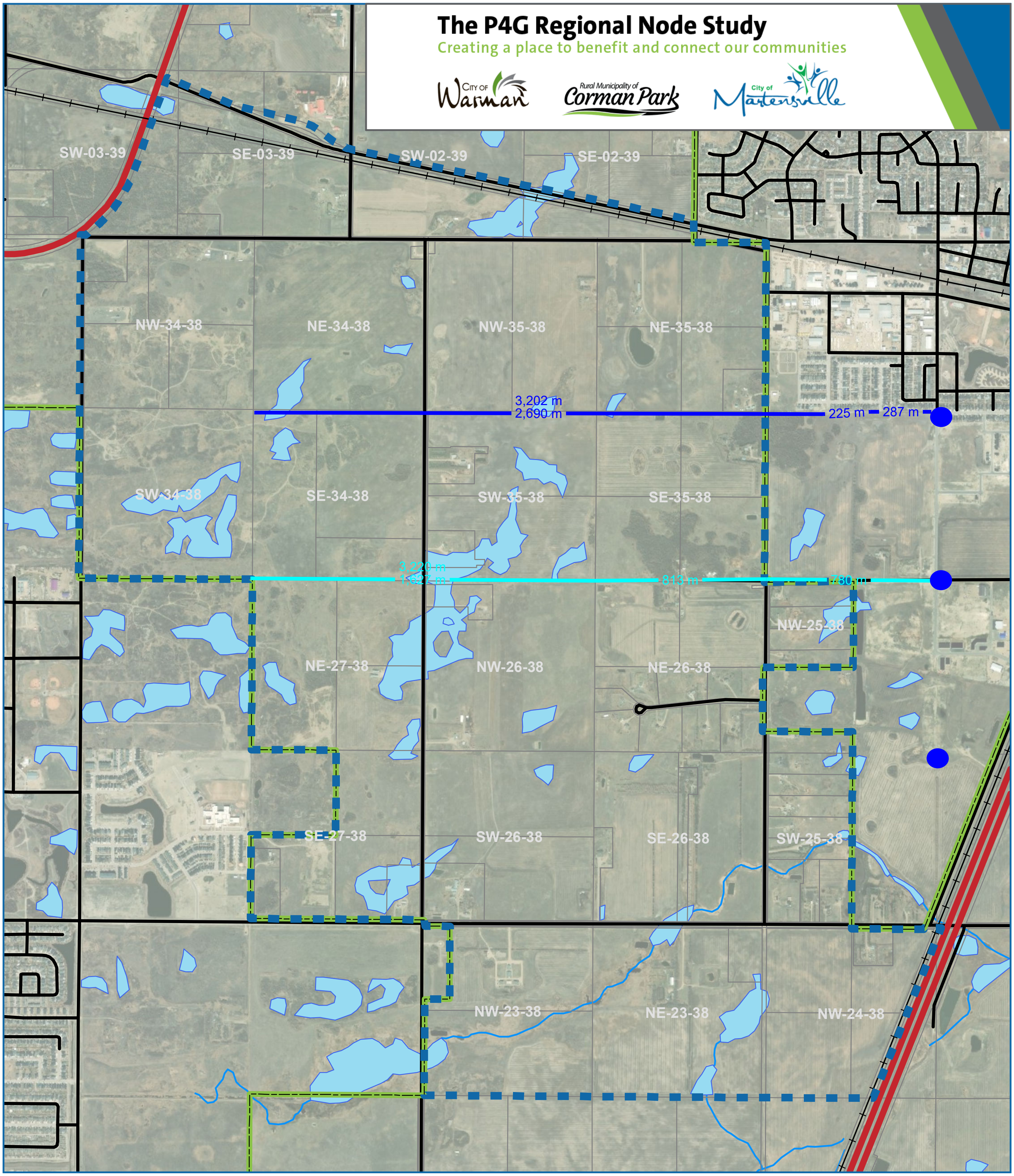
Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX C: WARMAN WATER SERVICING BY PLANNING UNIT



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ISL

N

- Study Area
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
- Watercourse
- Water Body

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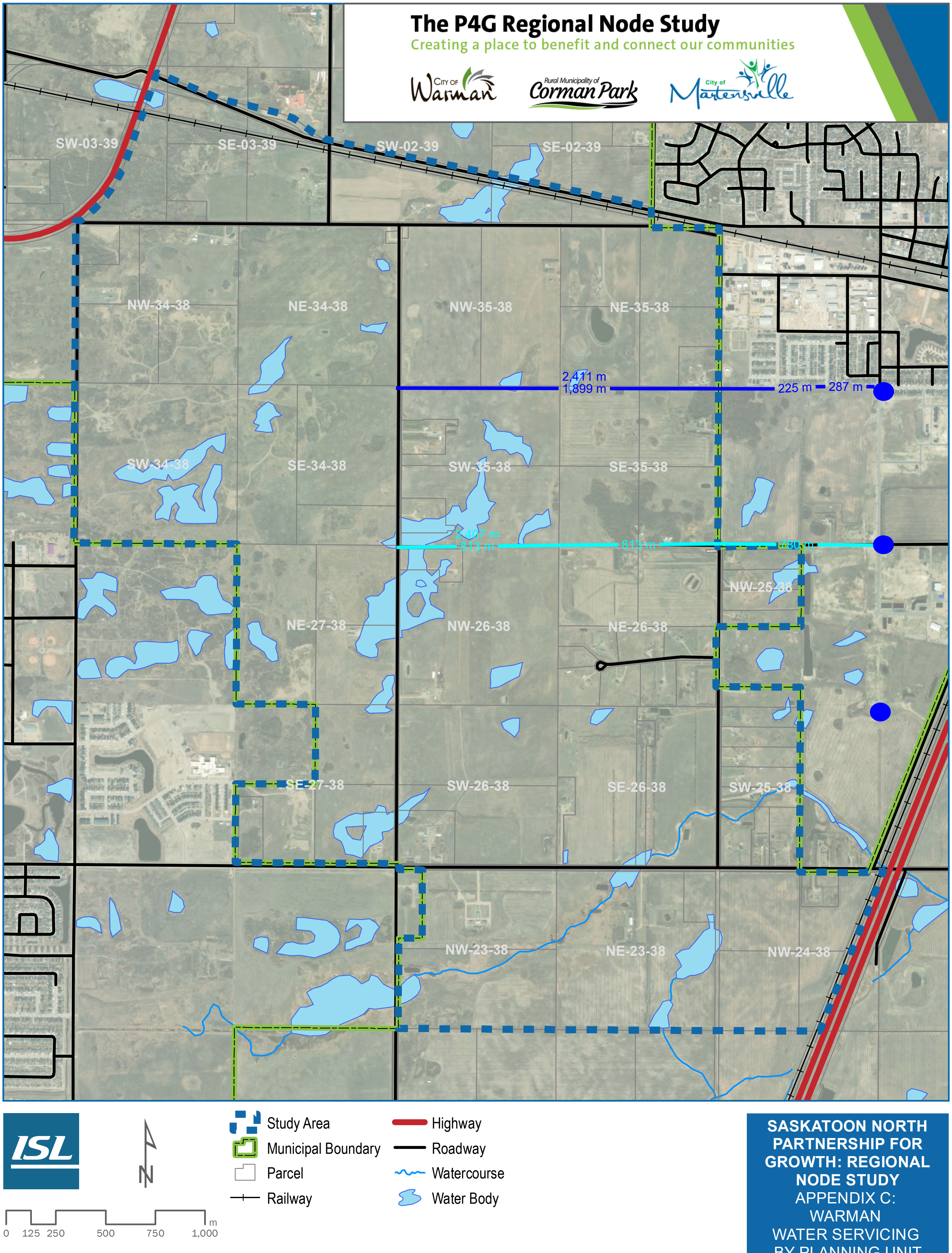
NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX C: WARMAN WATER SERVICING BY PLANNING UNIT



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ISL

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX C:
WARMAN
WATER SERVICING
BY PLANNING UNIT

The P4G Regional Node Study

Creating a place to benefit and connect our communities

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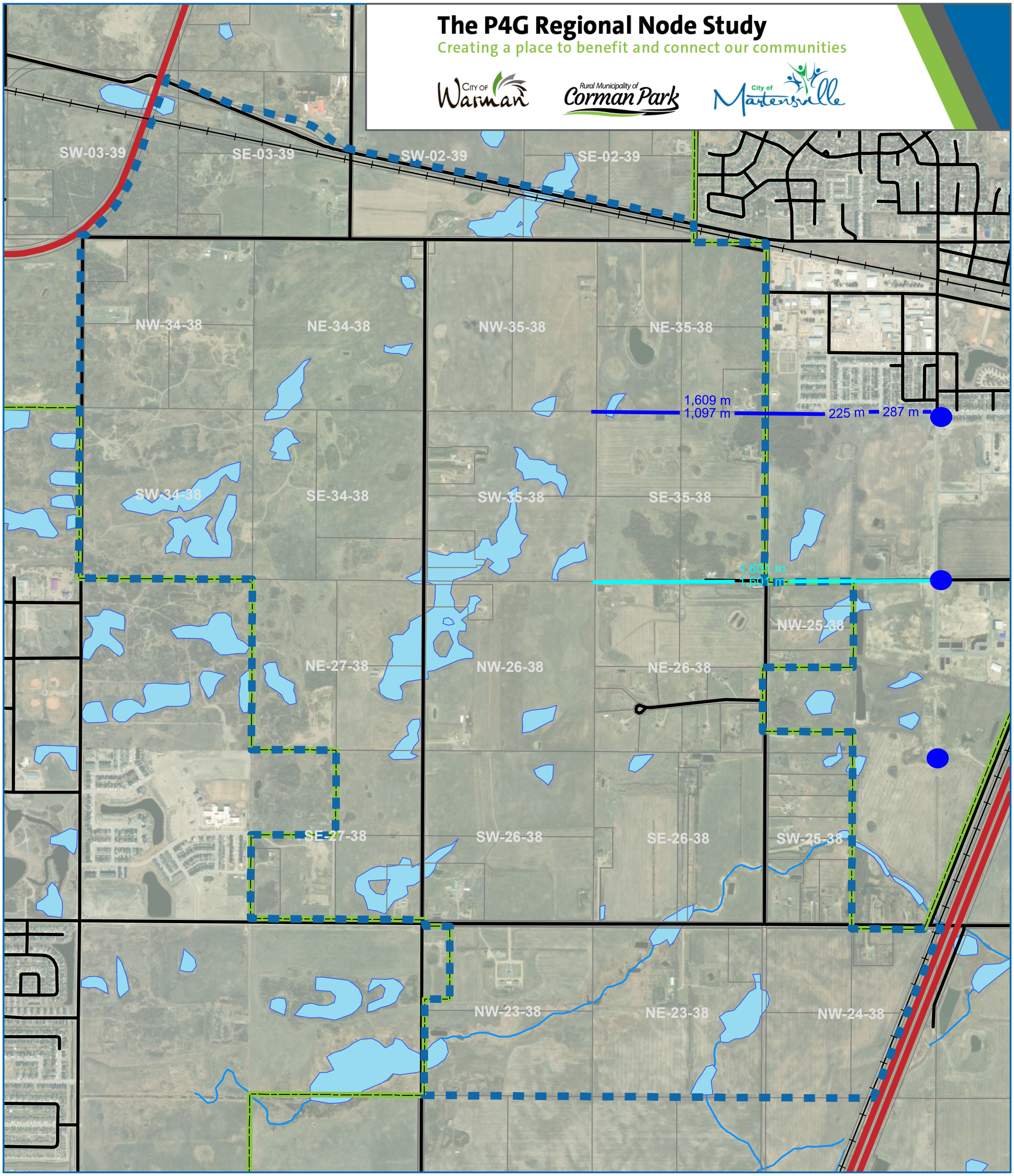

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ISL

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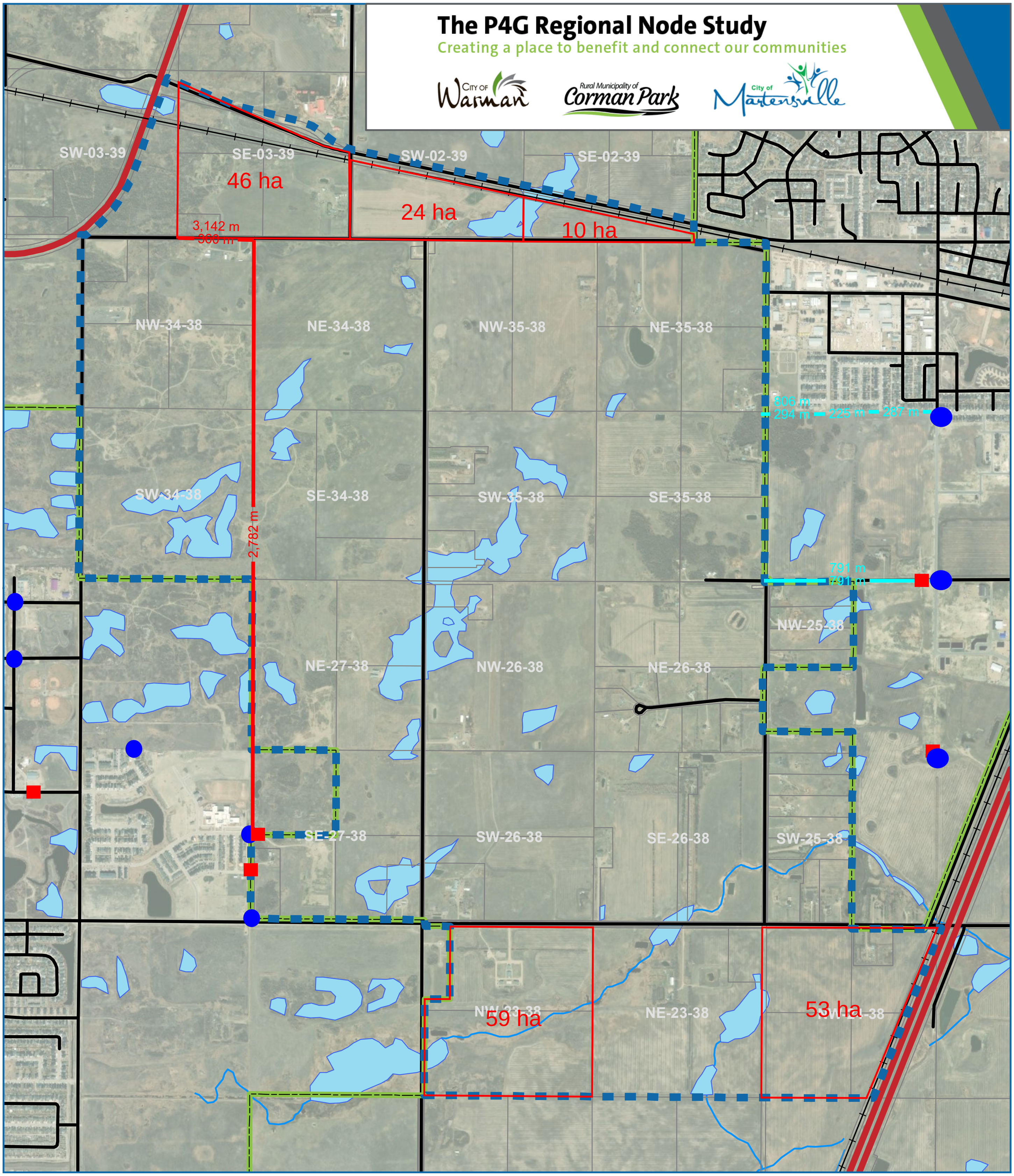
SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX C:
WARMAN
WATER SERVICING
BY PLANNING UNIT



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- Study Area
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0 125 250 500 750 1,000 m

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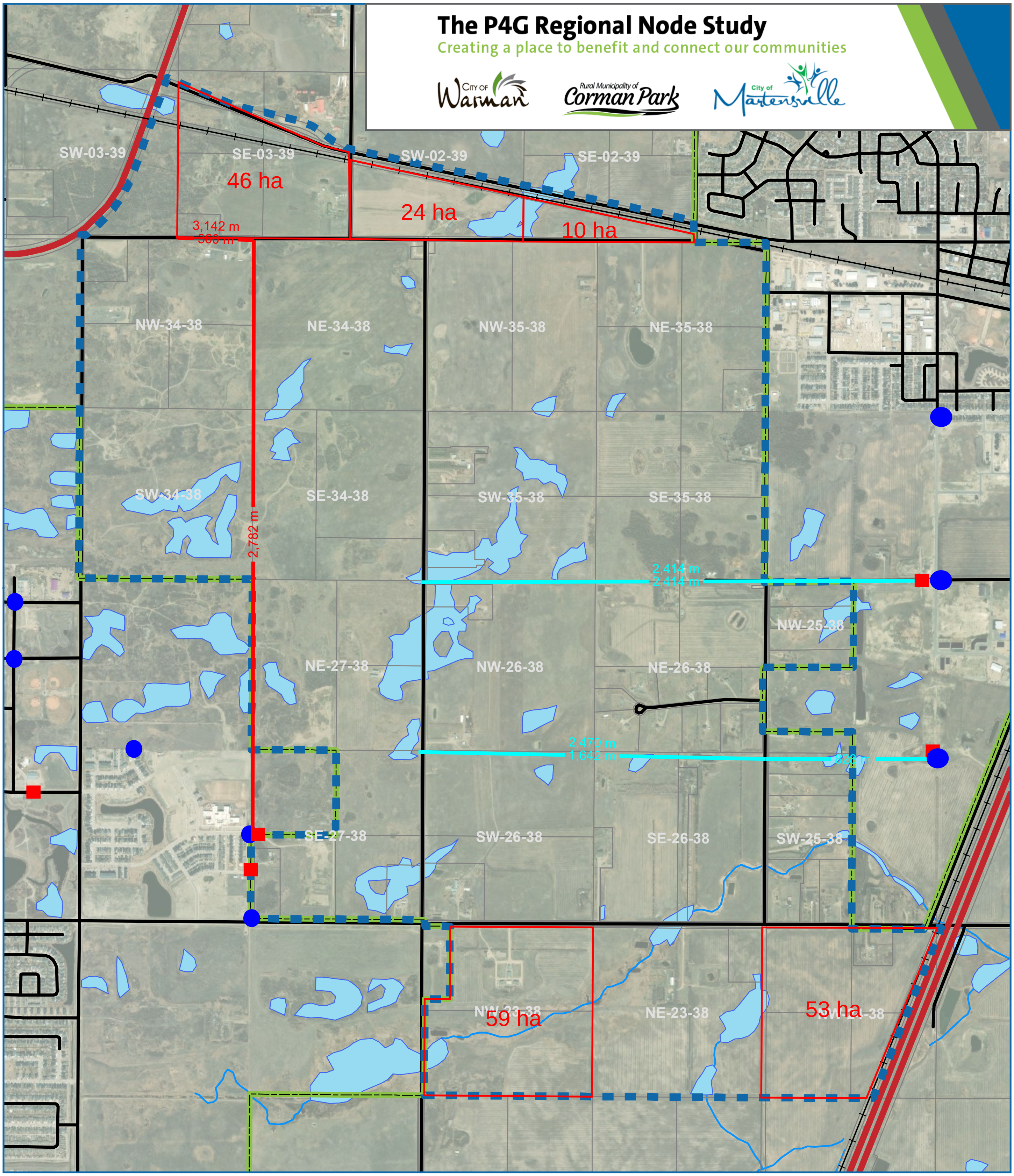
SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX C: WARMAN WATER SERVICING BY PLANNING UNIT



Study Area
Municipal Boundary
Parcel
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Highway
Roadway
Watercourse
Water Body

ISL

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0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX C:
WARMAN
WATER SERVICING
BY PLANNING UNIT

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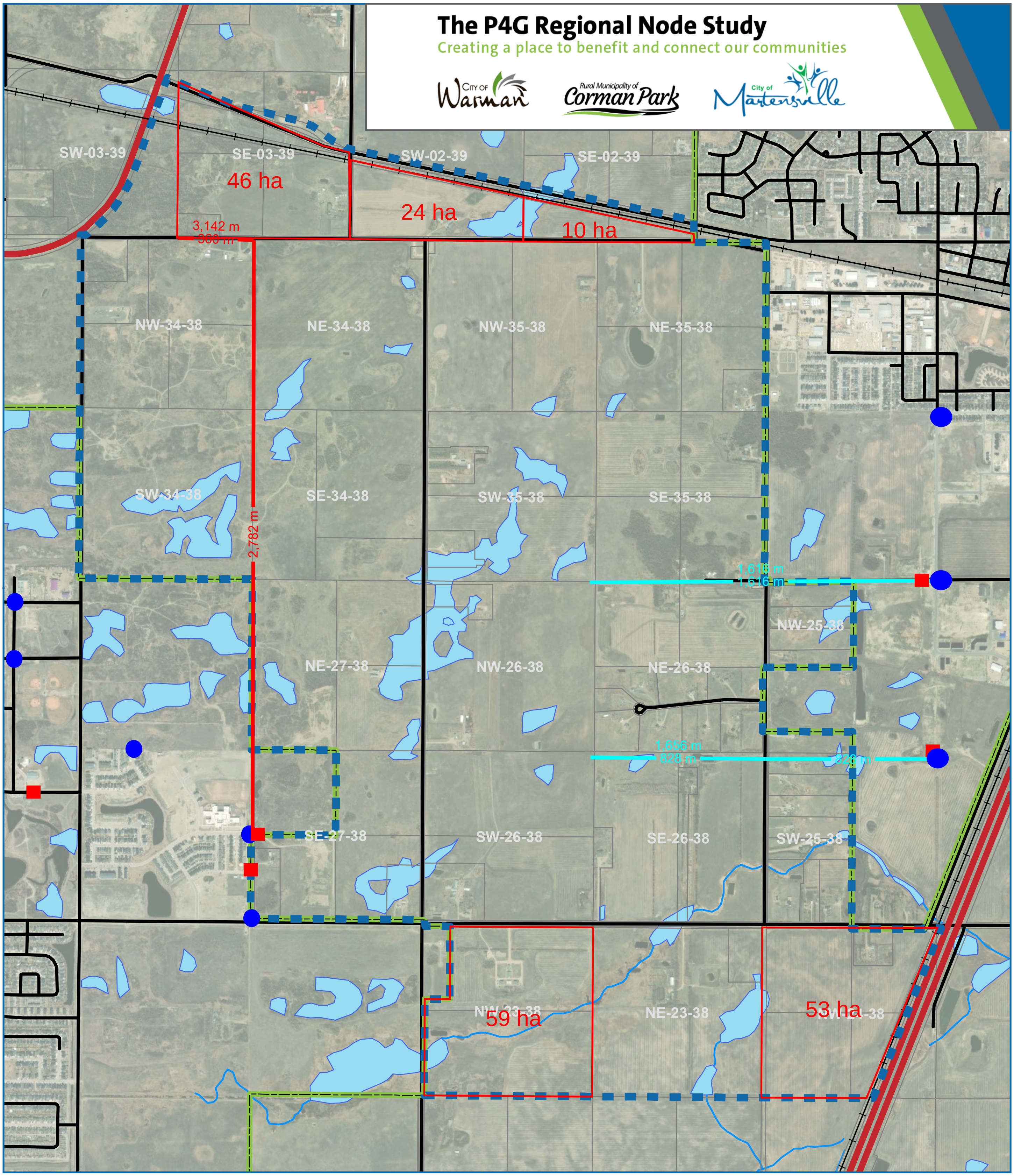

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ISL

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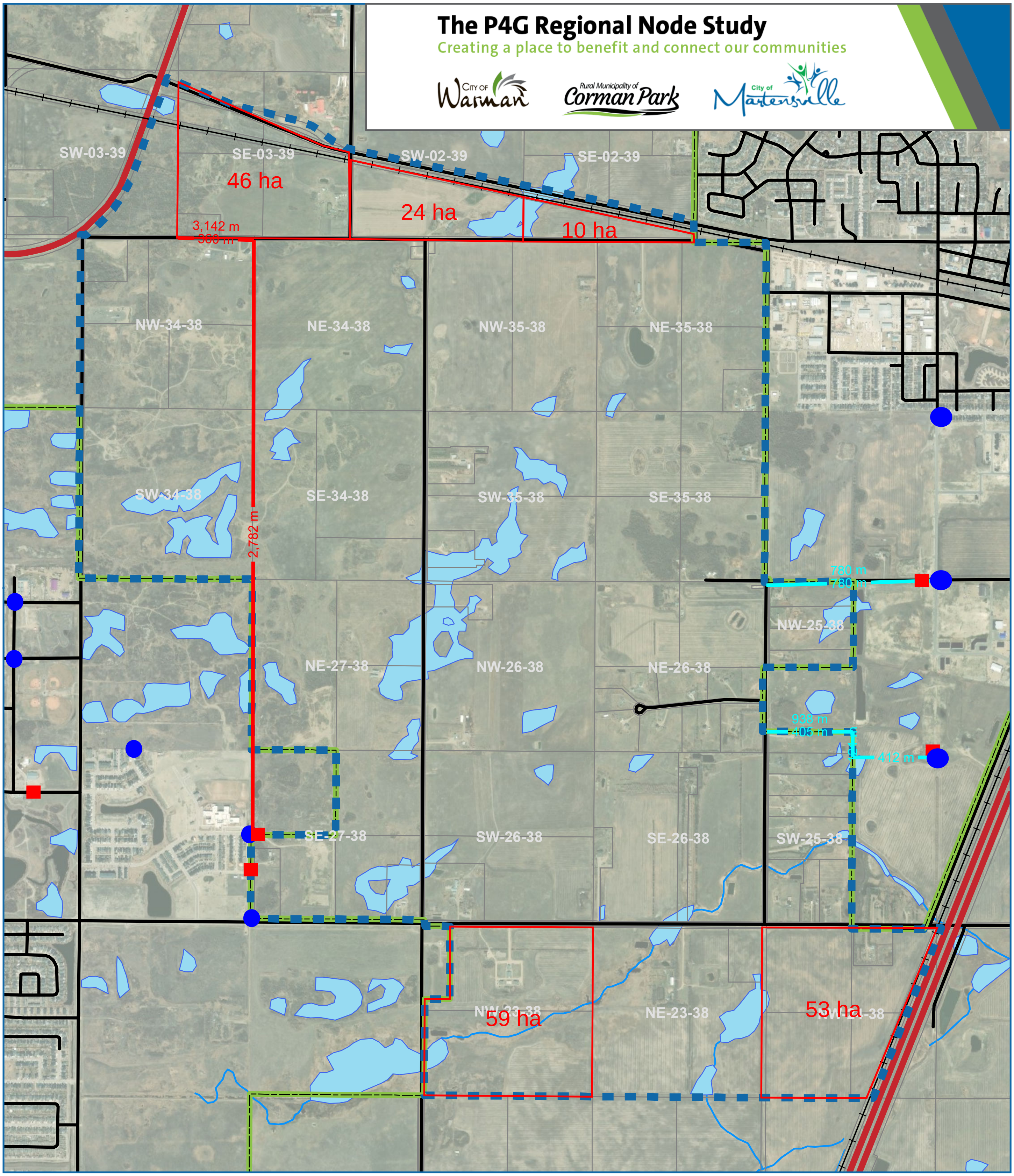
0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX C:
WARMAN
WATER SERVICING
BY PLANNING UNIT



Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX C: WARMAN WATER SERVICING BY PLANNING UNIT

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The P4G Regional Node Study

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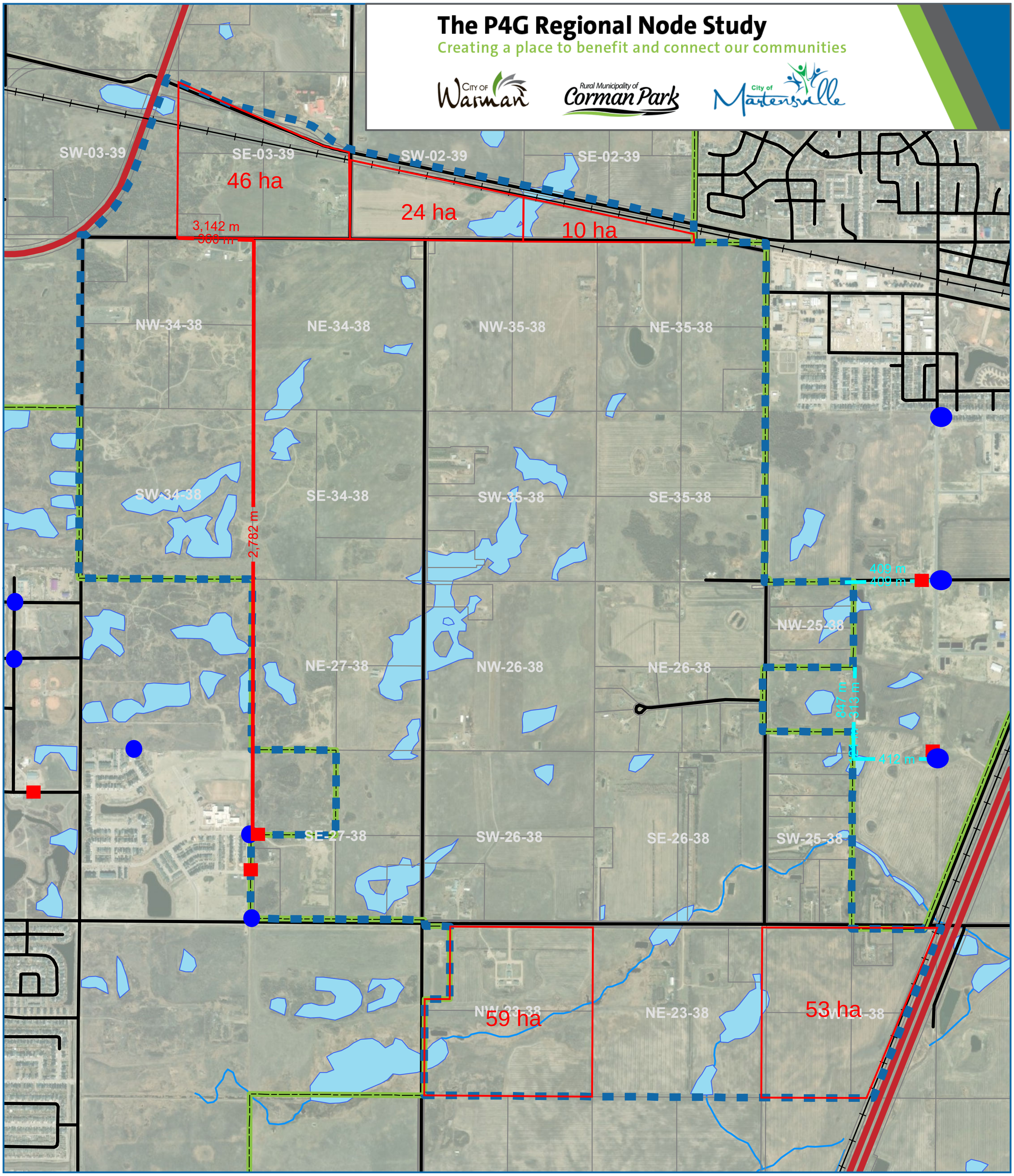

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX C:
WARMAN
WATER SERVICING
BY PLANNING UNIT

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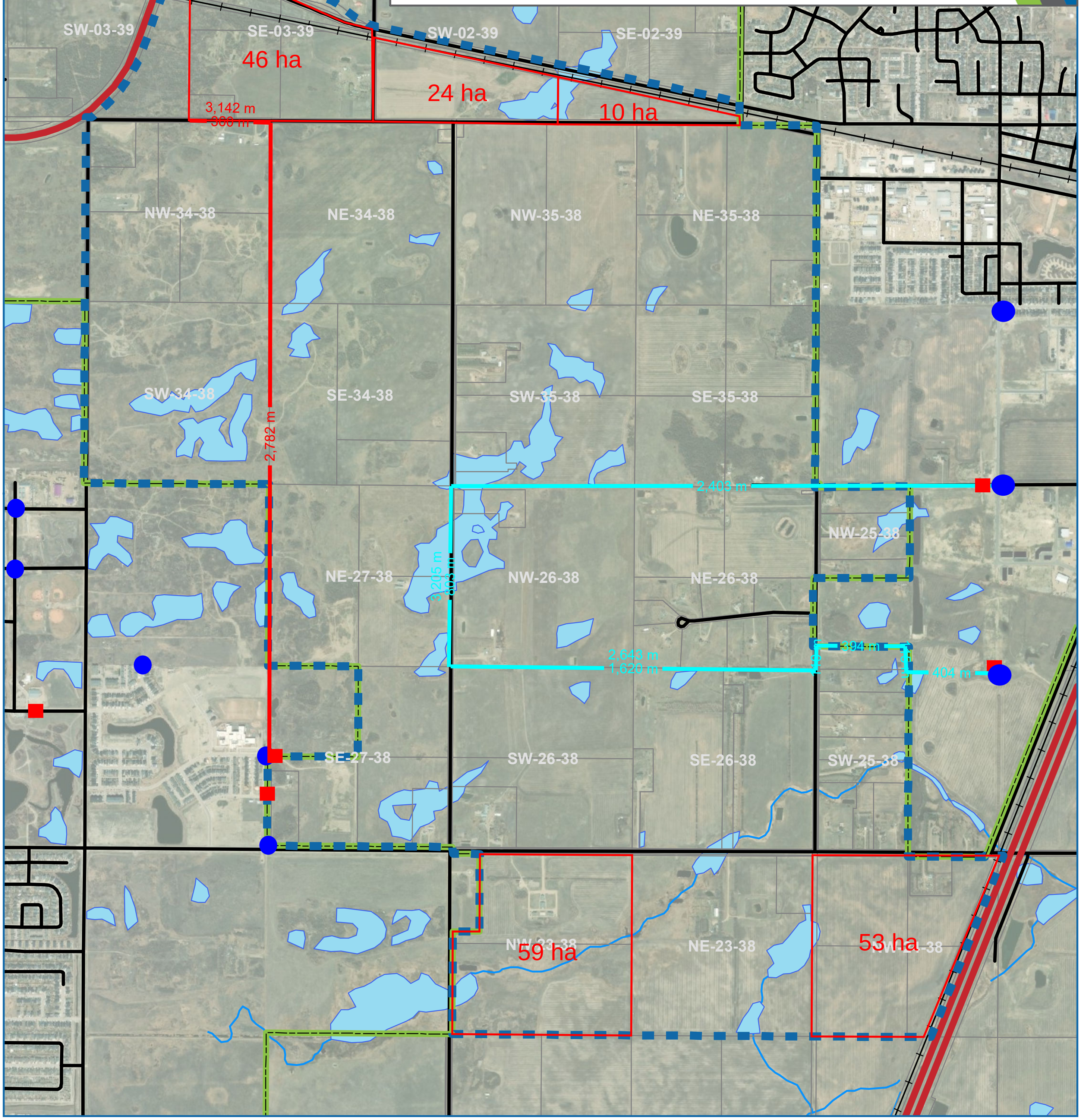

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Date: 7/30/2024

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ISL

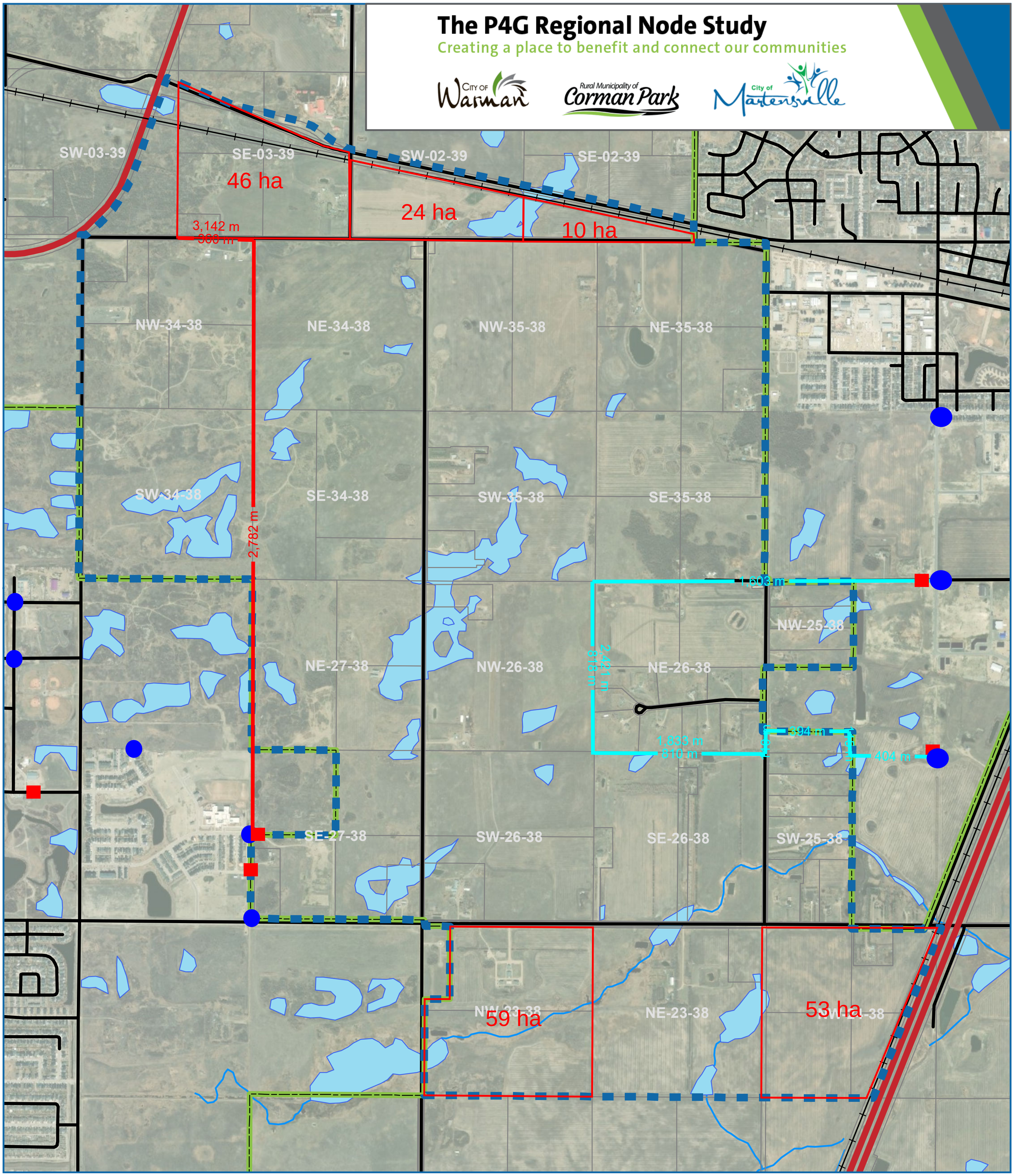
Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX C: WARMAN WATER SERVICING BY PLANNING UNIT



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Date: 7/30/2024

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ISL

N

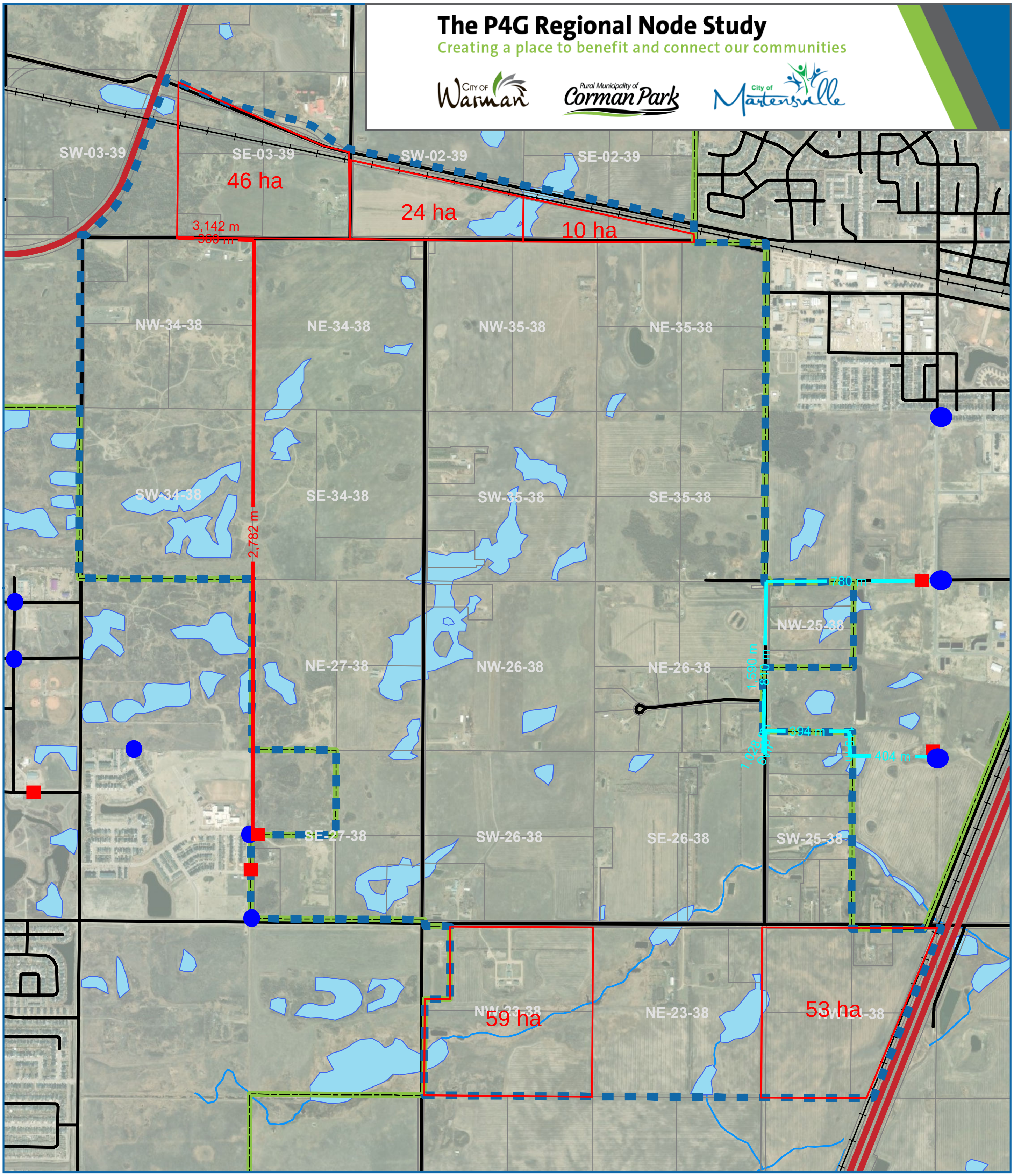
0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

- Study Area
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
- Watercourse
- Water Body

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX C: WARMAN WATER SERVICING BY PLANNING UNIT



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Date: 7/30/2024

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ISL

N

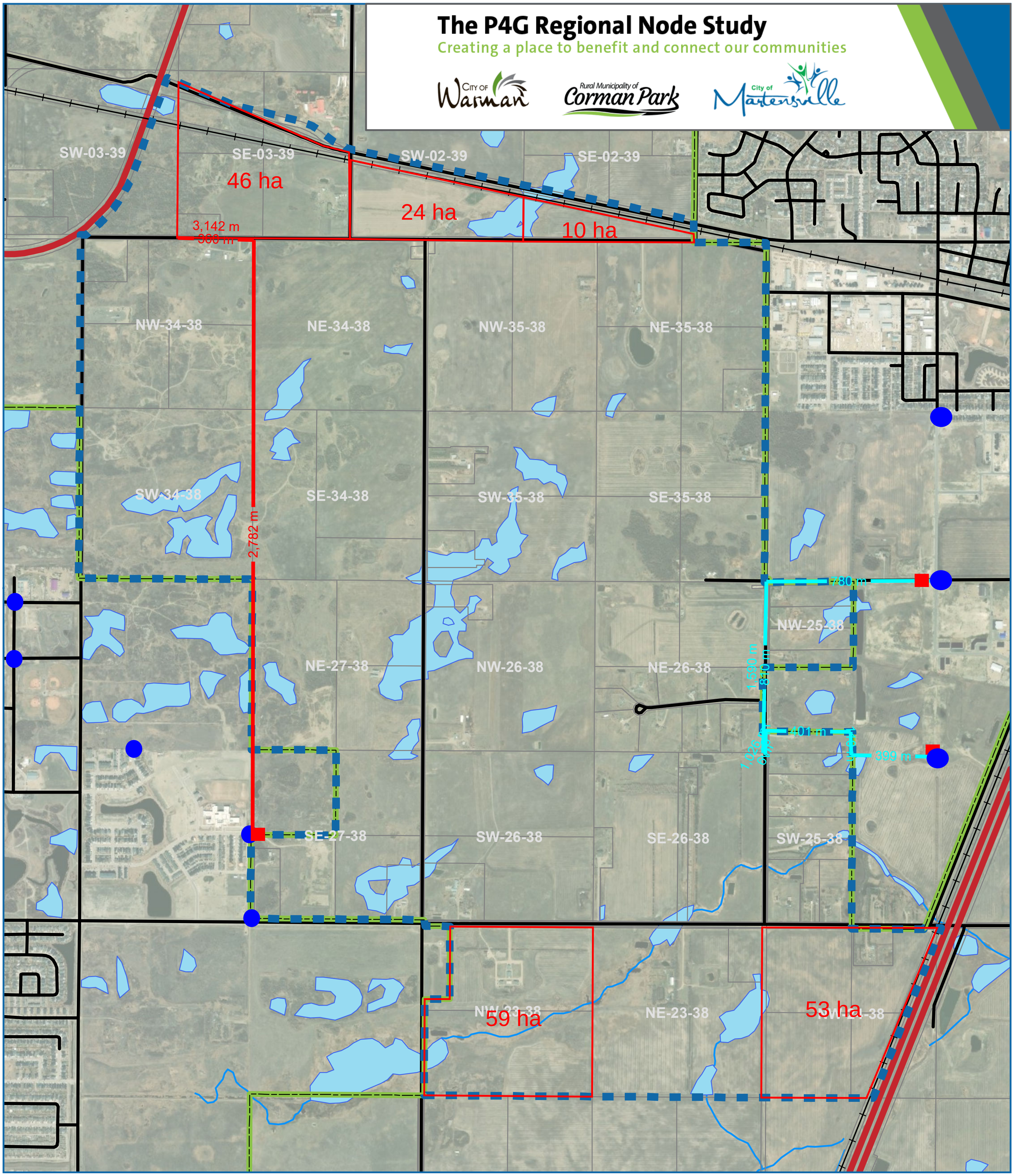
- Study Area
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
- Watercourse
- Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX C: WARMAN WATER SERVICING BY PLANNING UNIT



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ISL

N

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX C:
WARMAN
WATER SERVICING
BY PLANNING UNIT

The P4G Regional Node Study

Creating a place to benefit and connect our communities

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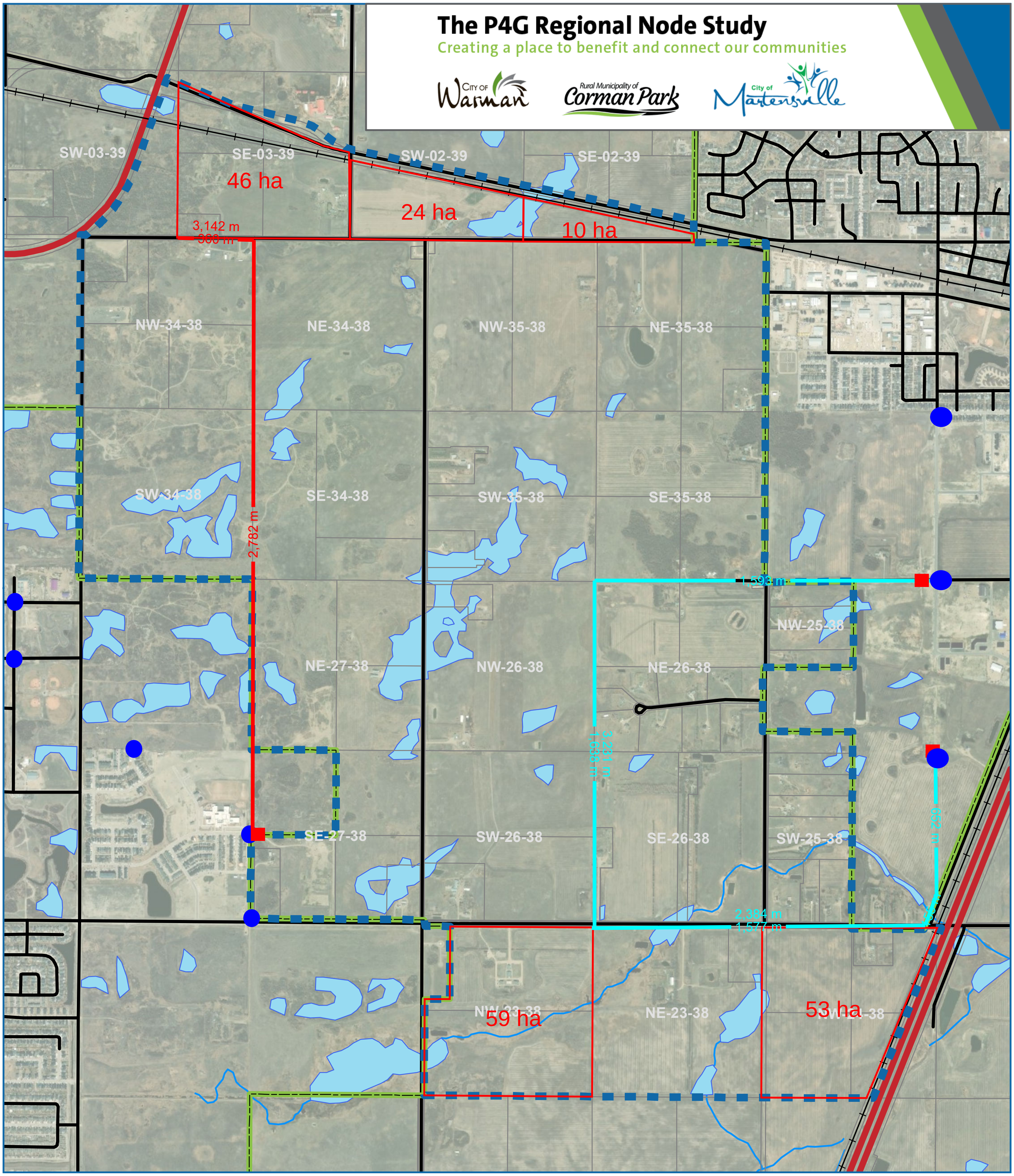

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Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ISL

Legend:
- Study Area
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
- Watercourse
- Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

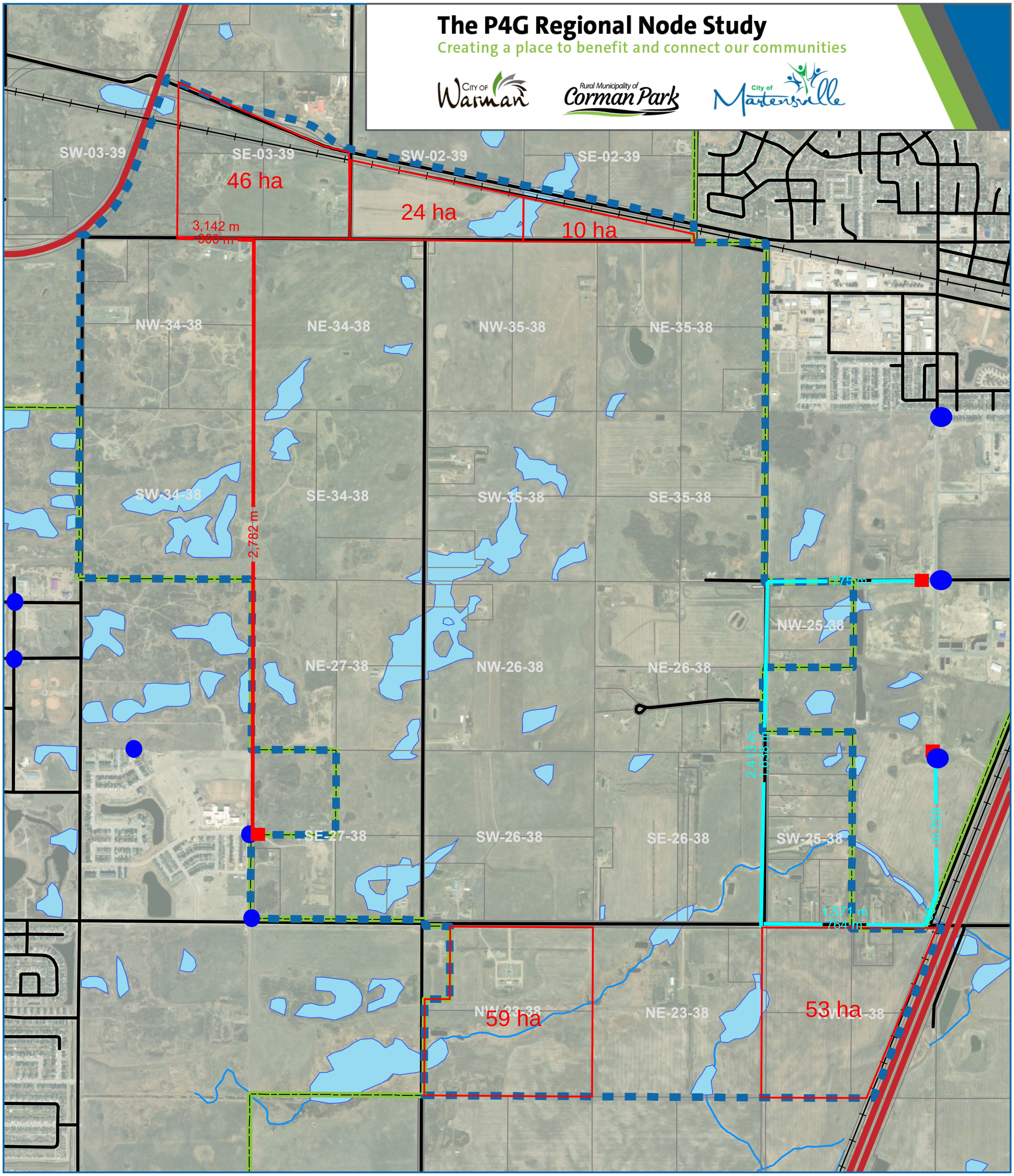
SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX C: WARMAN WATER SERVICING BY PLANNING UNIT

The P4G Regional Node Study

Creating a place to benefit and connect our communities

City of Warman · Rural Municipality of Corman Park · City of Martensville



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ISL

N

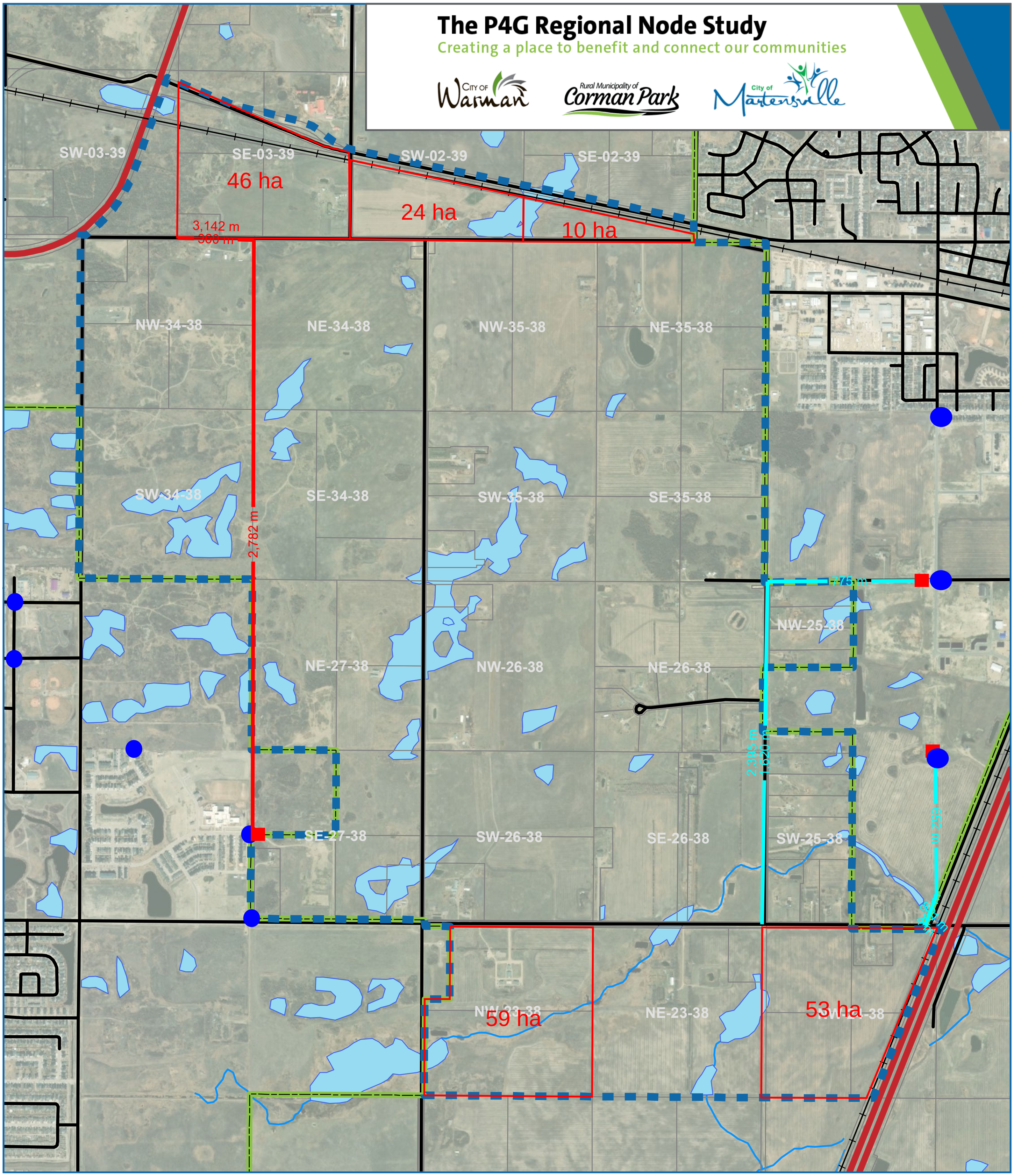
- Study Area
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
- Watercourse
- Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX C:
WARMAN
WATER SERVICING
BY PLANNING UNIT



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ISL

N

- Study Area
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
- Watercourse
- Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX C:
WARMAN
WATER SERVICING
BY PLANNING UNIT

APPENDIX D
SaskWater Servicing by Planning Unit

The P4G Regional Node Study

Creating a place to benefit and connect our communities

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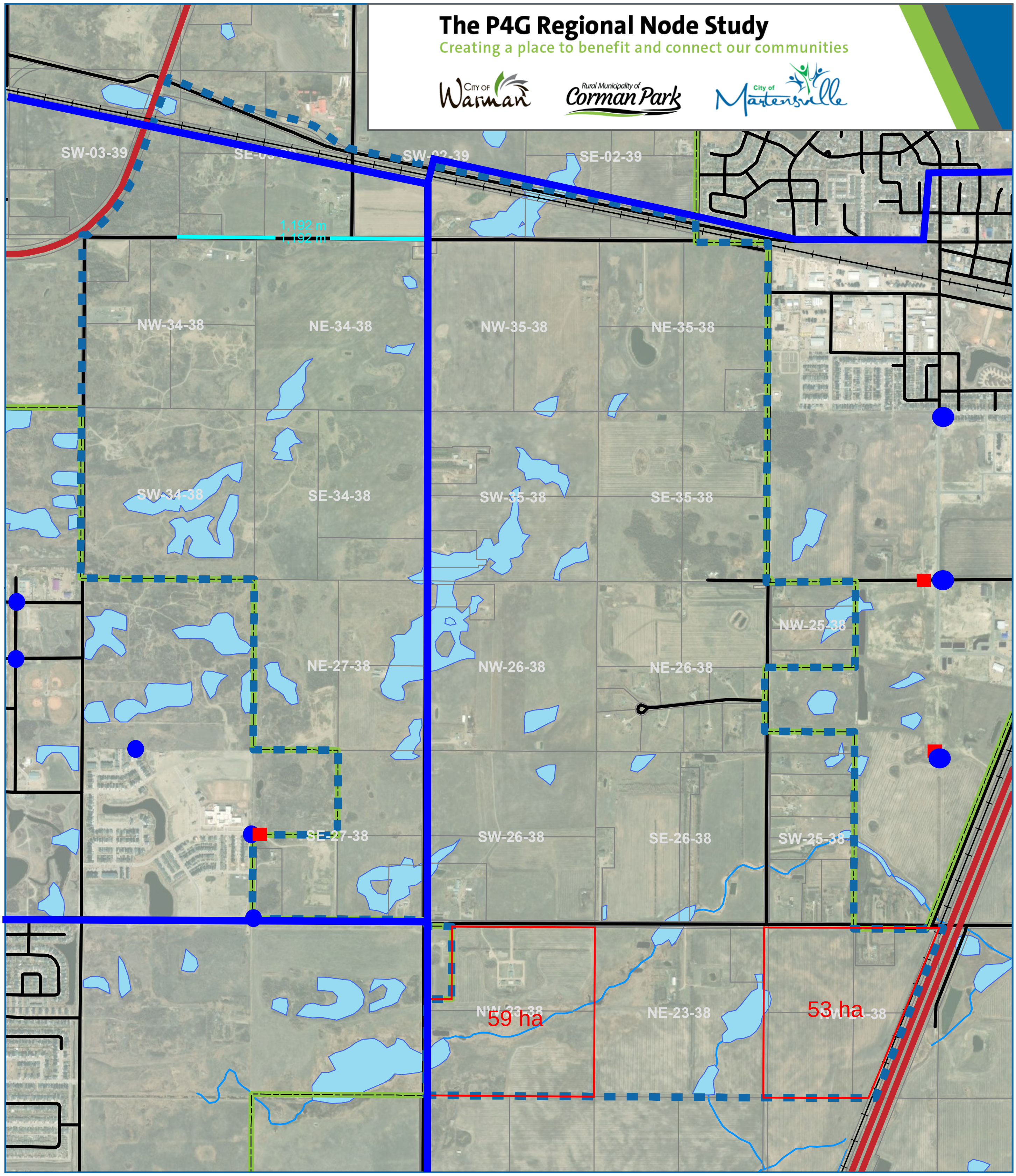

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Date: 7/30/2024

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ISL

N

- Study Area
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
- Watercourse
- Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

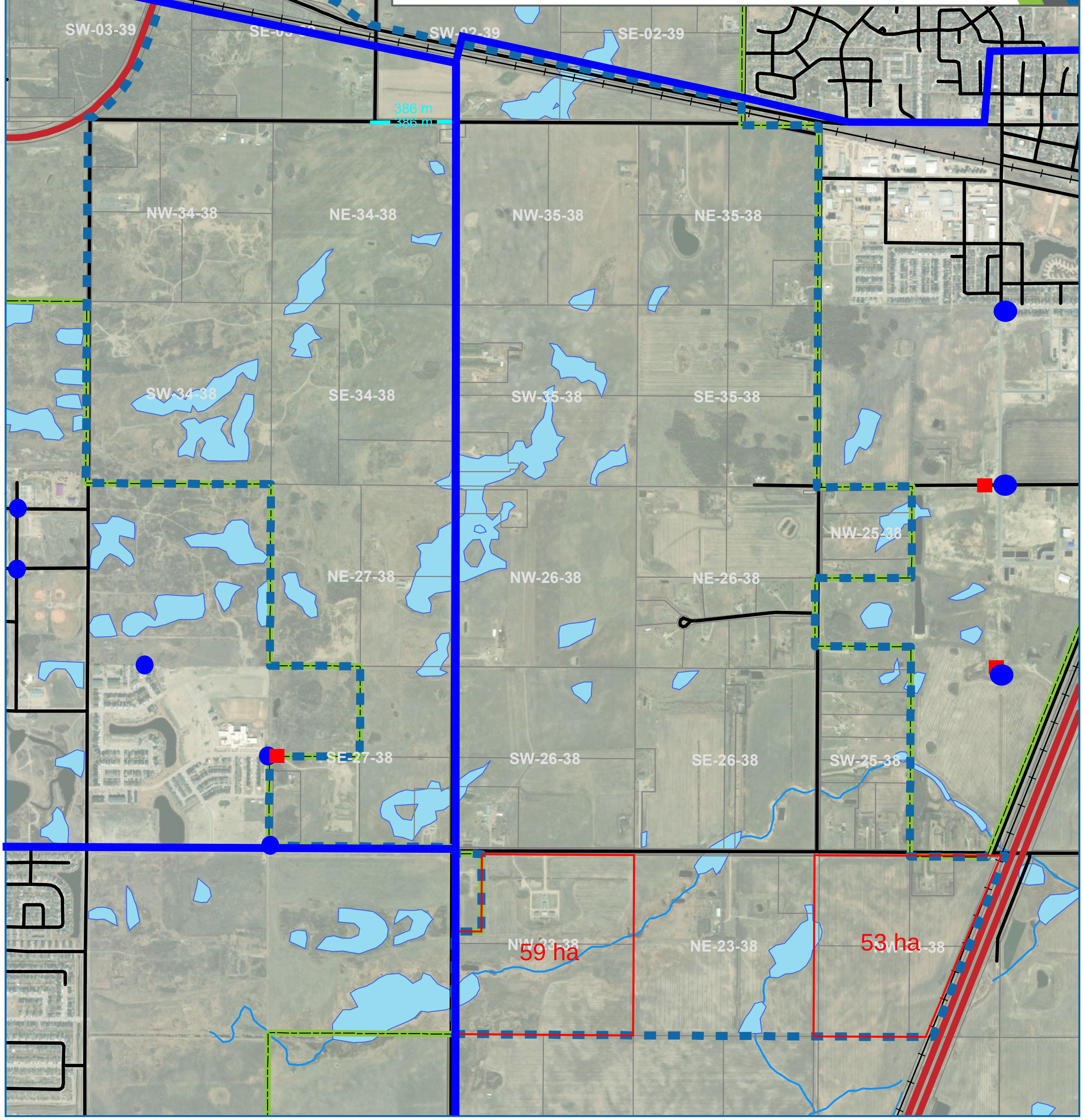
SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX D: SASKWATER SERVICING BY PLANNING UNIT

The P4G Regional Node Study

Creating a place to benefit and connect our communities

City of Warman · Rural Municipality of Corman Park · City of Martensville



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ISL

N

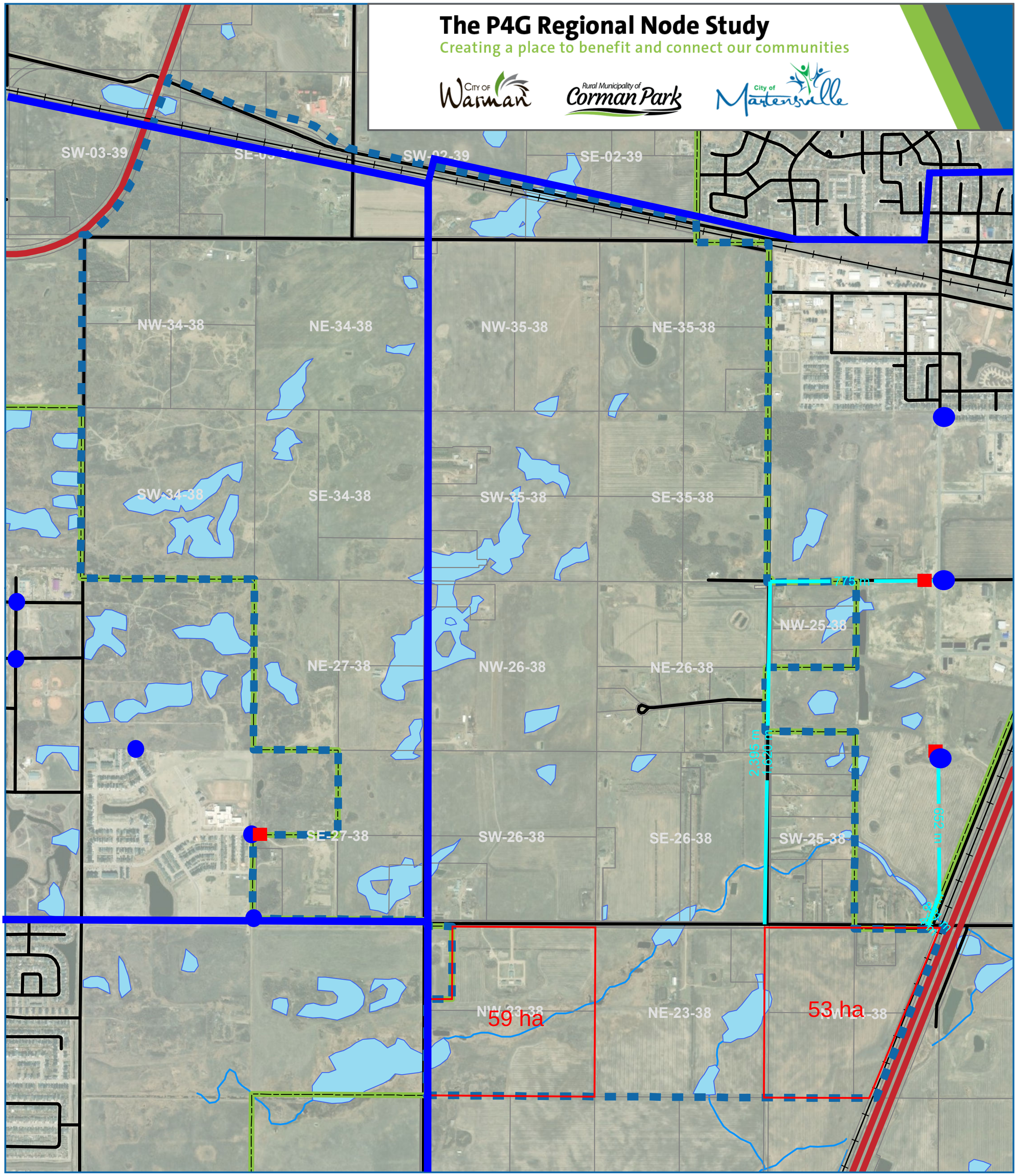
- Study Area
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
- Watercourse
- Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX D: SASKWATER SERVICING BY PLANNING UNIT



ISL

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Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

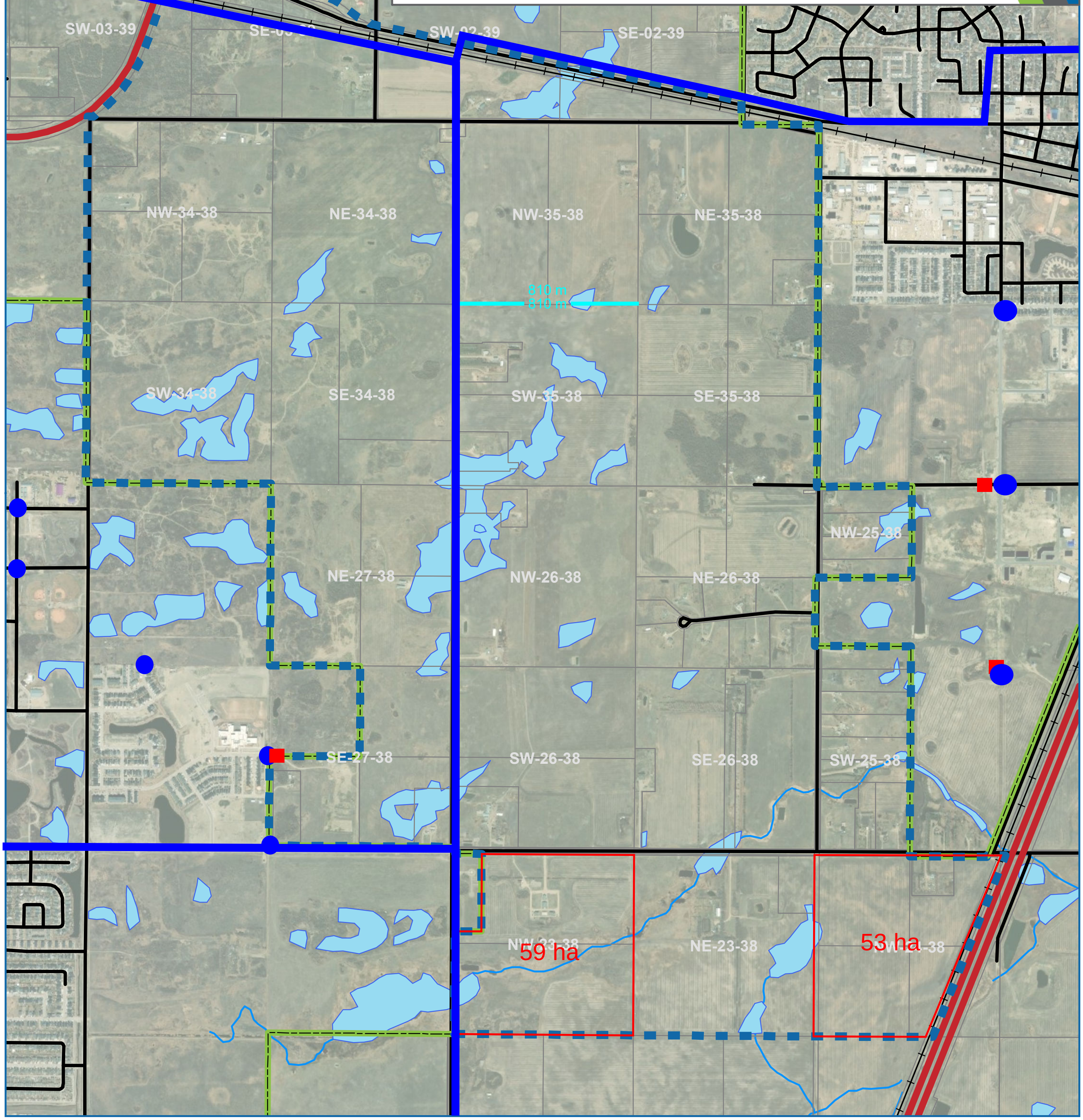
NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX D: SASKWATER SERVICING BY PLANNING UNIT

The P4G Regional Node Study

Creating a place to benefit and connect our communities

City of Warman | Rural Municipality of Corman Park | City of Martensville



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Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

ISL

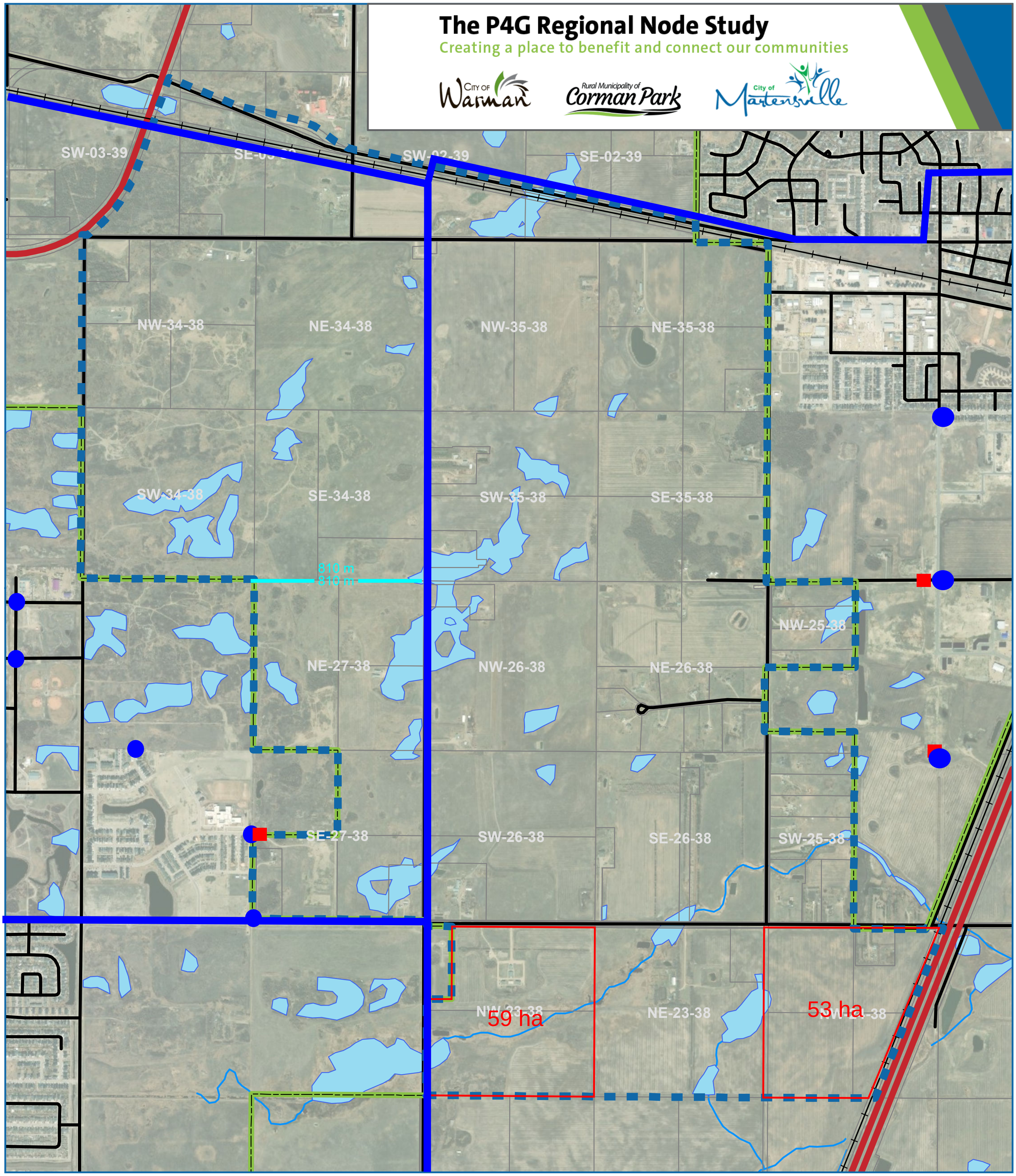
- Study Area
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
- Watercourse
- Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX D: SASKWATER SERVICING BY PLANNING UNIT



Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

ISL

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

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APPENDIX D: SASKWATER SERVICING BY PLANNING UNIT

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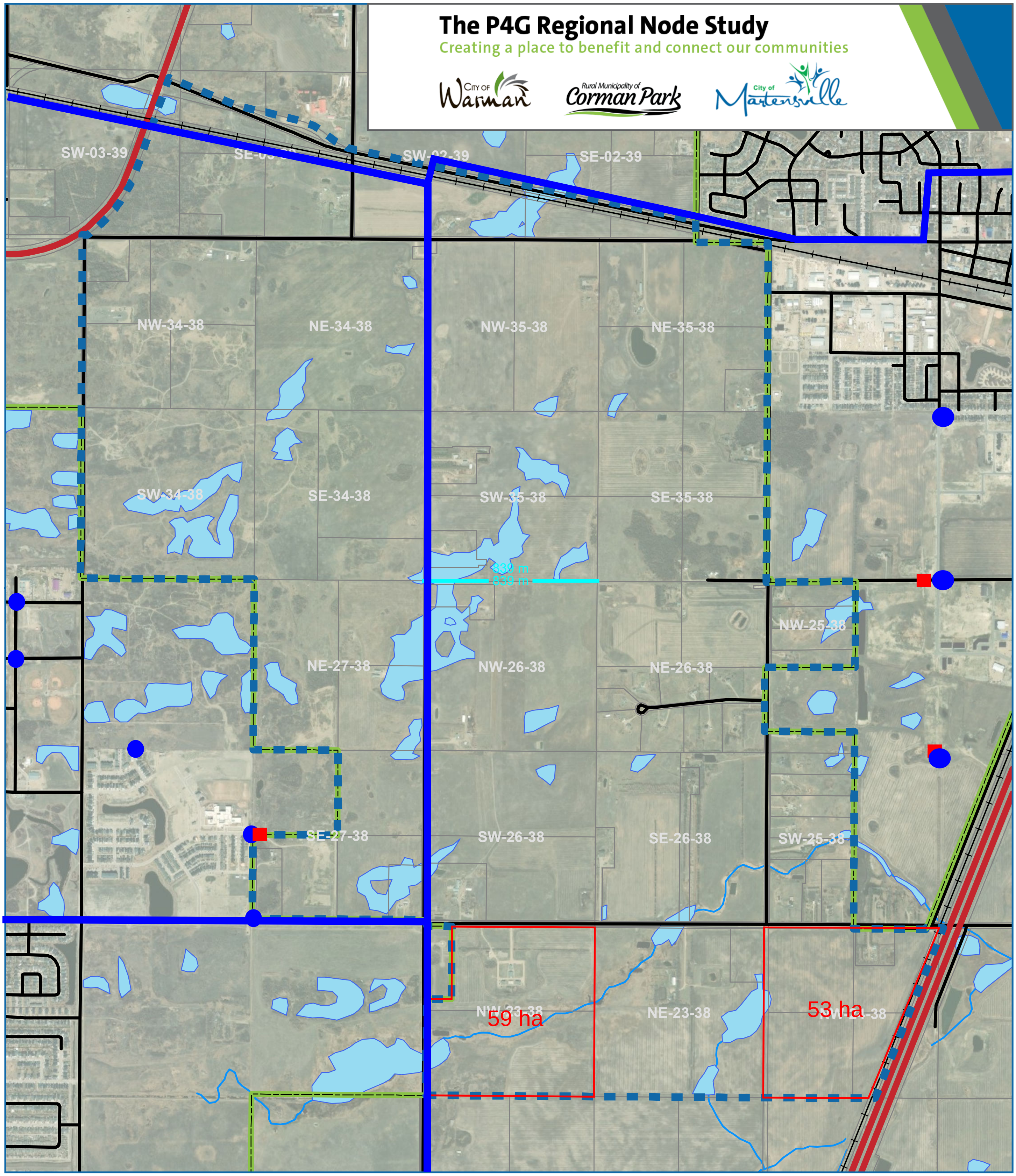

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

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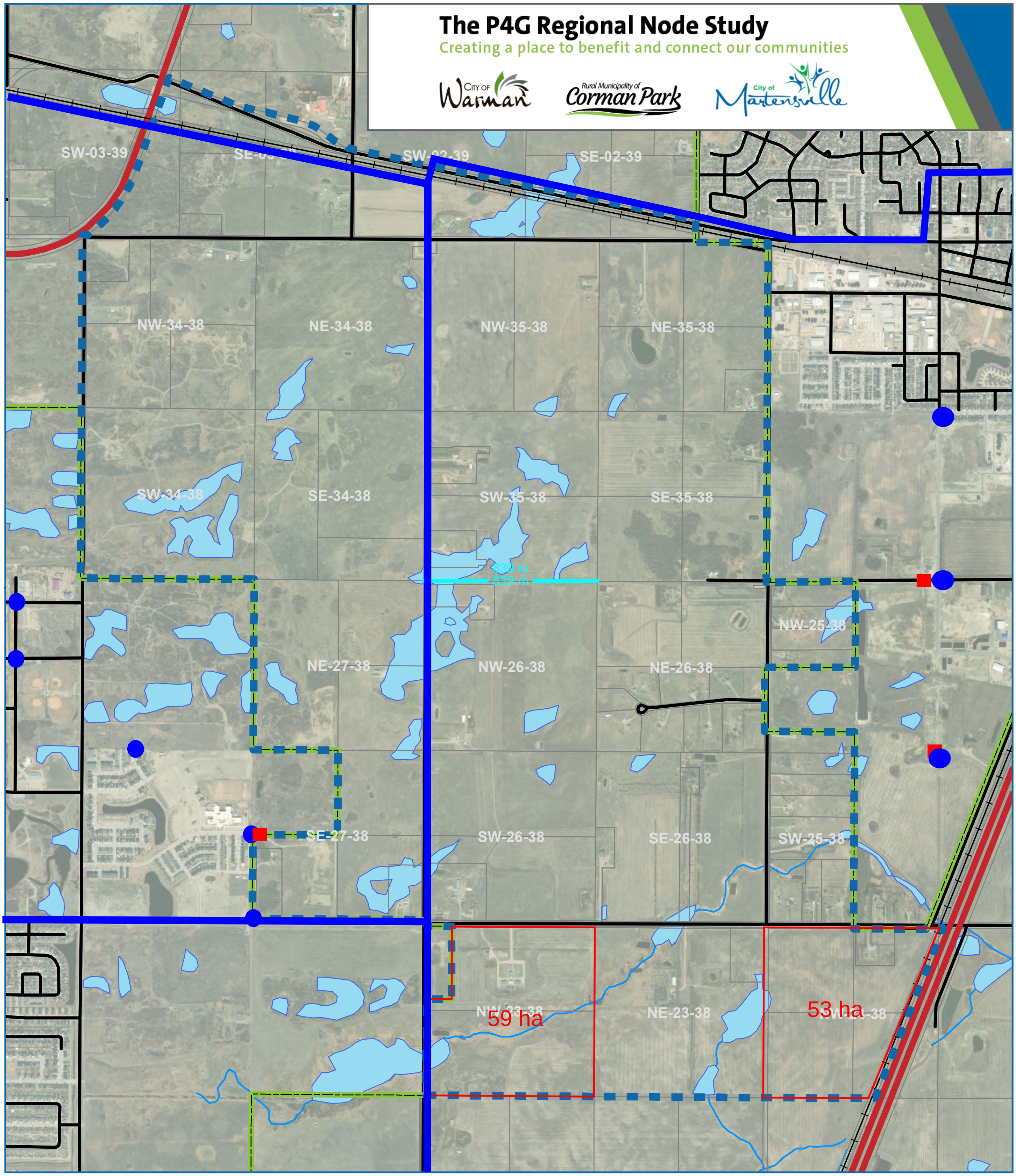
APPENDIX D: SASKWATER SERVICING BY PLANNING UNIT



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ISL

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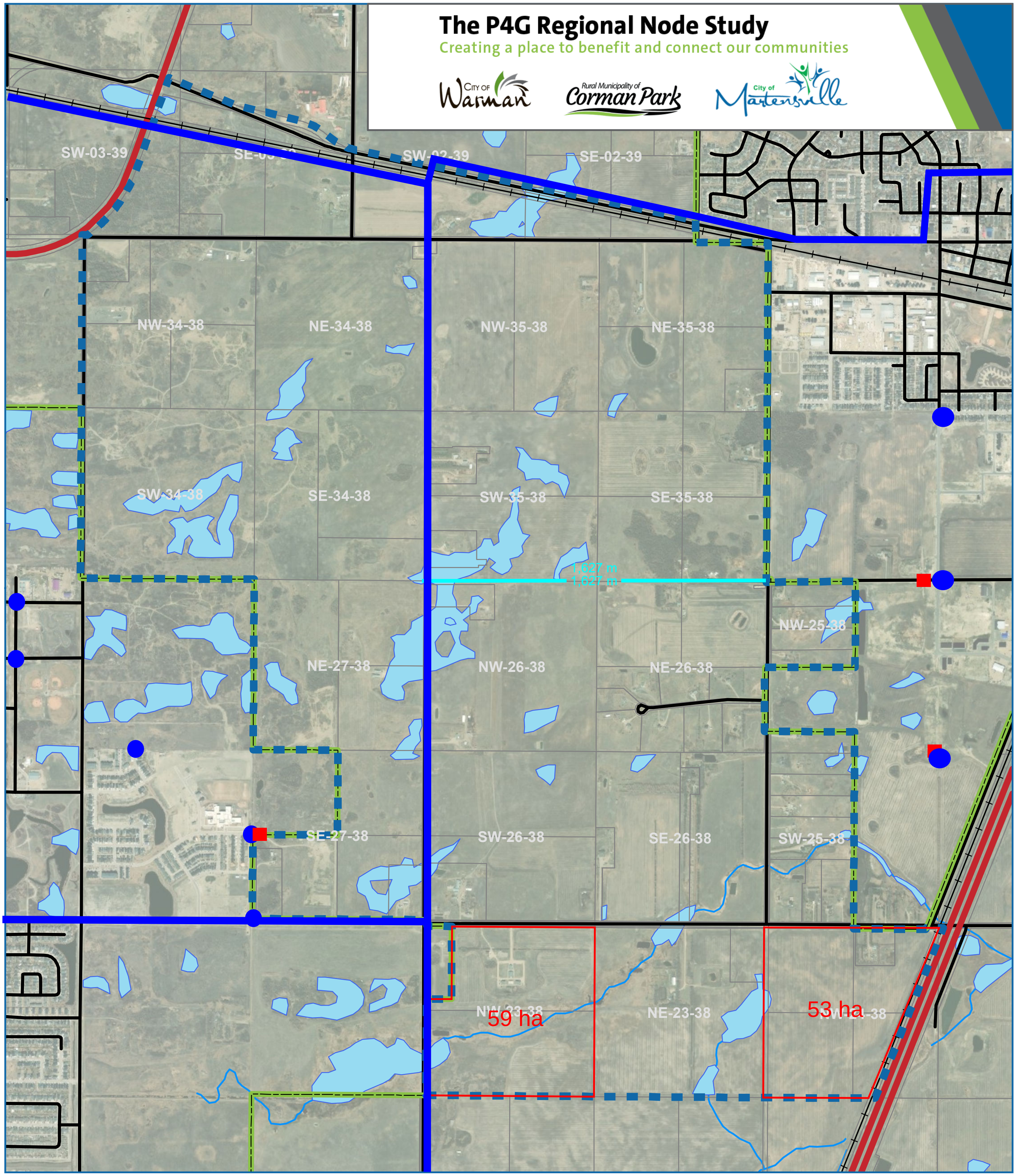
Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX D: SASKWATER SERVICING BY PLANNING UNIT



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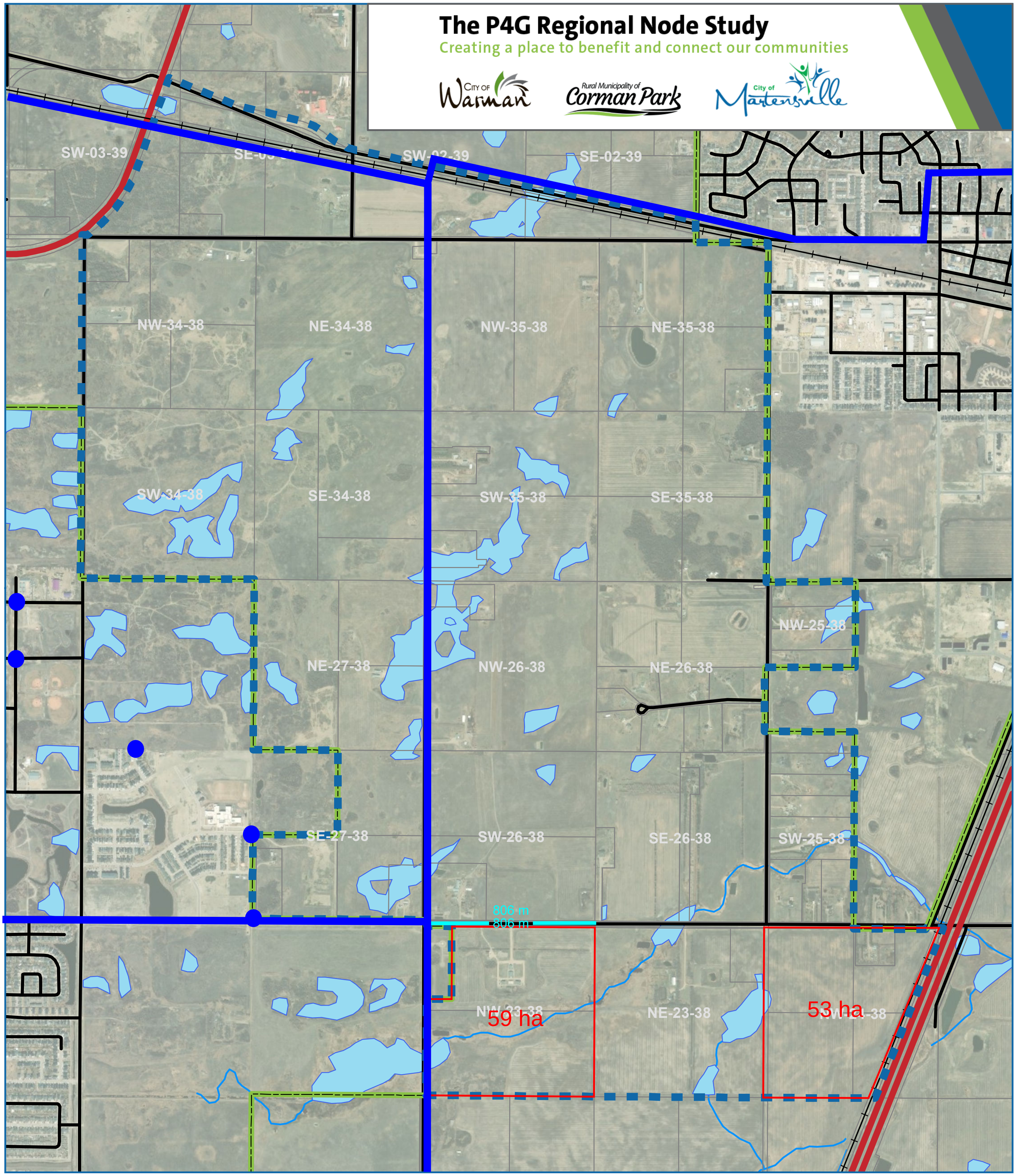

ISL

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Railway
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Roadway
Watercourse
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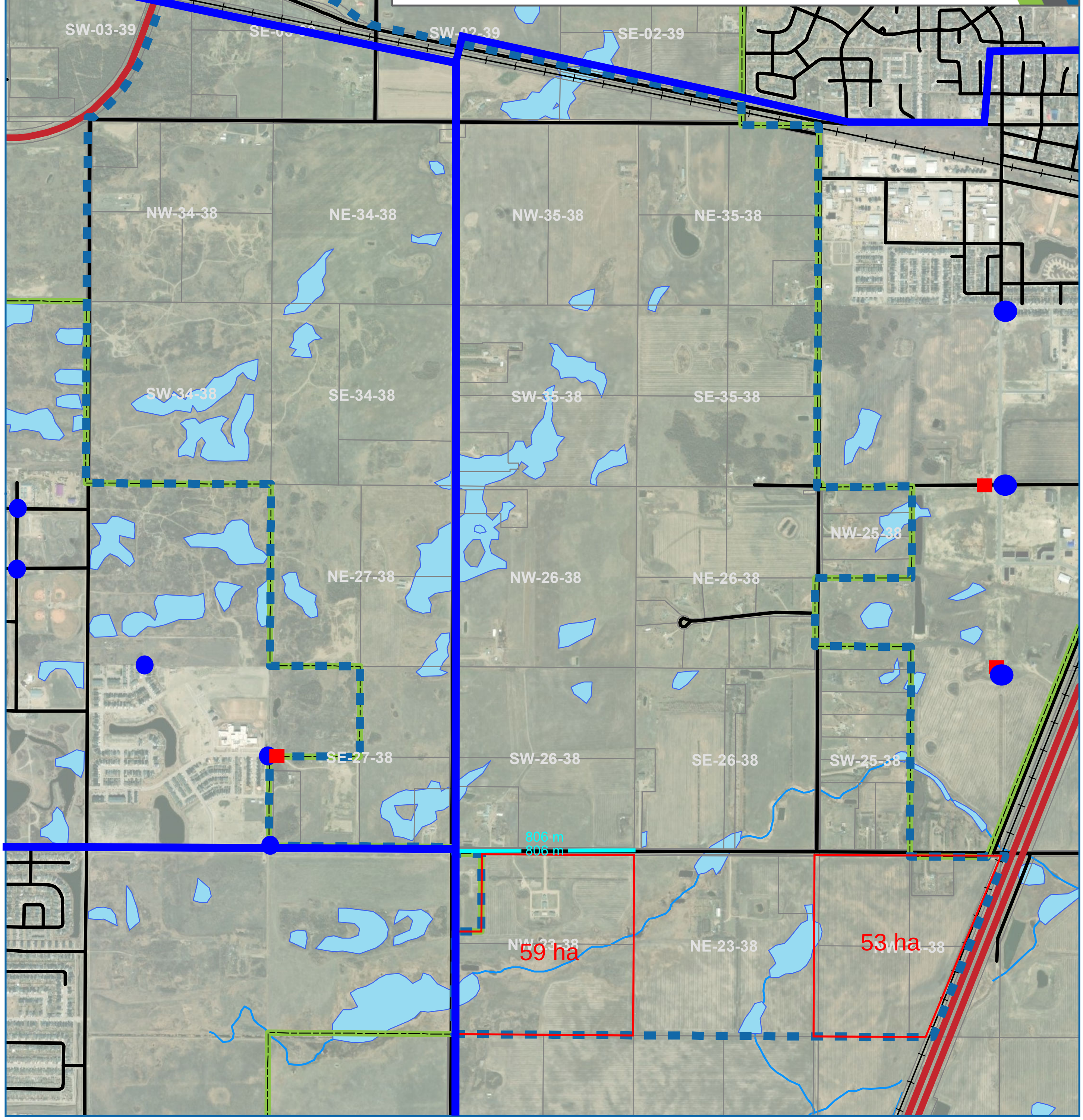

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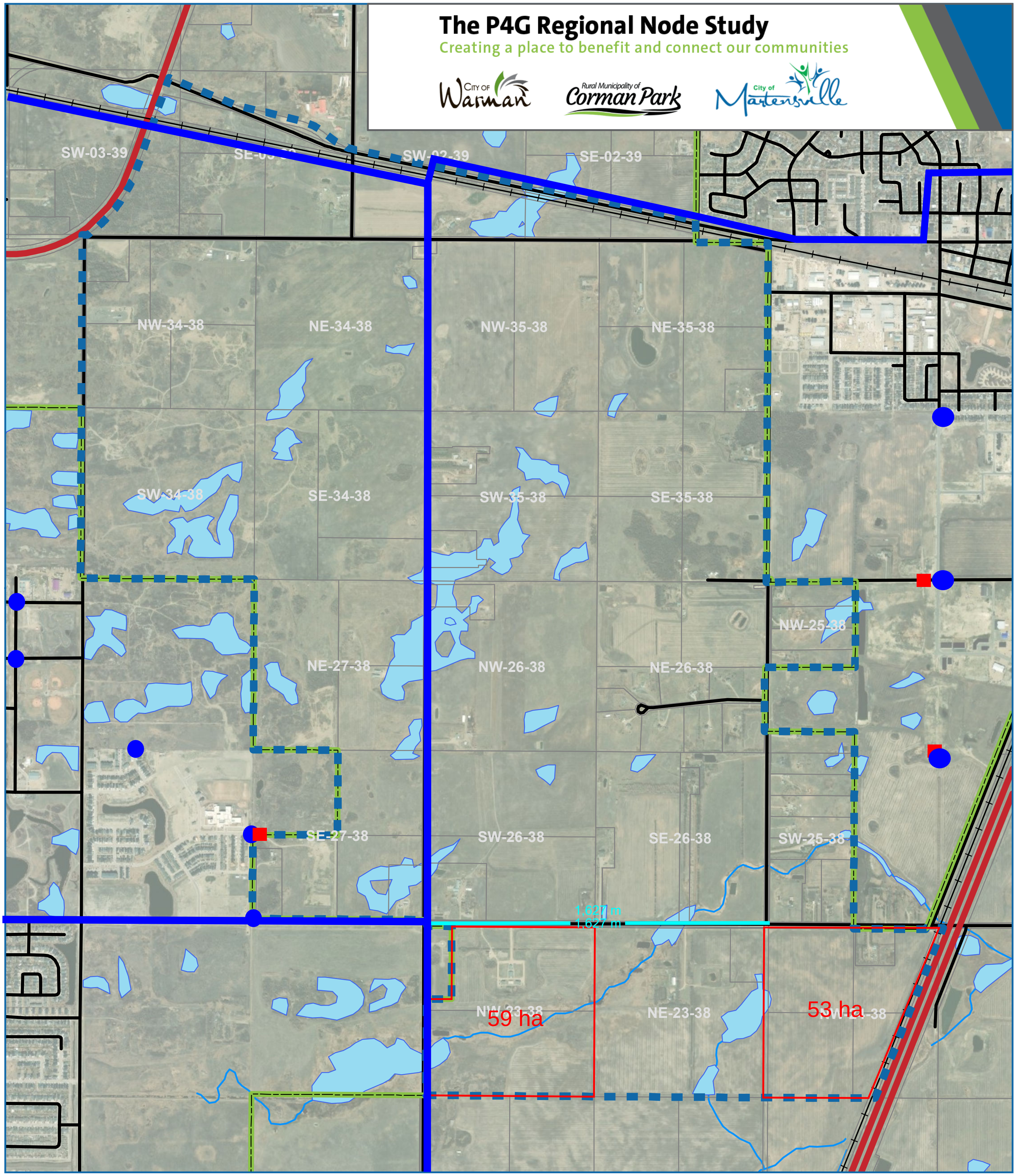

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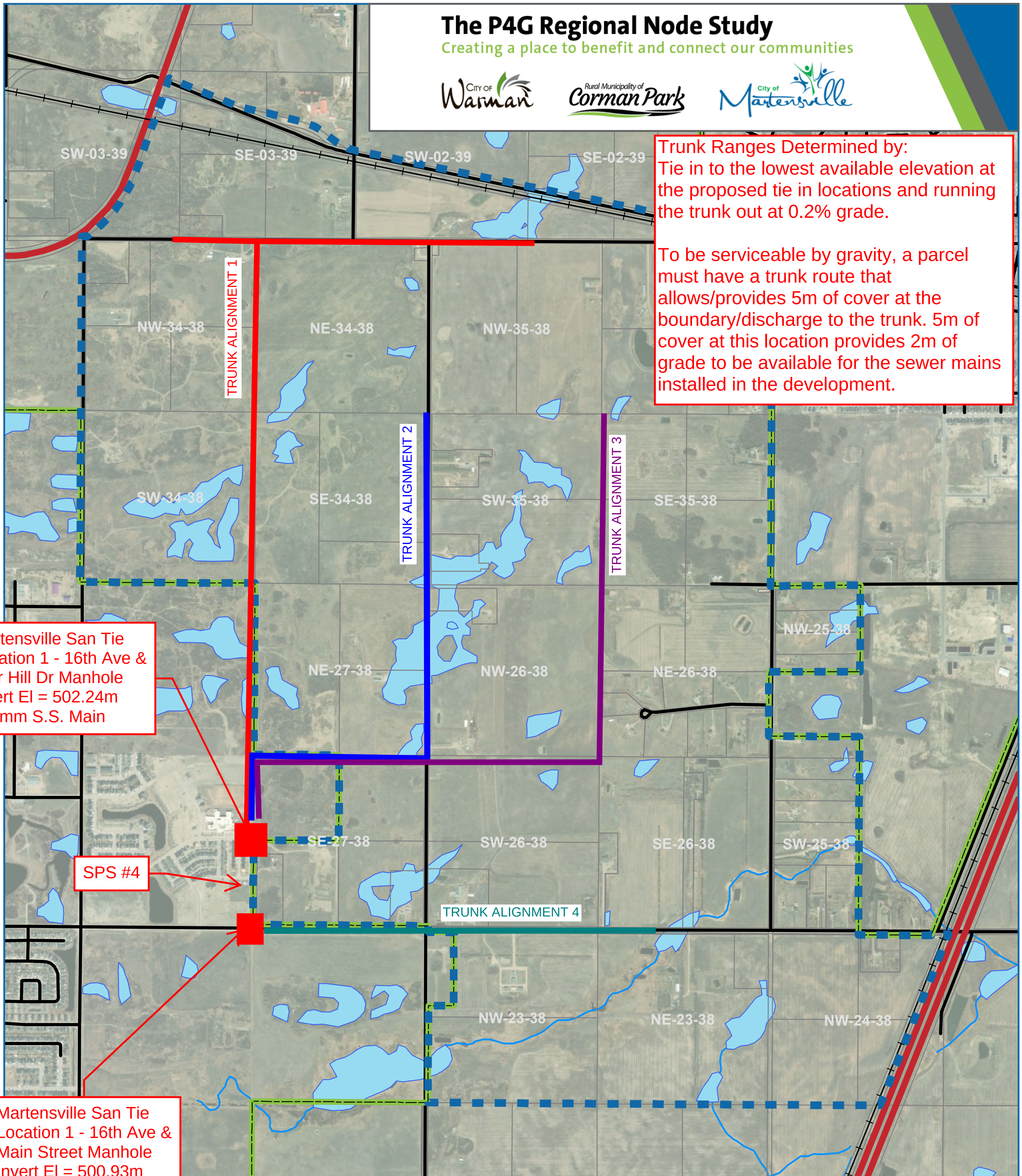
SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX D: SASKWATER SERVICING BY PLANNING UNIT

APPENDIX E
Martensville Wastewater Servicing by Planning Unit

Alignment Options for Sanitary Sewer Trunks Discharging to Martensville



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ISL

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Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
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APPENDIX E: MARTENSVILLE WASTEWATER SERVICING BY PLANNING UNIT

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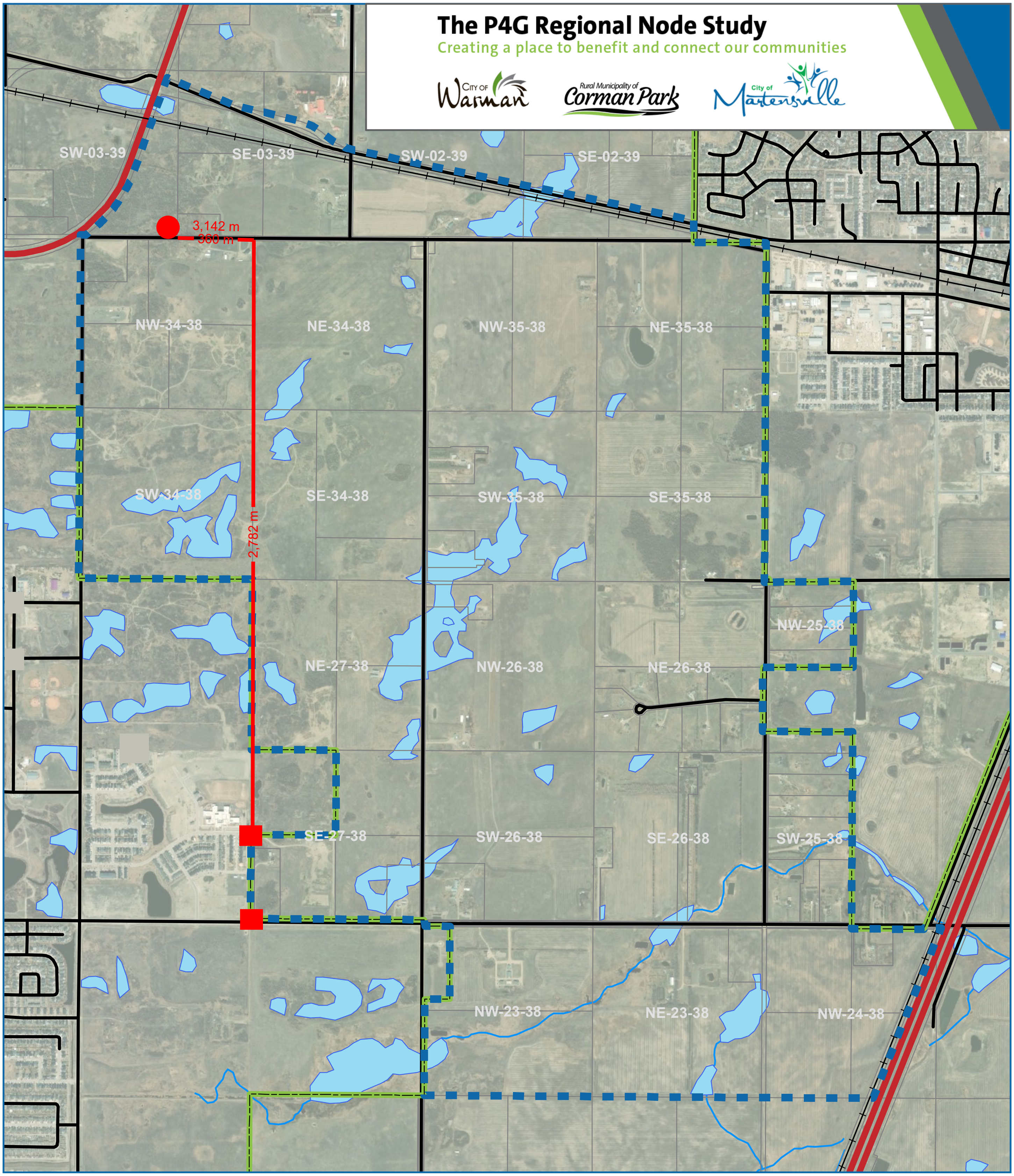

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ISL

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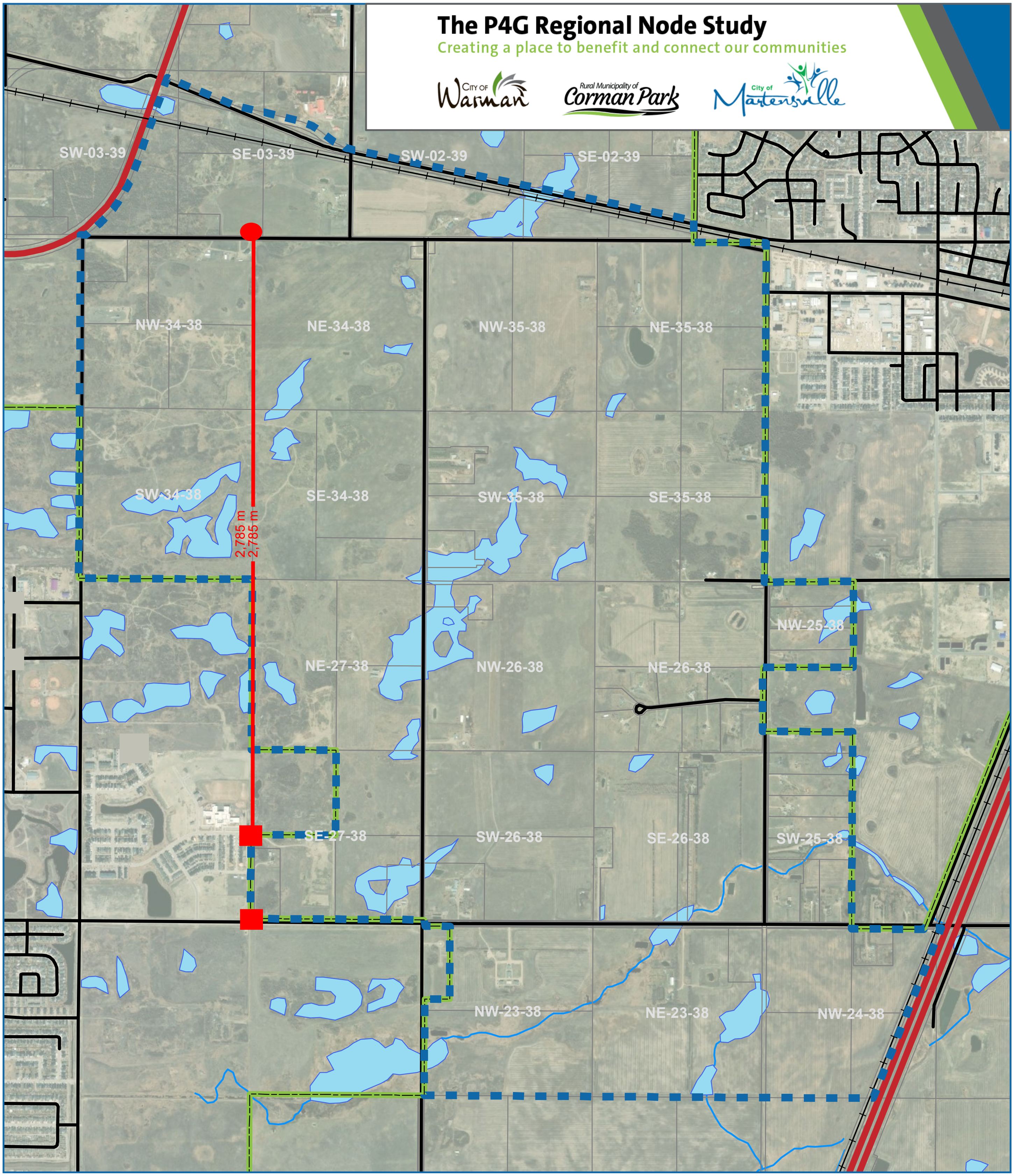
APPENDIX E: MARTENSVILLE WASTEWATER SERVICING BY PLANNING UNIT



Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
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Water Body

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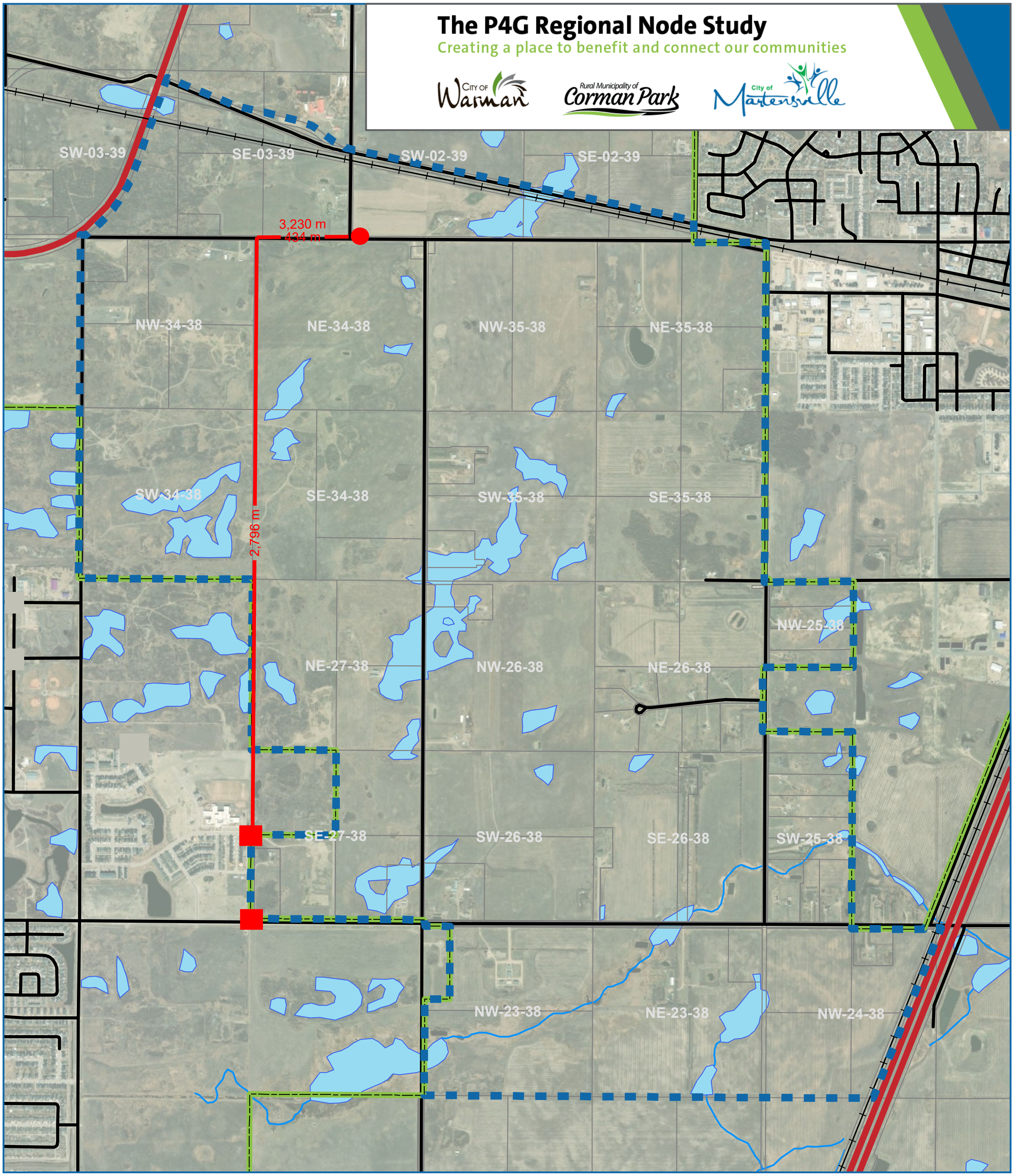
APPENDIX E: MARTENSVILLE WASTEWATER SERVICING BY PLANNING UNIT



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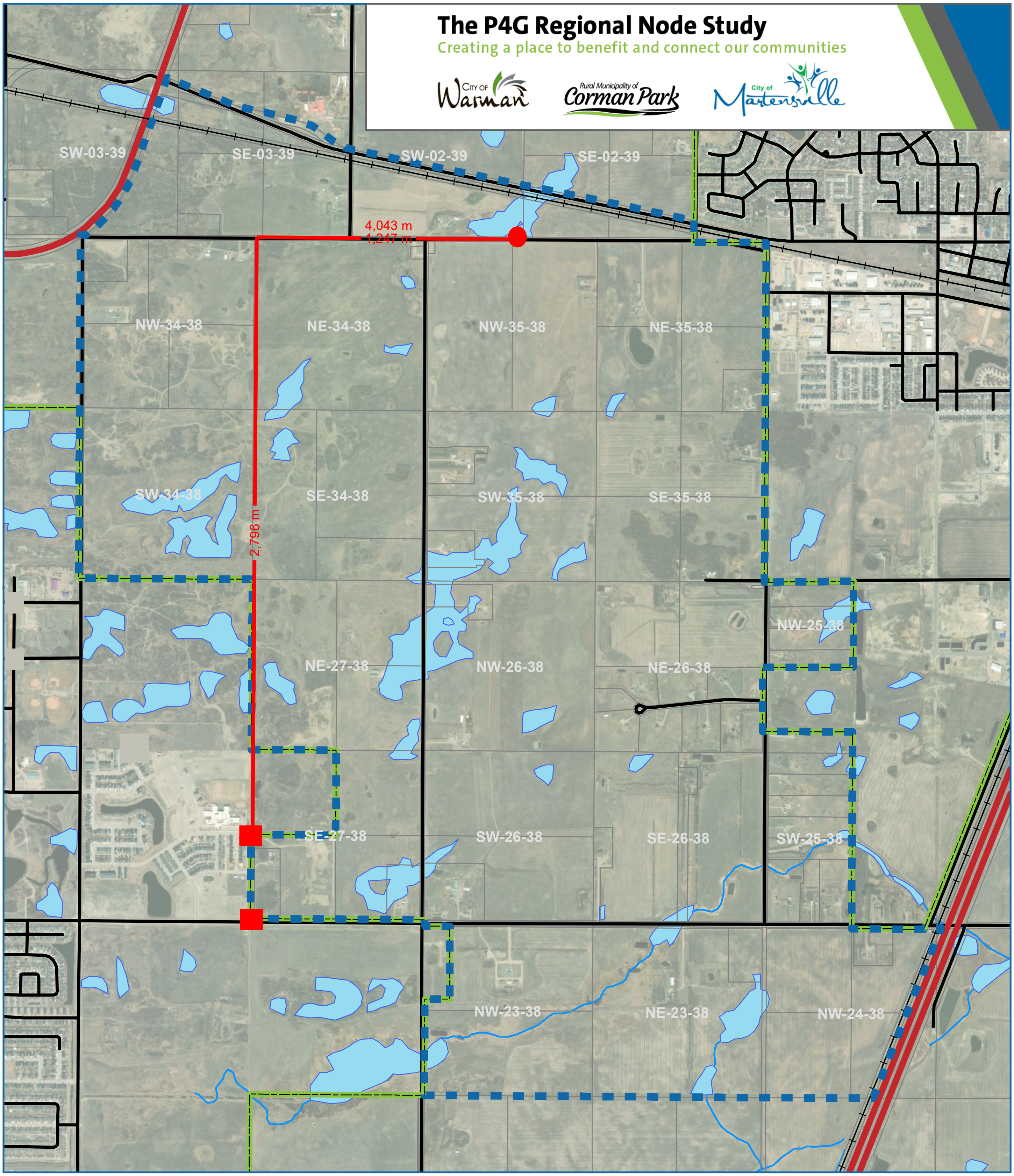
APPENDIX E: MARTENSVILLE WASTEWATER SERVICING BY PLANNING UNIT



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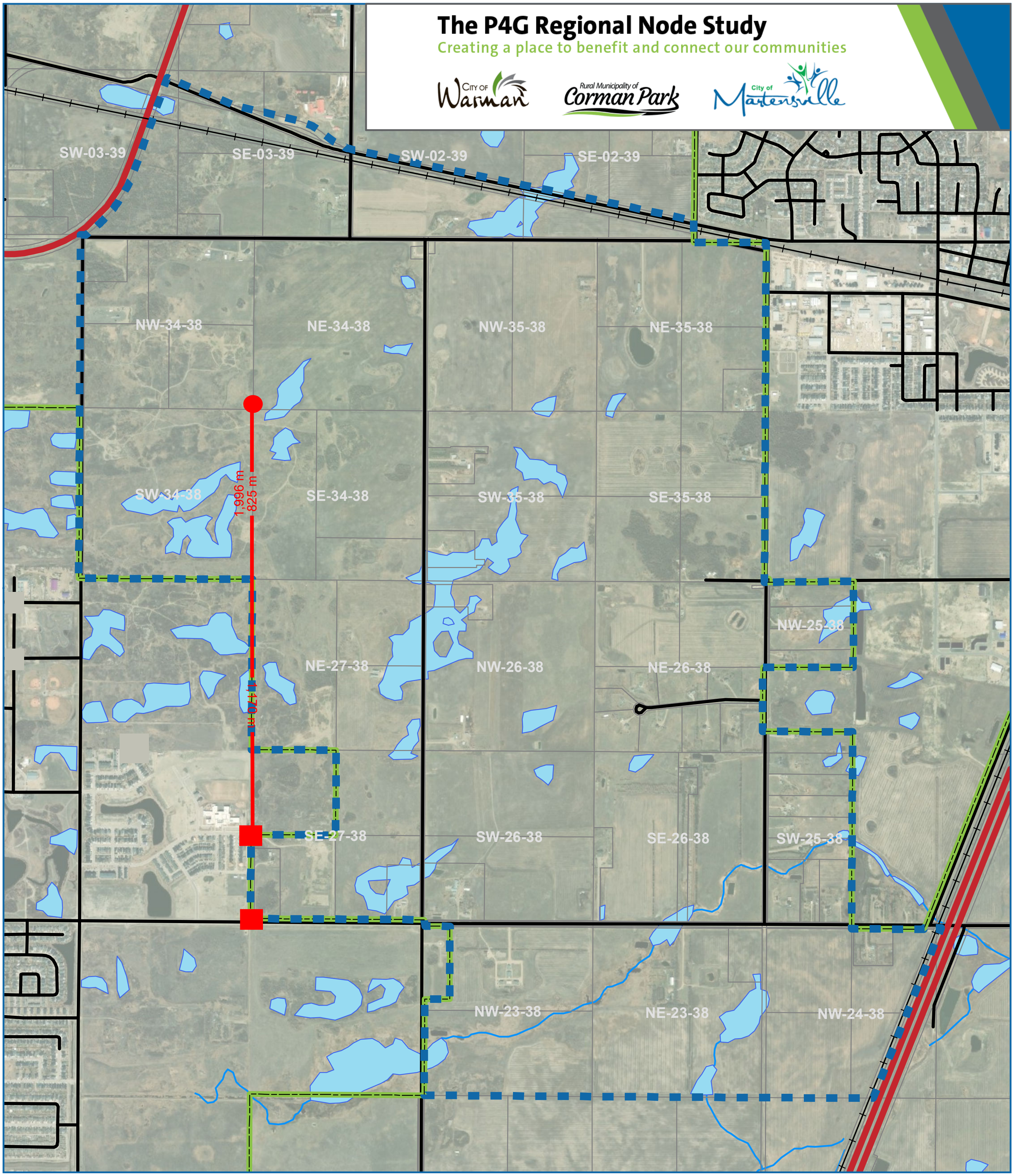
APPENDIX E: MARTENSVILLE WASTEWATER SERVICING BY PLANNING UNIT



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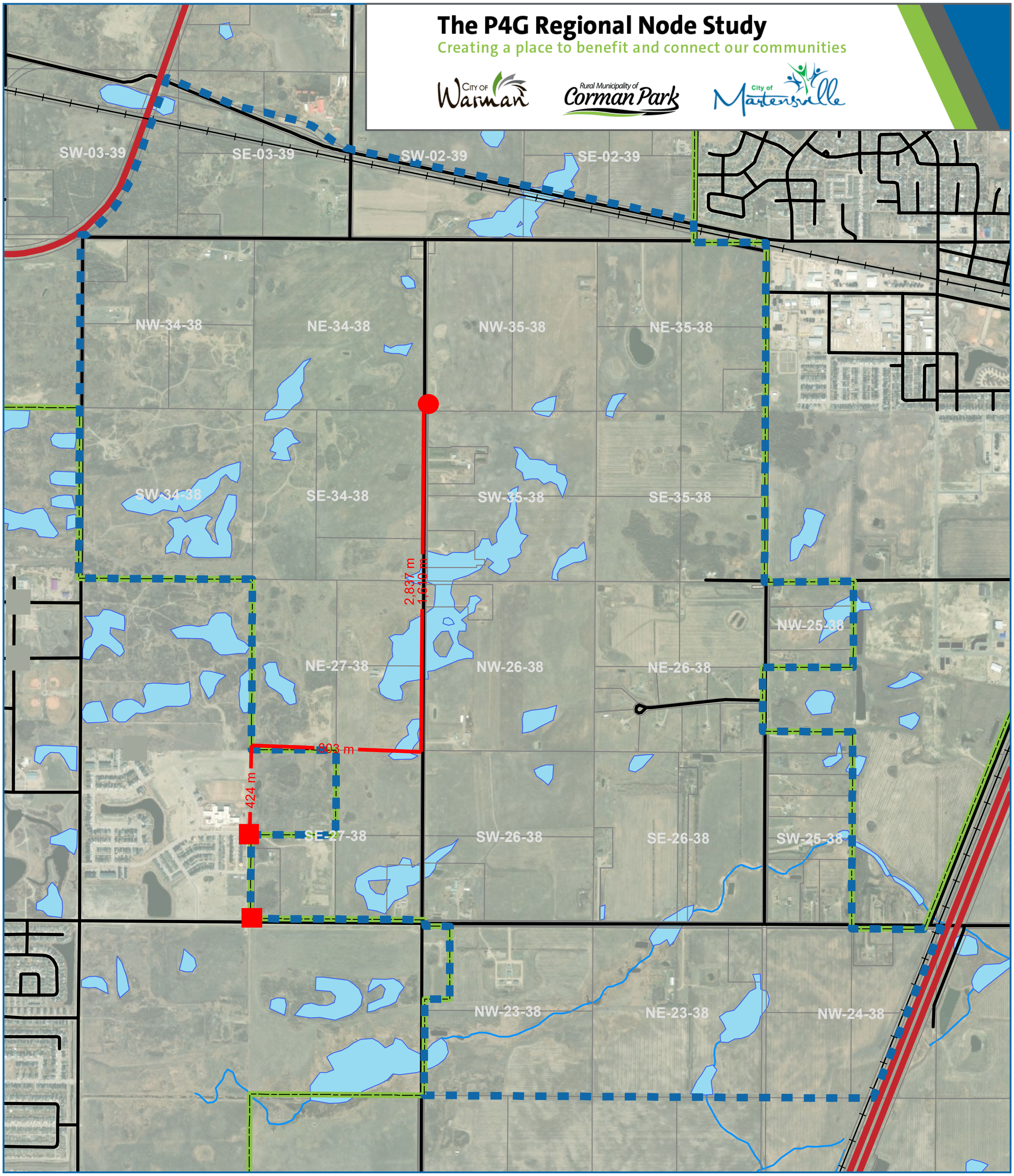
SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX E: MARTENSVILLE WASTEWATER SERVICING BY PLANNING UNIT



Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

ISL

N

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

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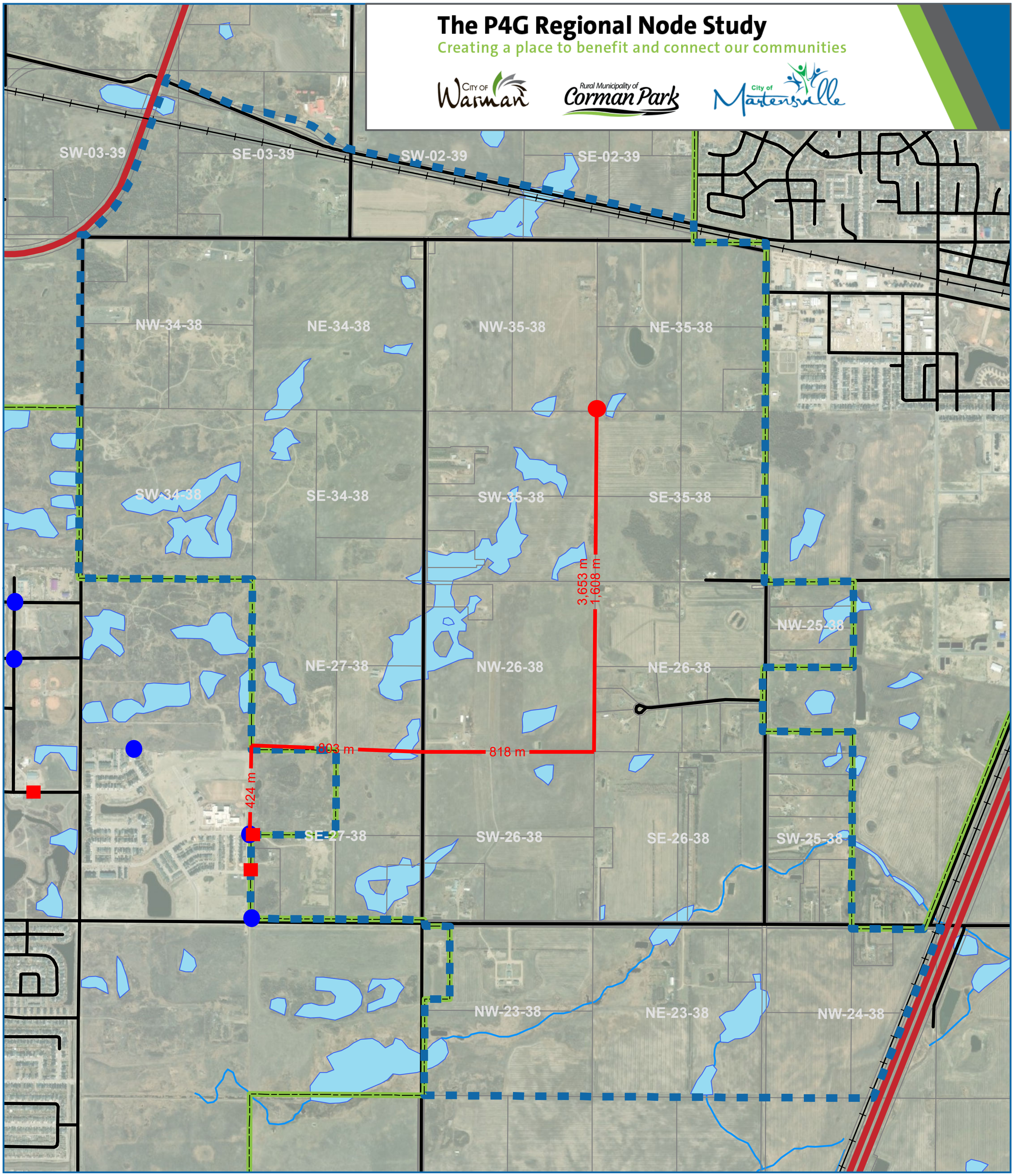

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

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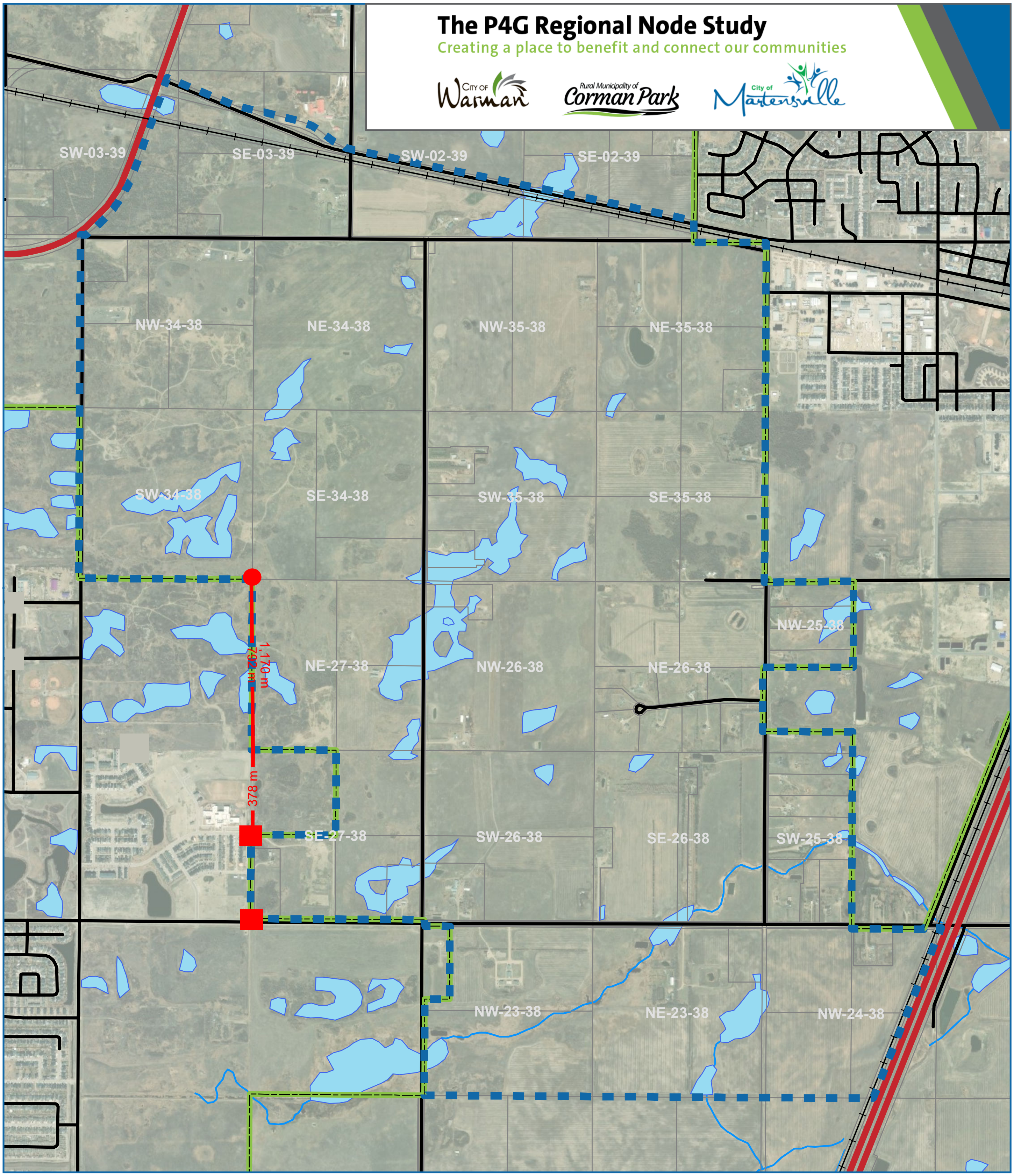

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

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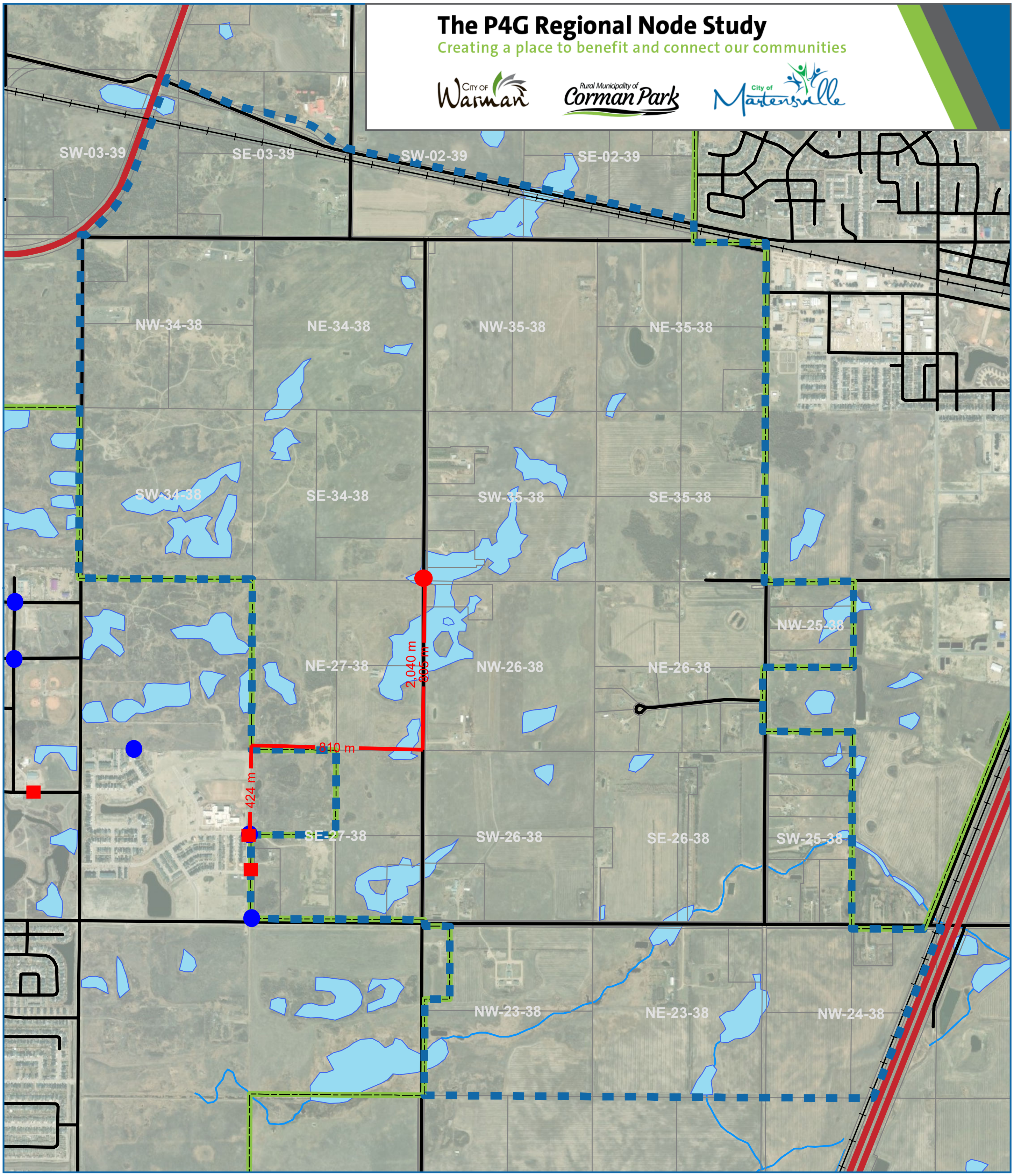

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ISL

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Legend	
Study Area	Highway
Municipal Boundary	Roadway
Parcel	Watercourse
Railway	Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX E: MARTENSVILLE WASTEWATER SERVICING BY PLANNING UNIT

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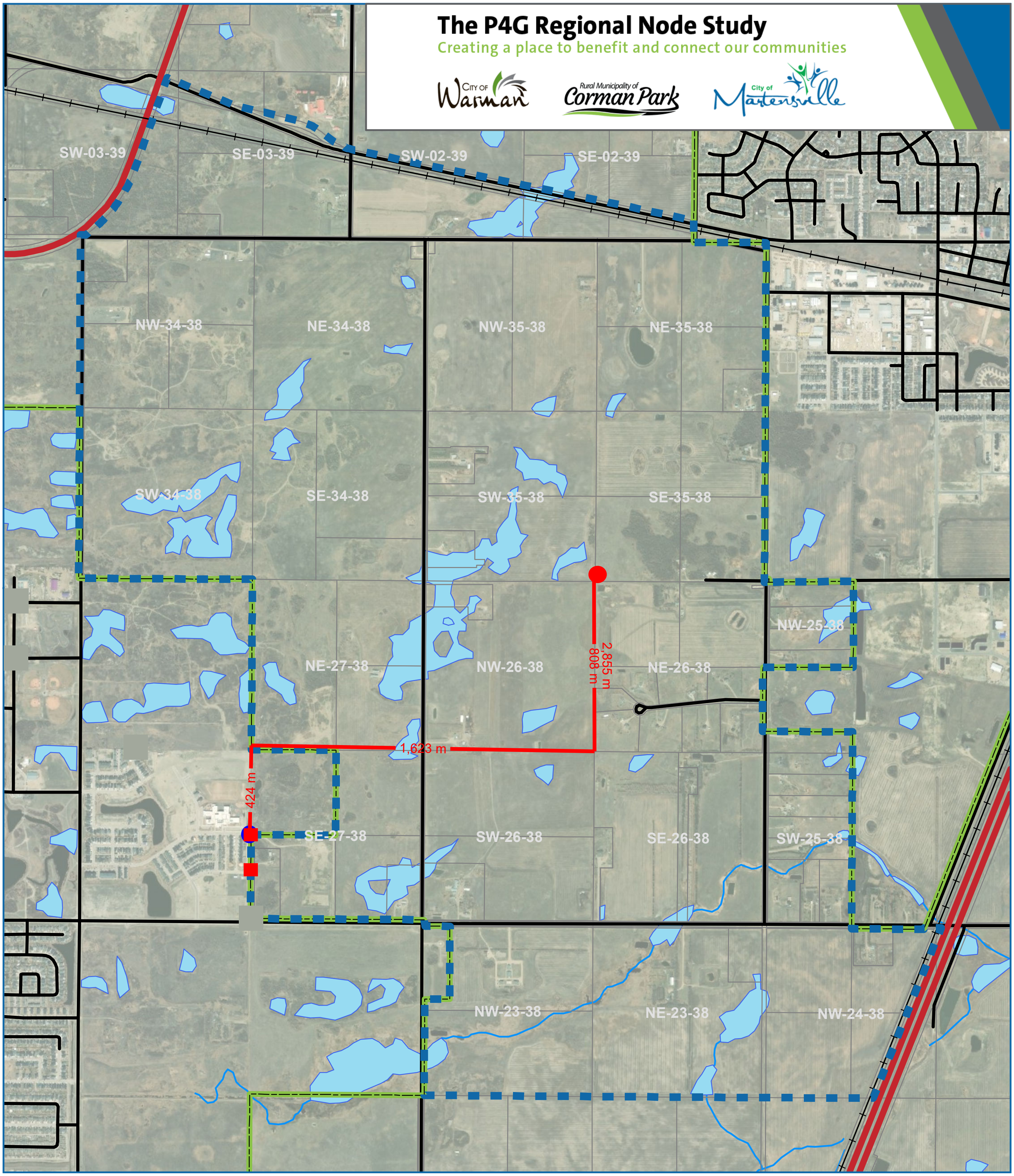

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

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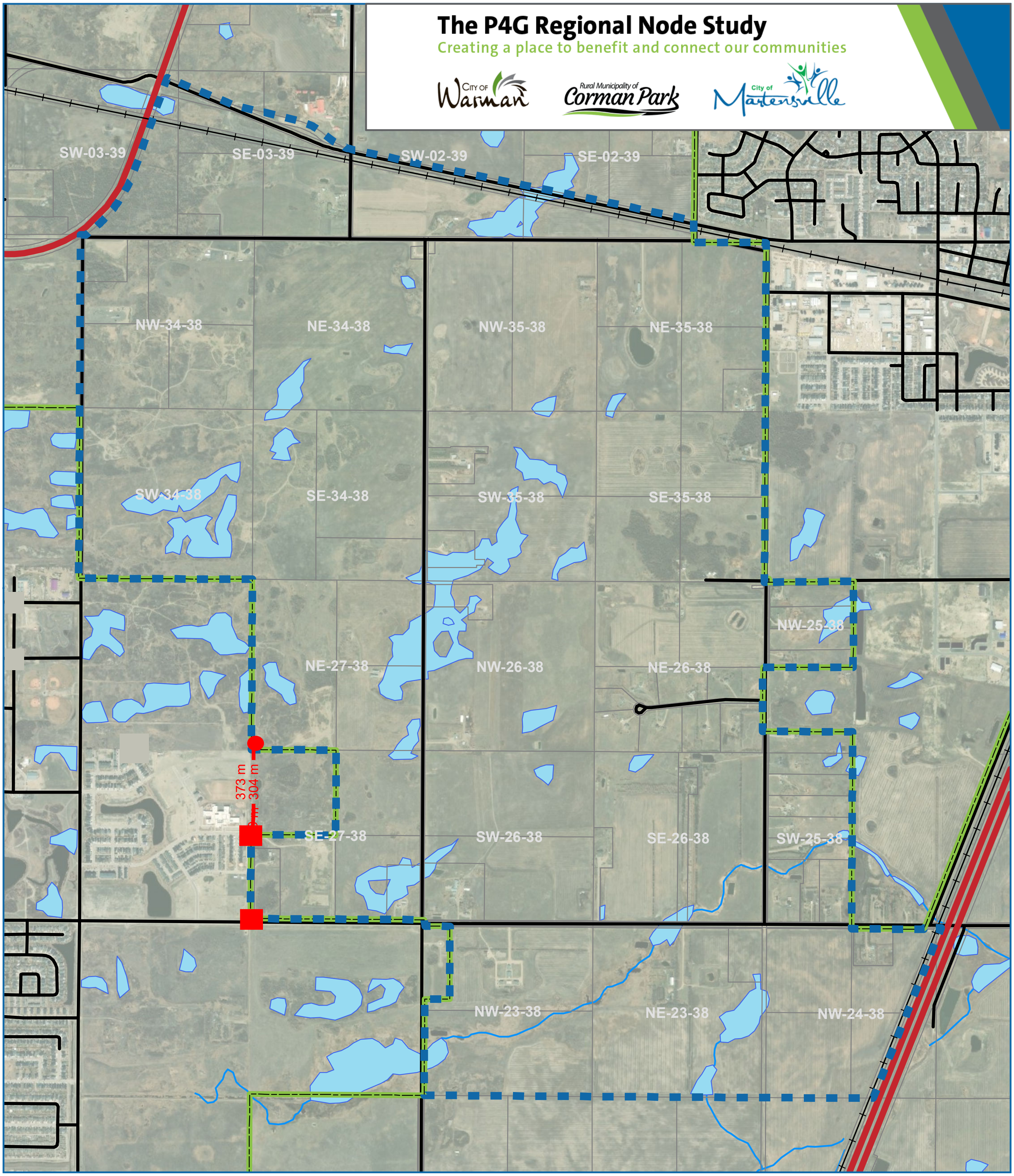

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ISL

N

- Study Area
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- Parcel
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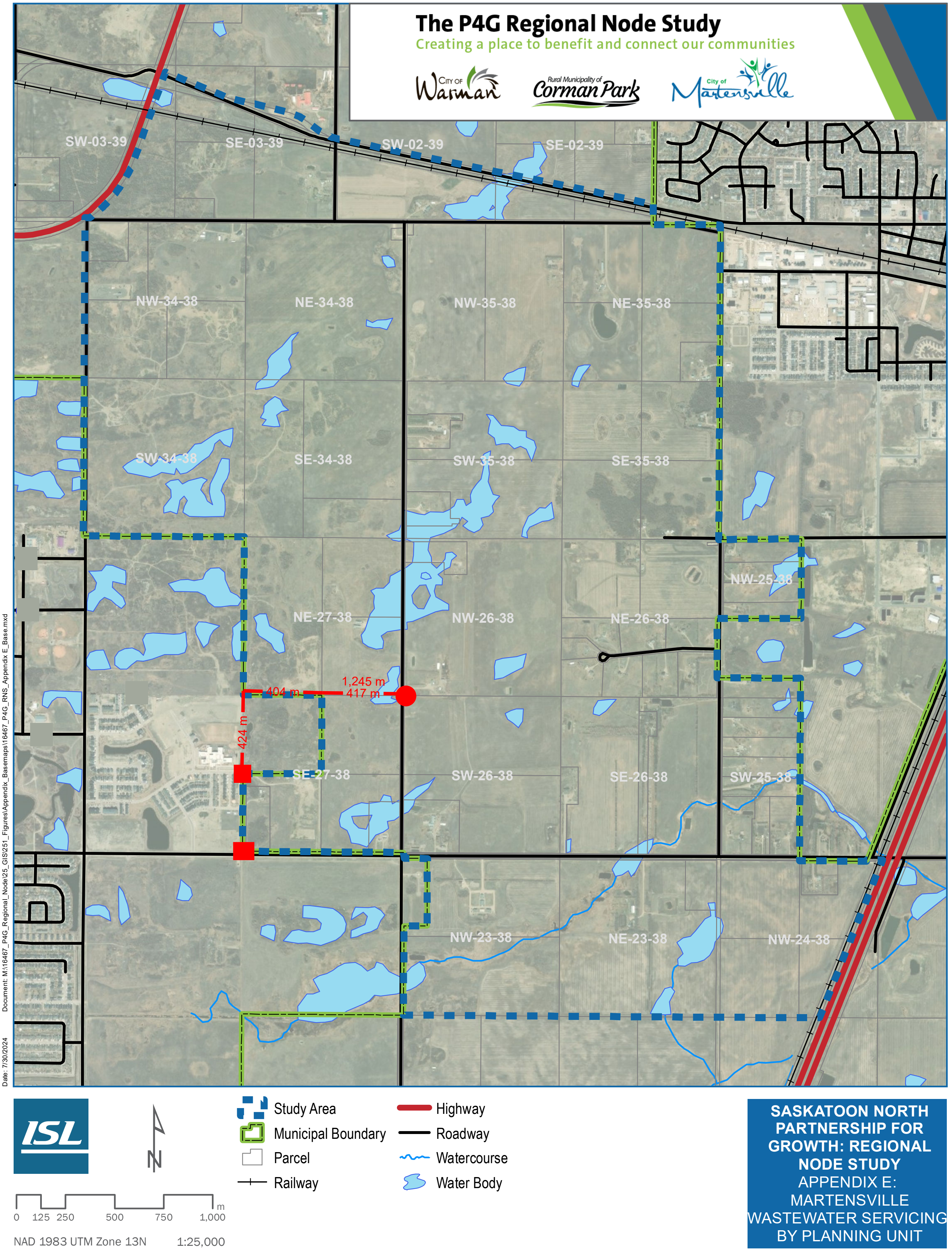
APPENDIX E: MARTENSVILLE WASTEWATER SERVICING BY PLANNING UNIT



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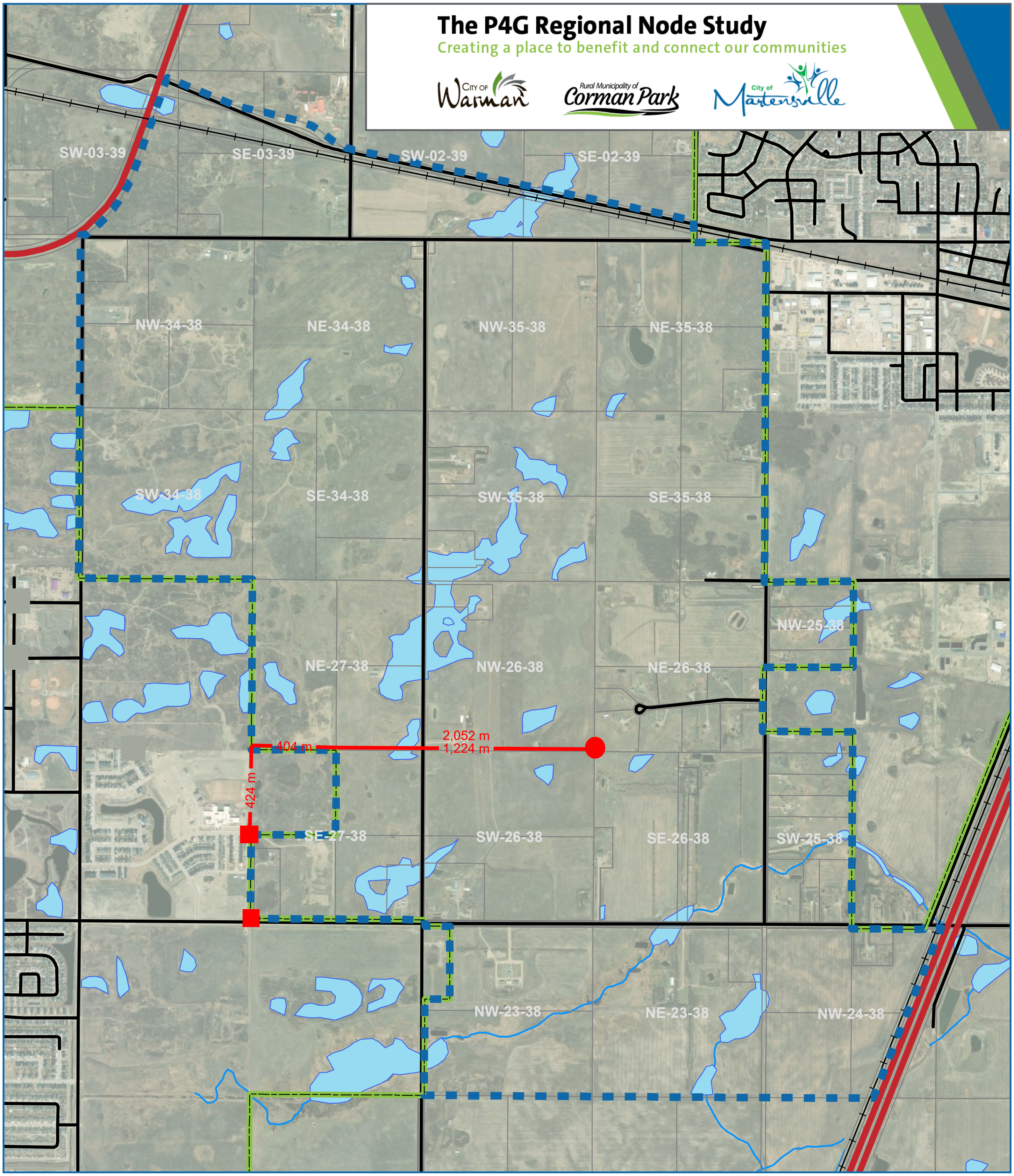

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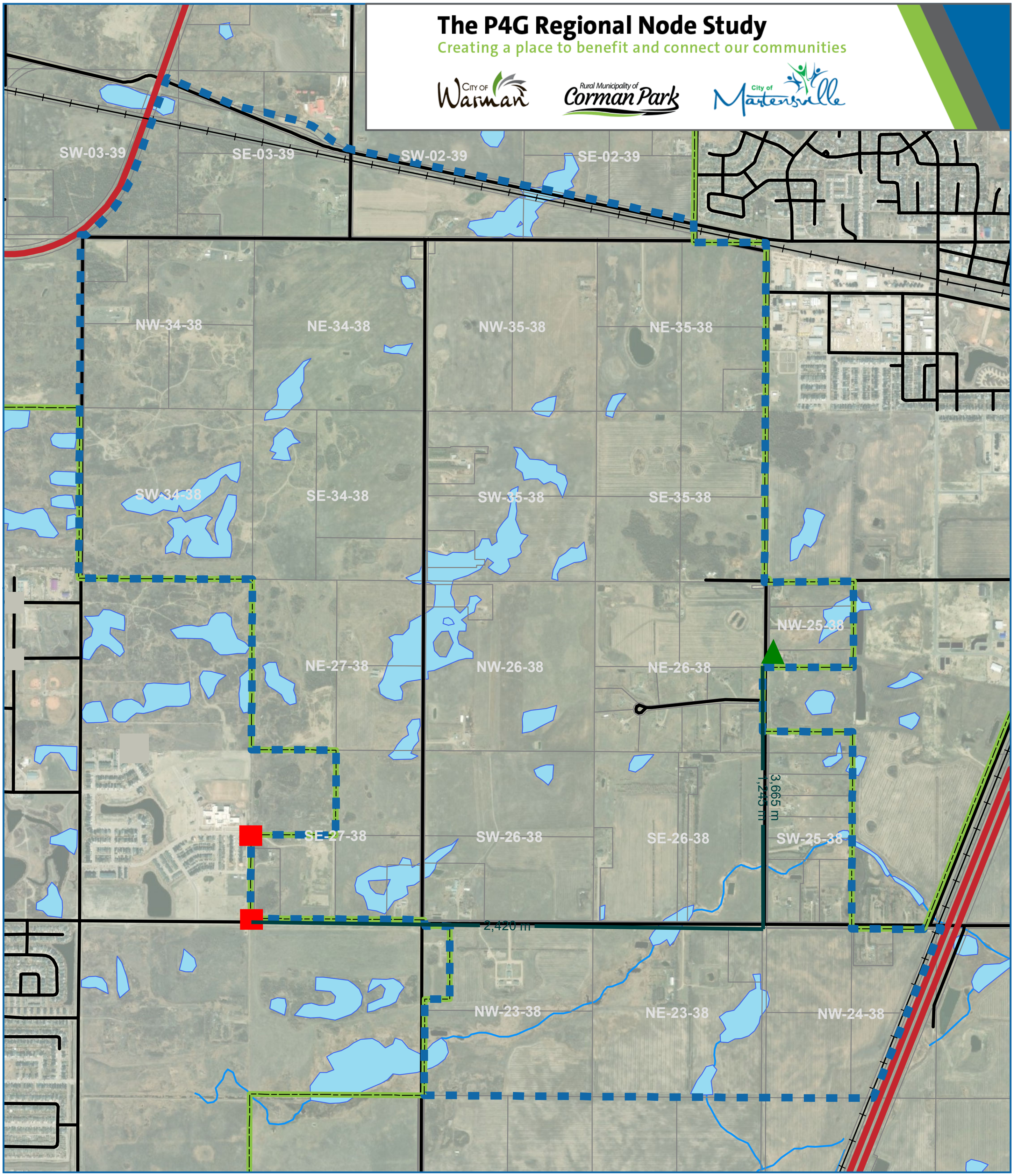

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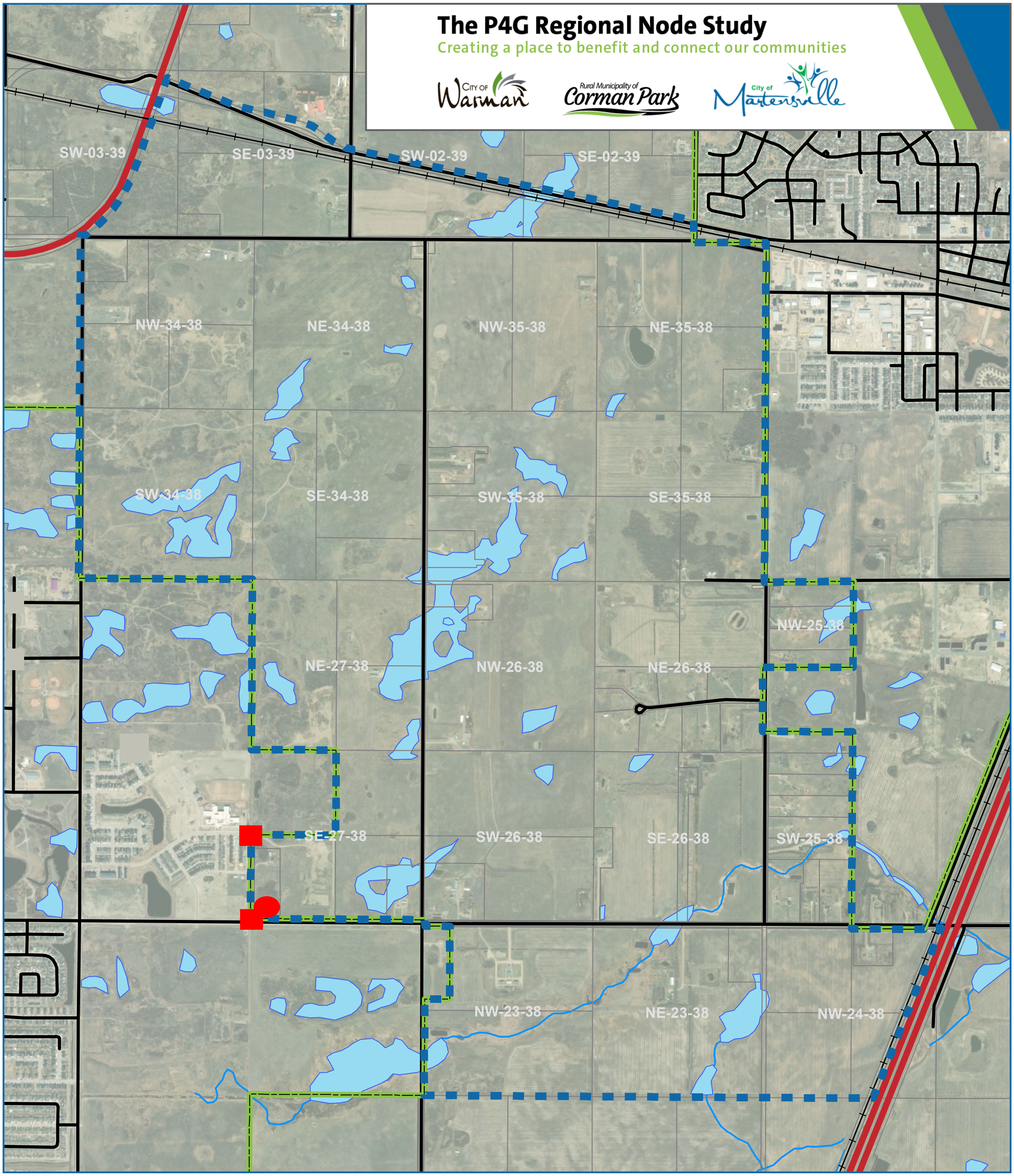

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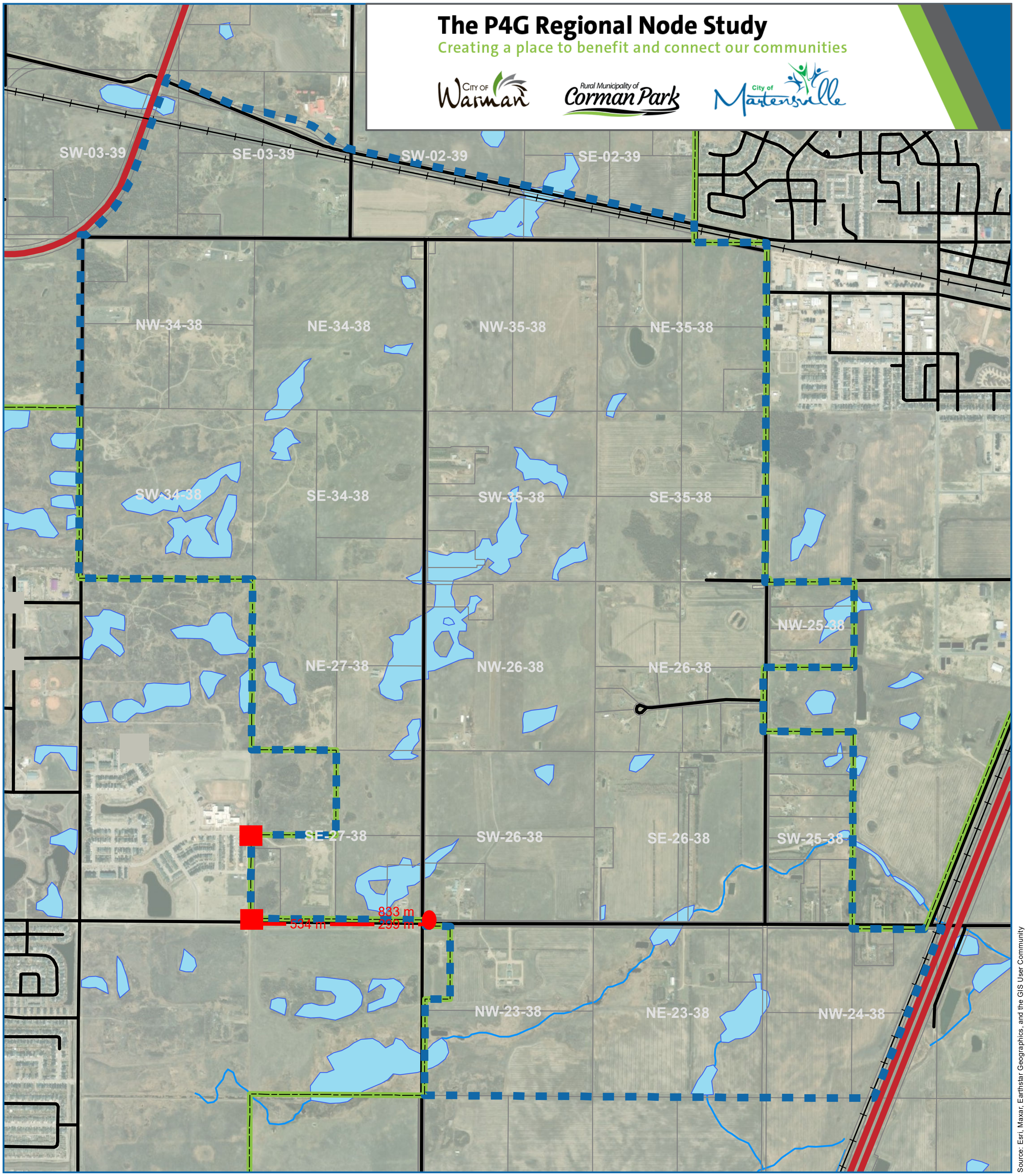

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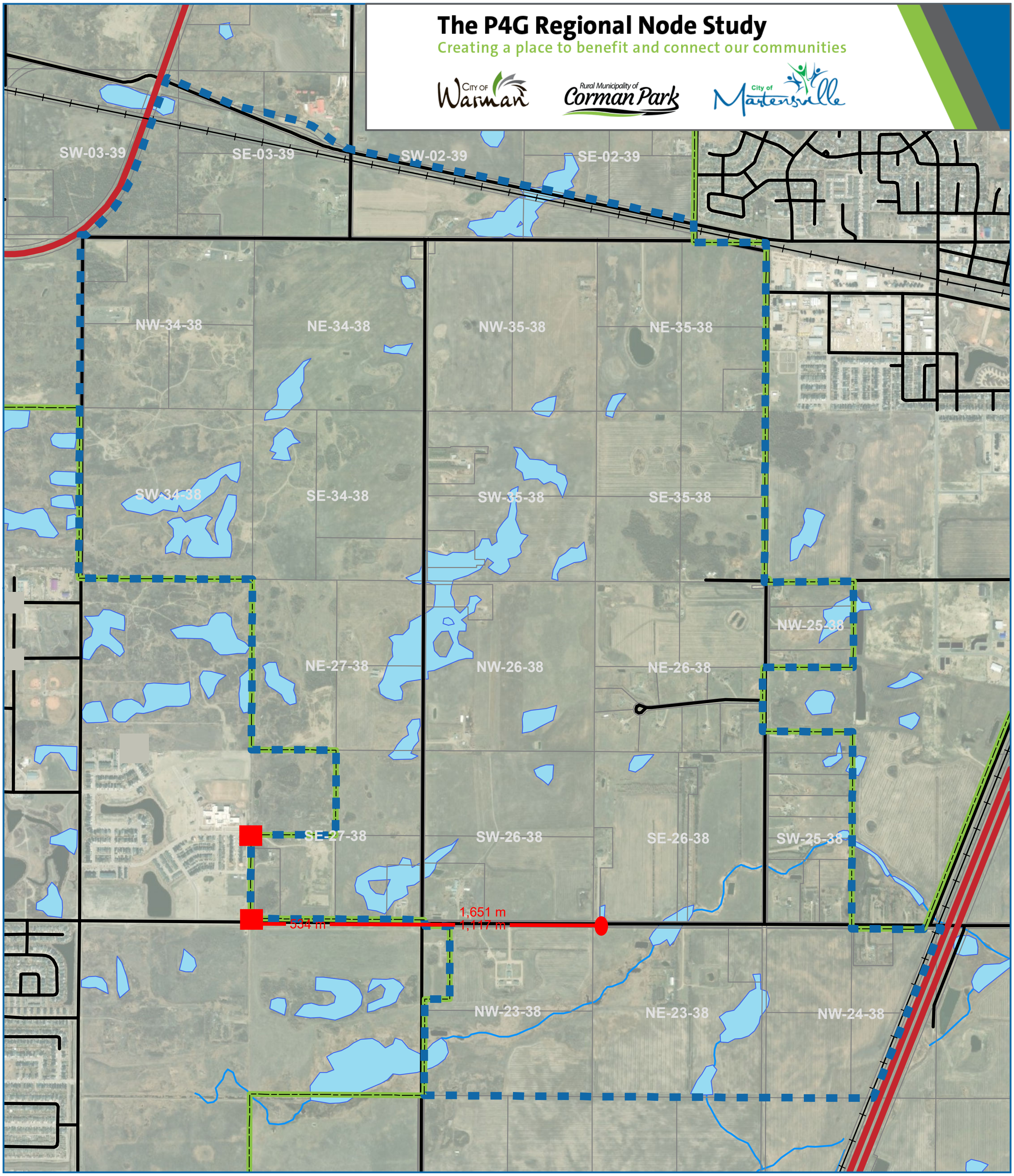

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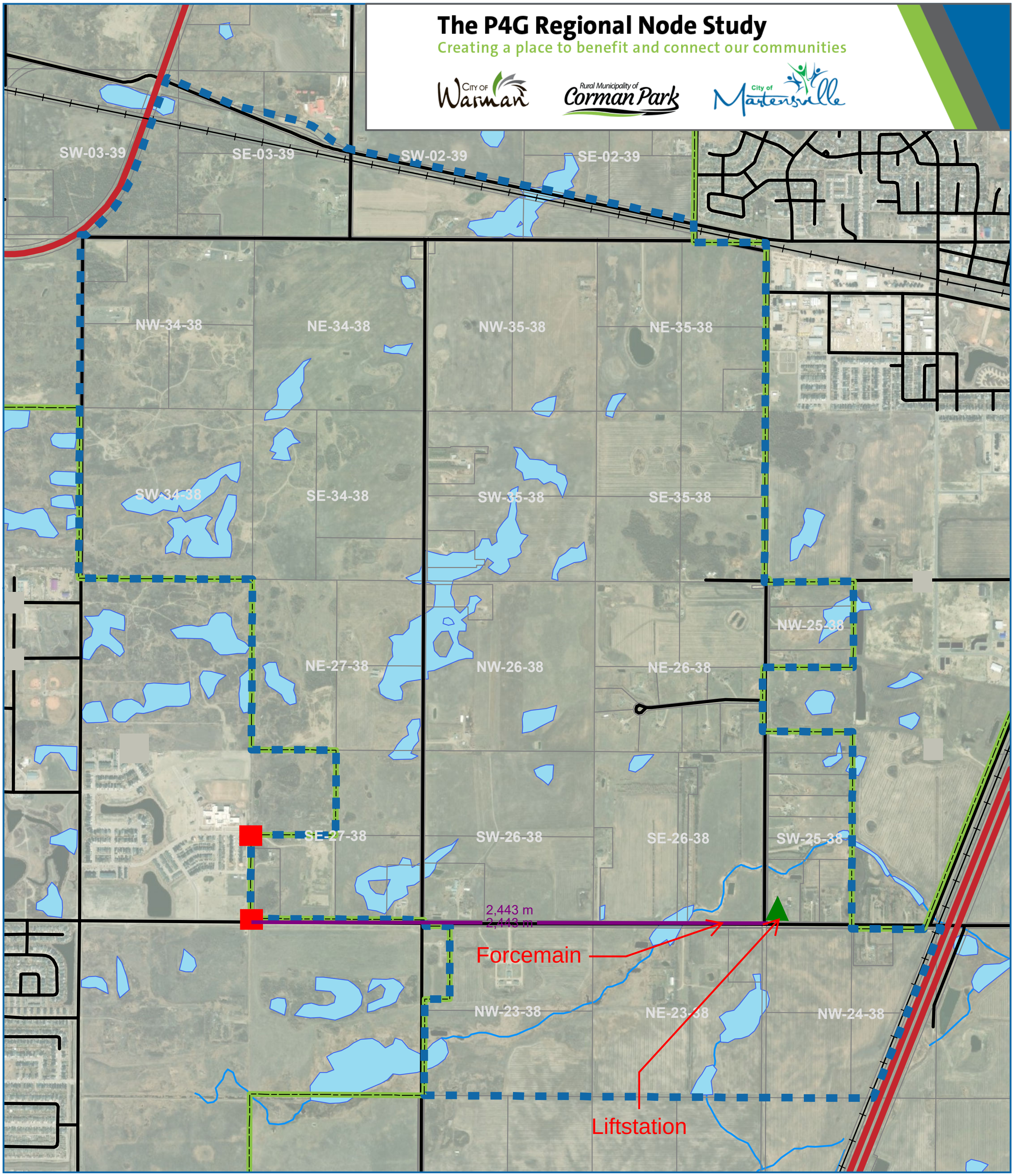

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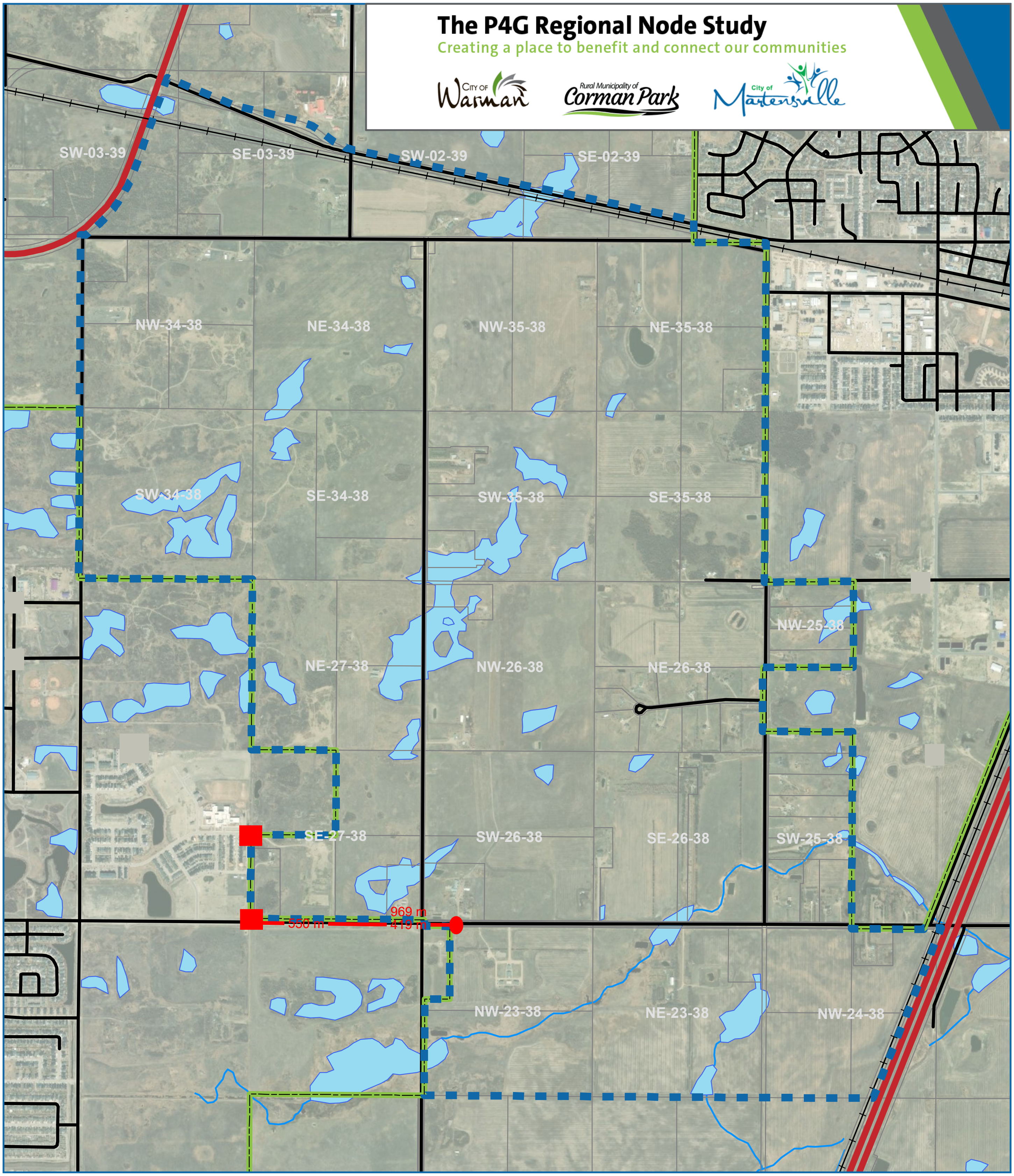

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX E: MARTENSVILLE WASTEWATER SERVICING BY PLANNING UNIT

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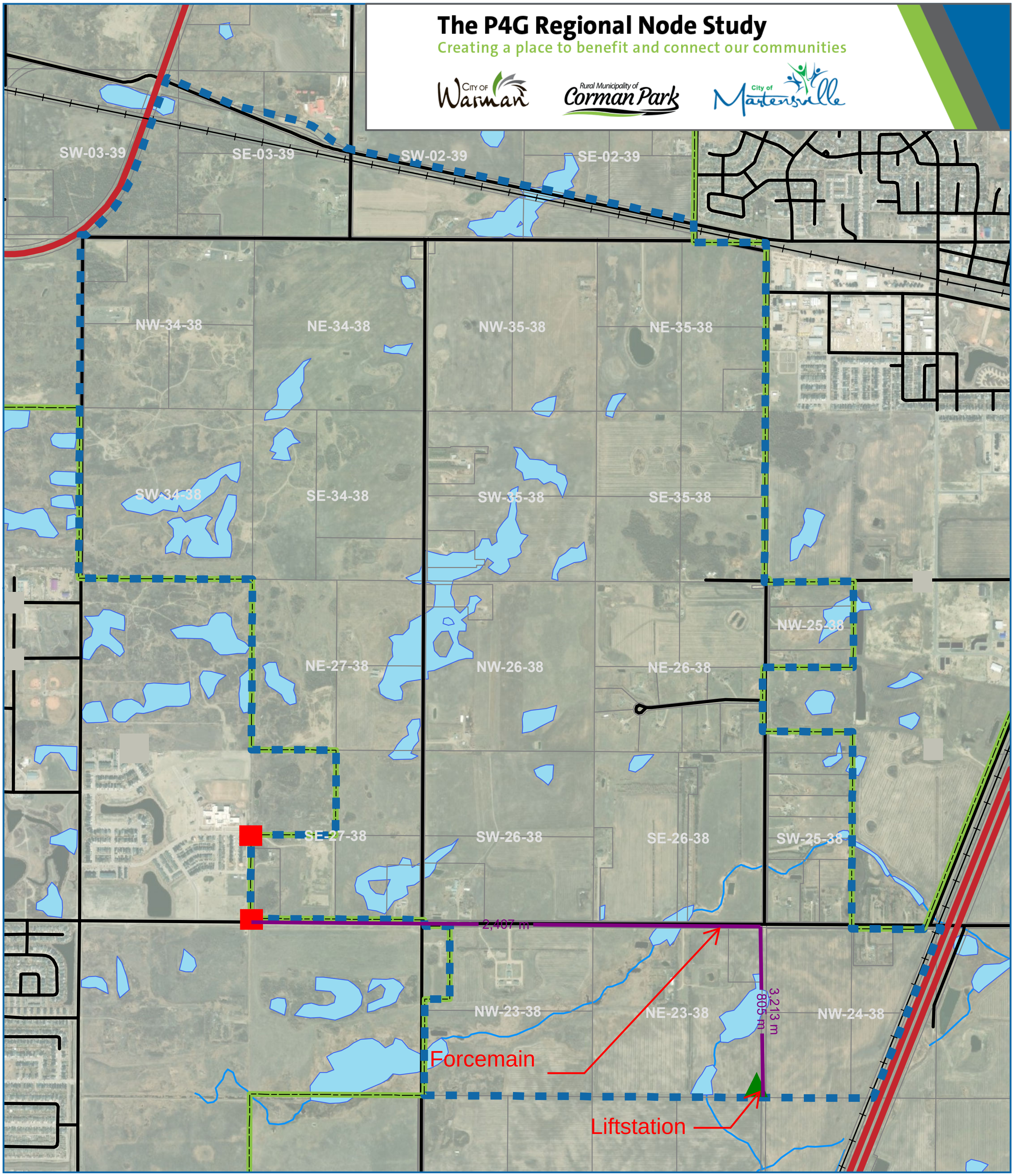

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ISL

N

- Study Area
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
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0 125 250 500 750 1,000 m

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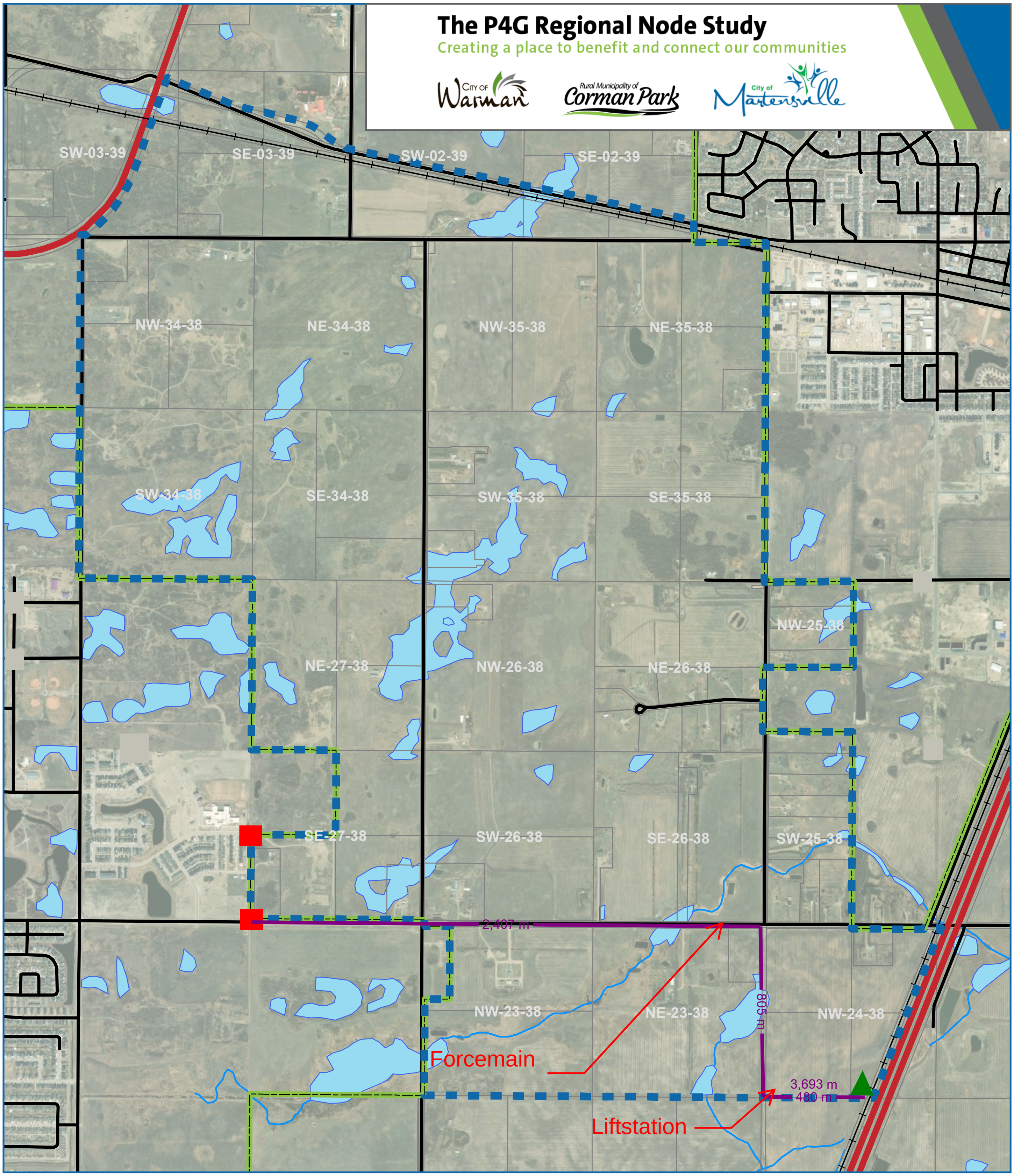

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ISL

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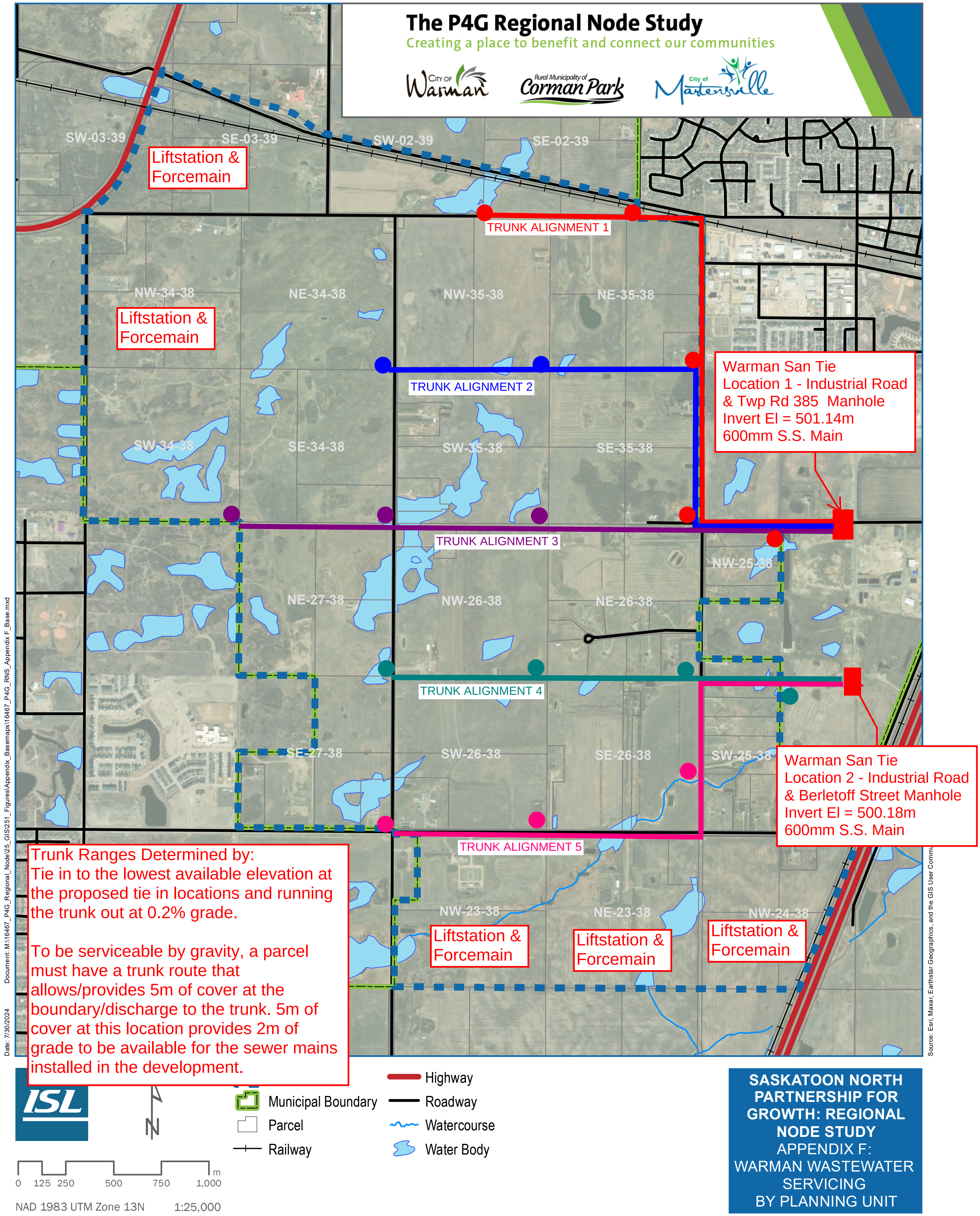
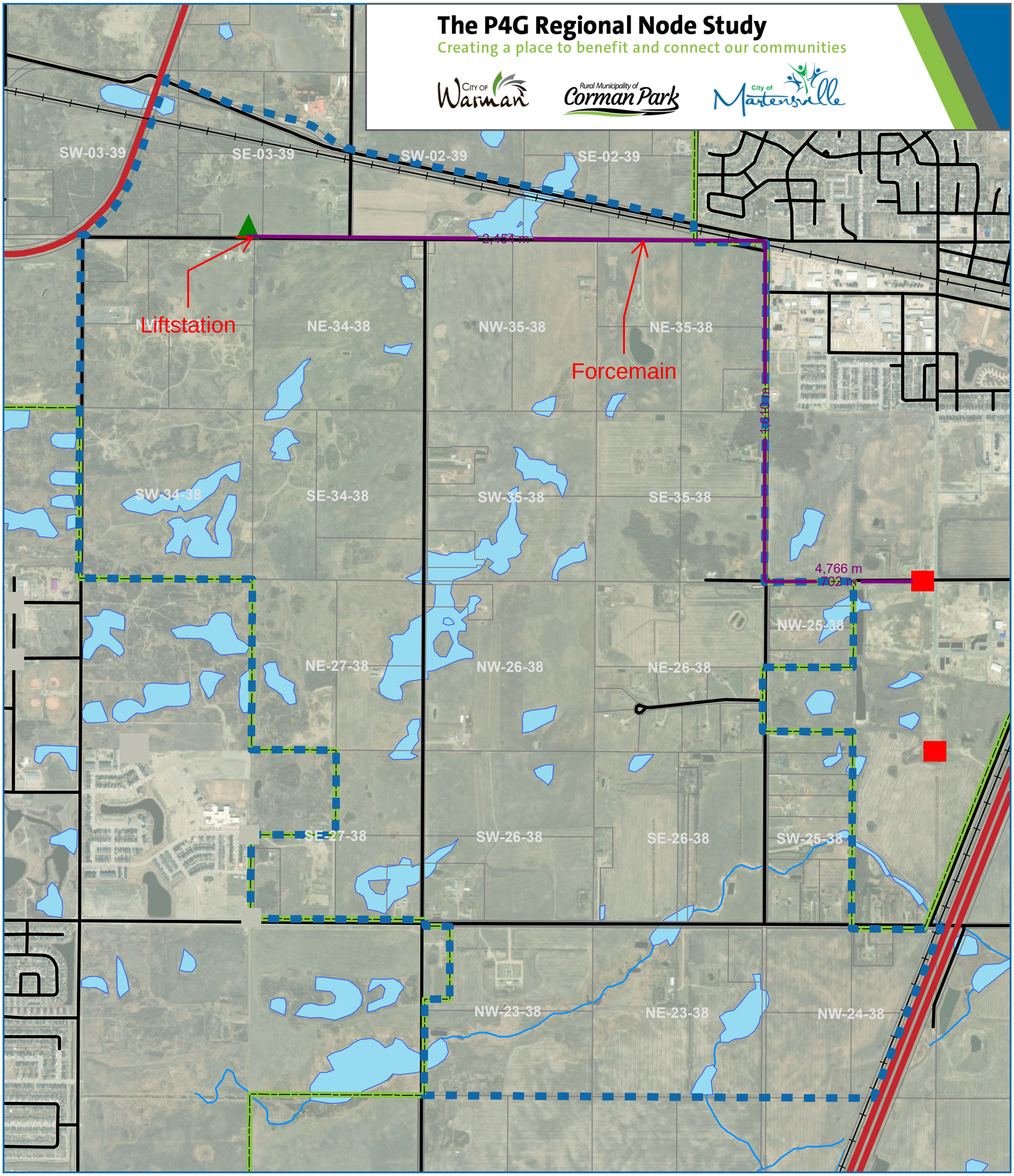
SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX E: MARTENSVILLE WASTEWATER SERVICING BY PLANNING UNIT

APPENDIX F
Warman Wastewater Servicing by Planning Unit

Alignment Options for Sanitary Sewer Trunks Discharging to Warman





ISL

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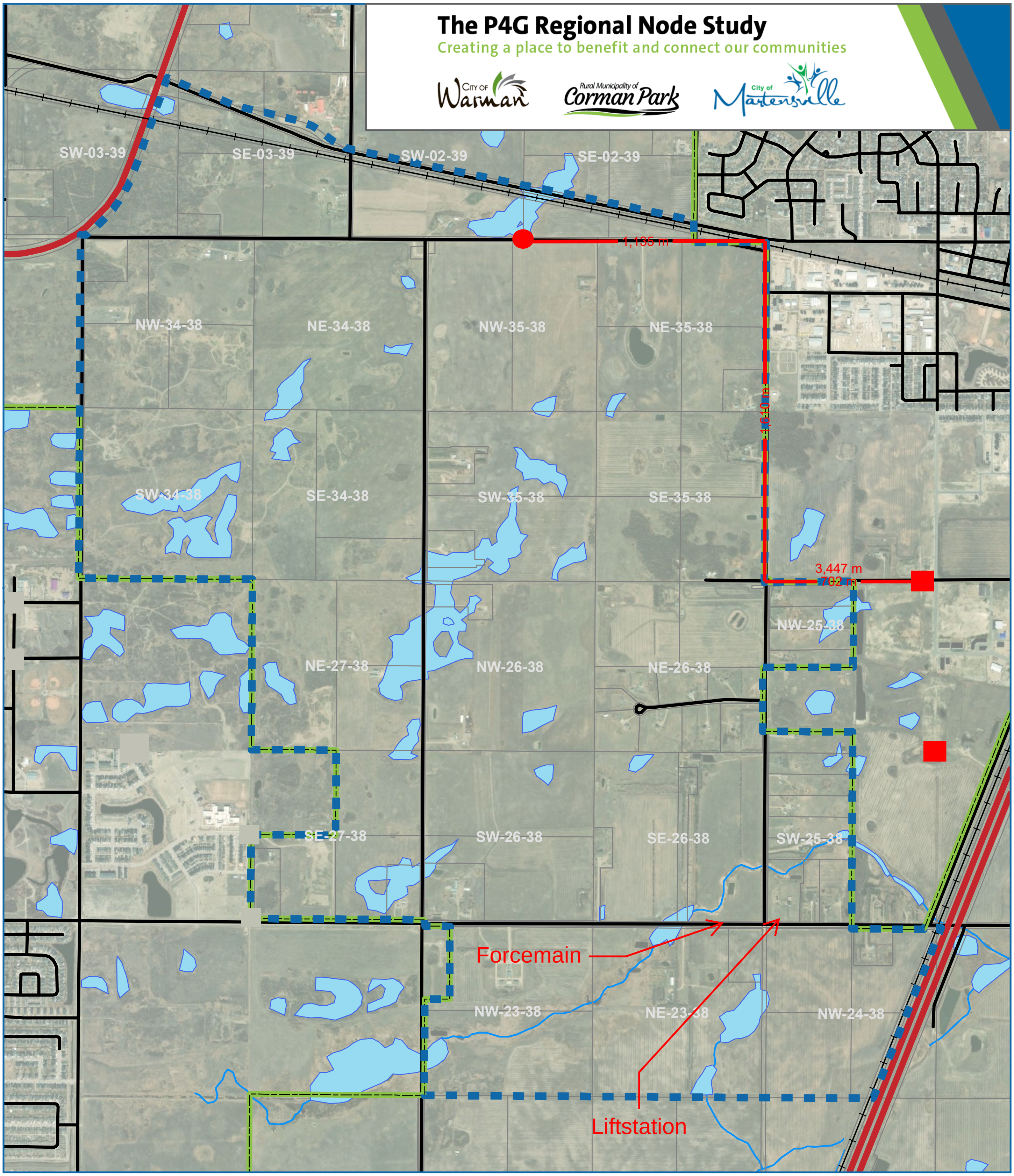

Study Area
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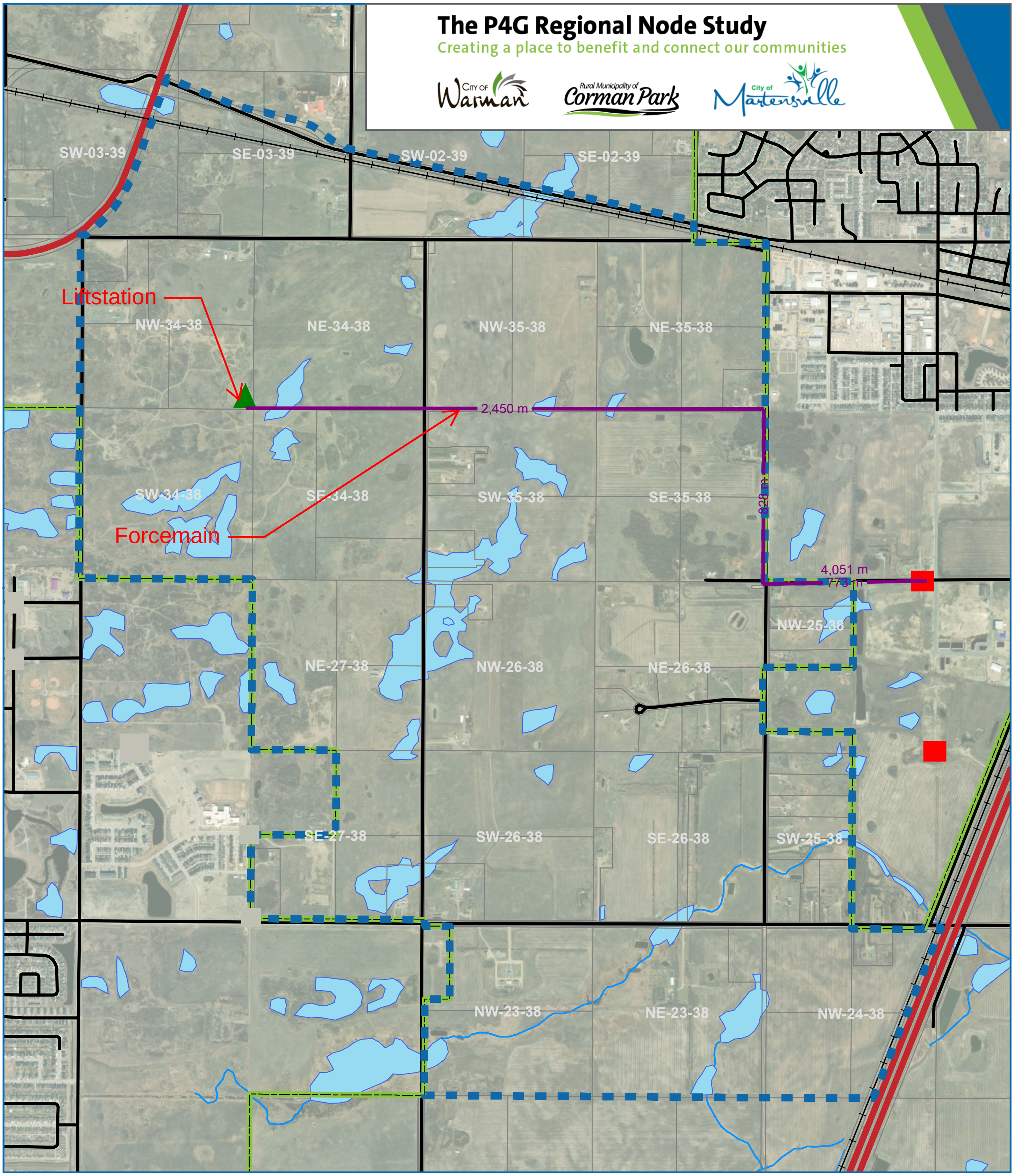

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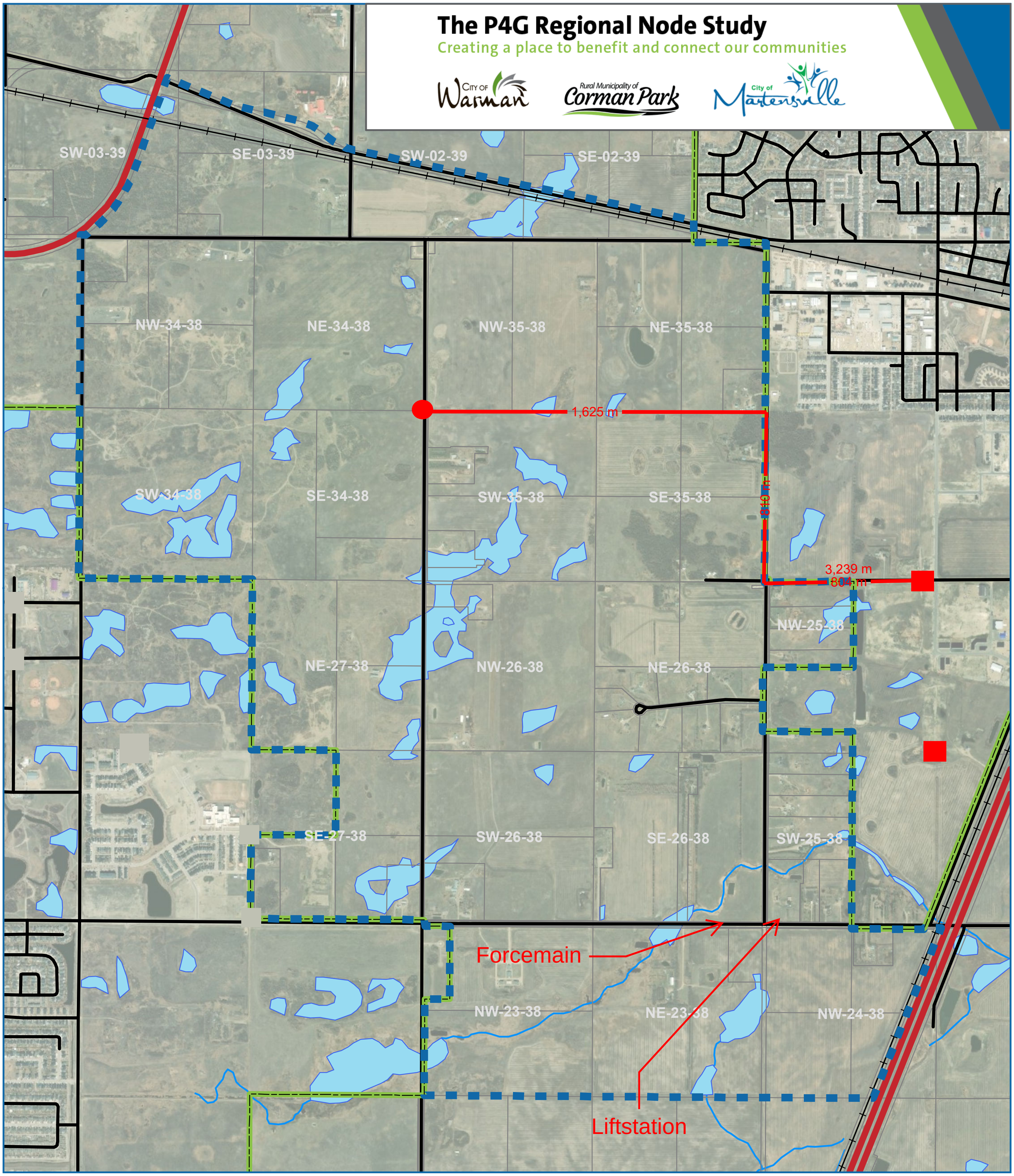

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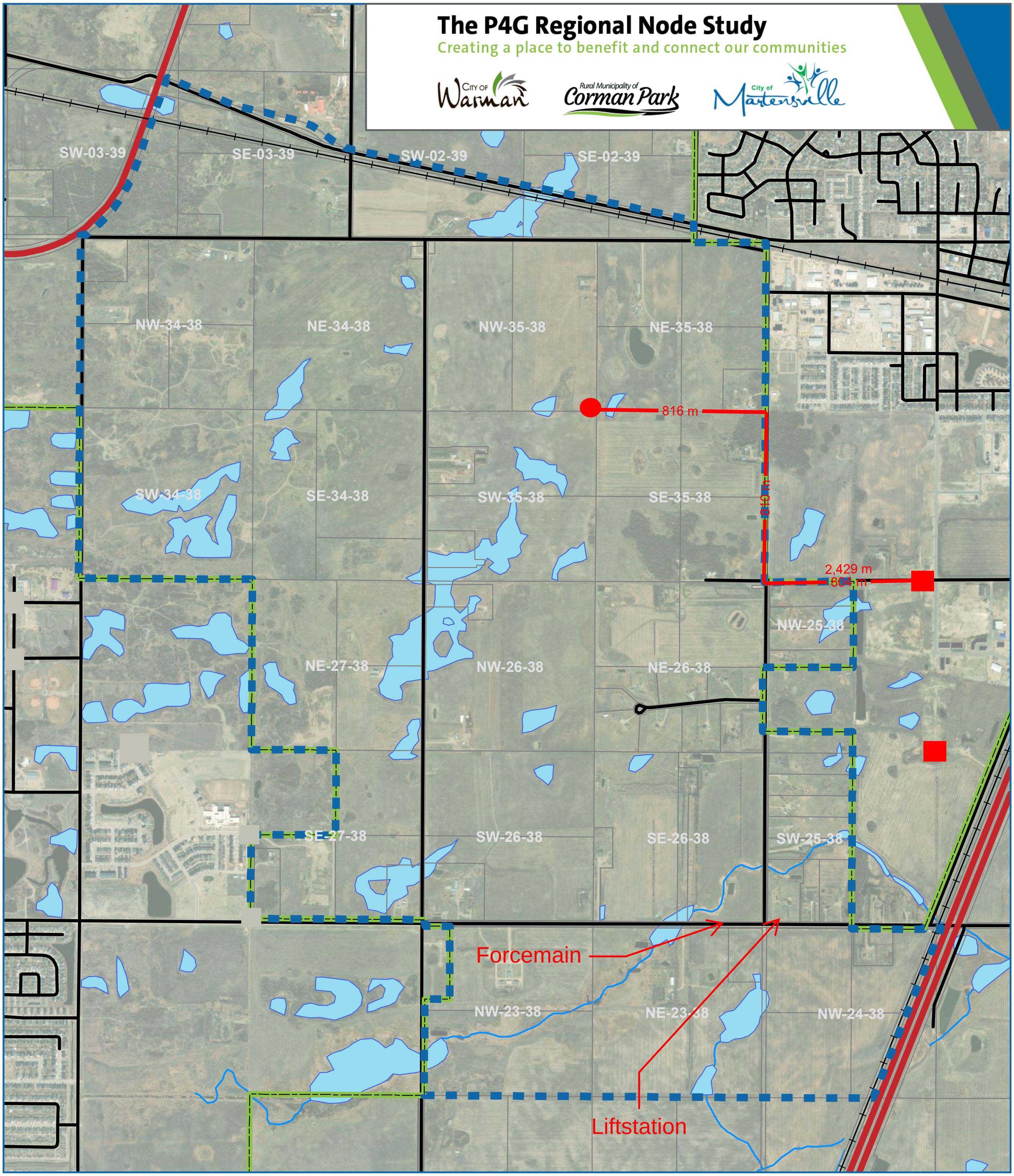

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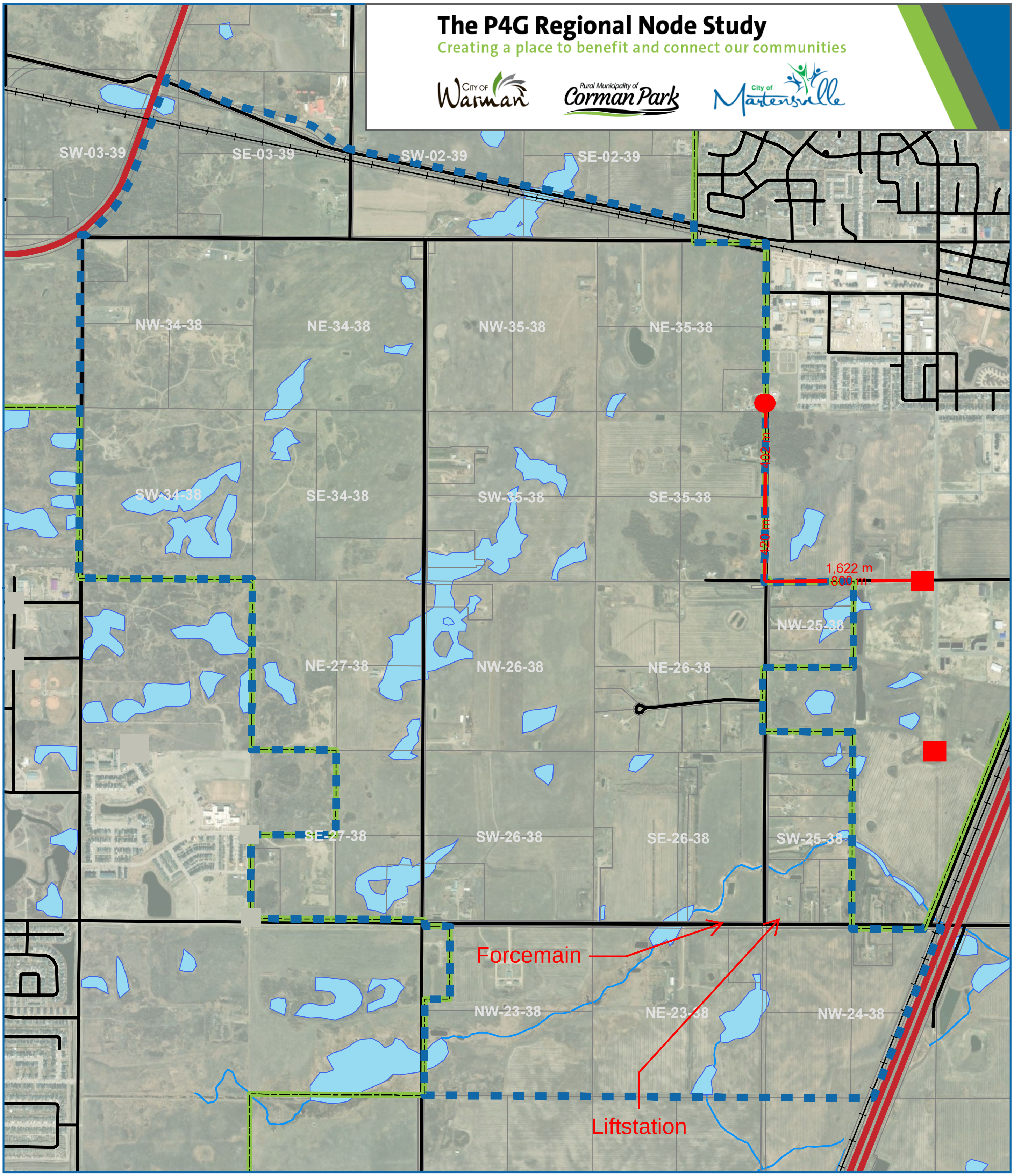

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APPENDIX F:
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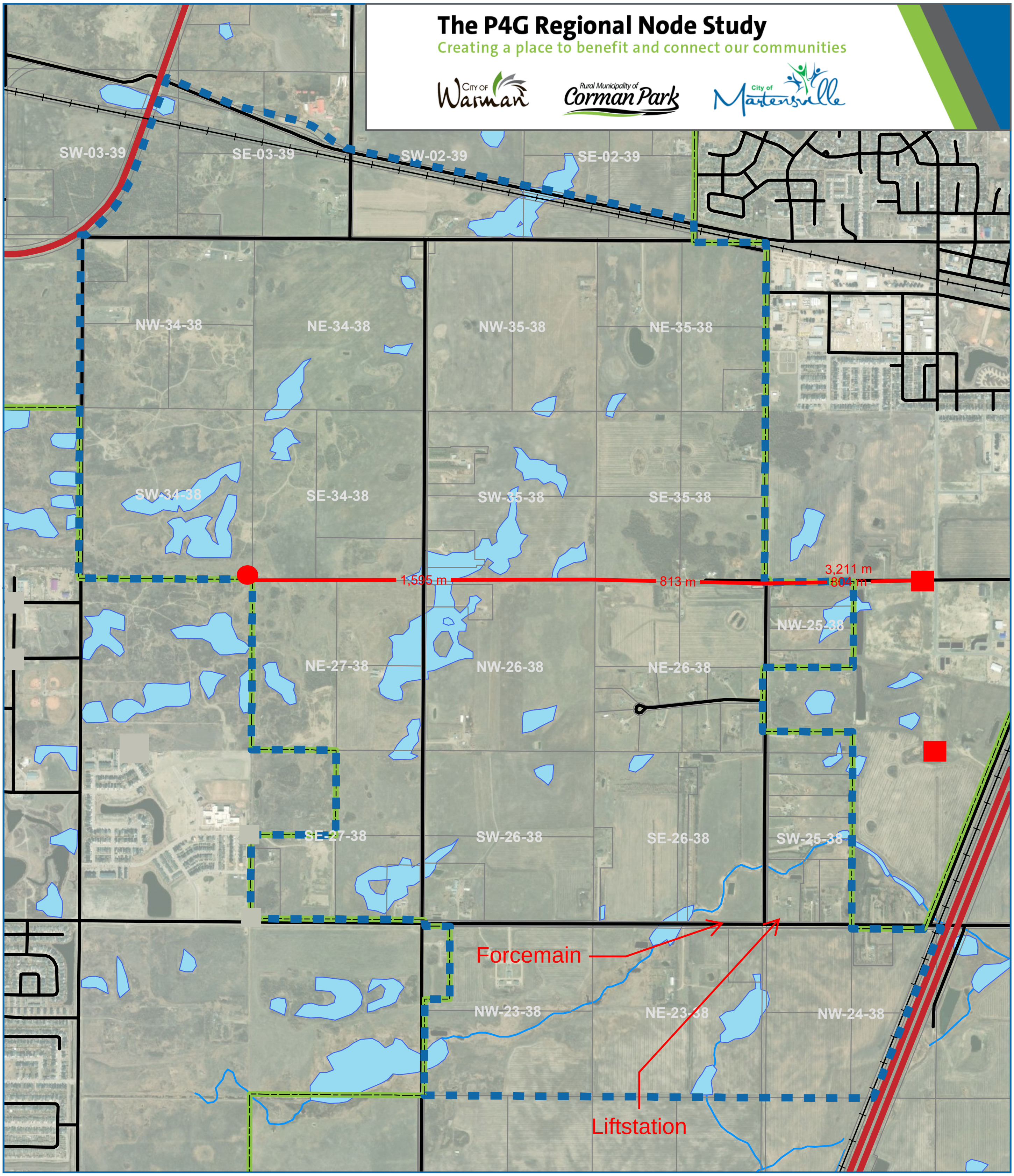

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ISL

N

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

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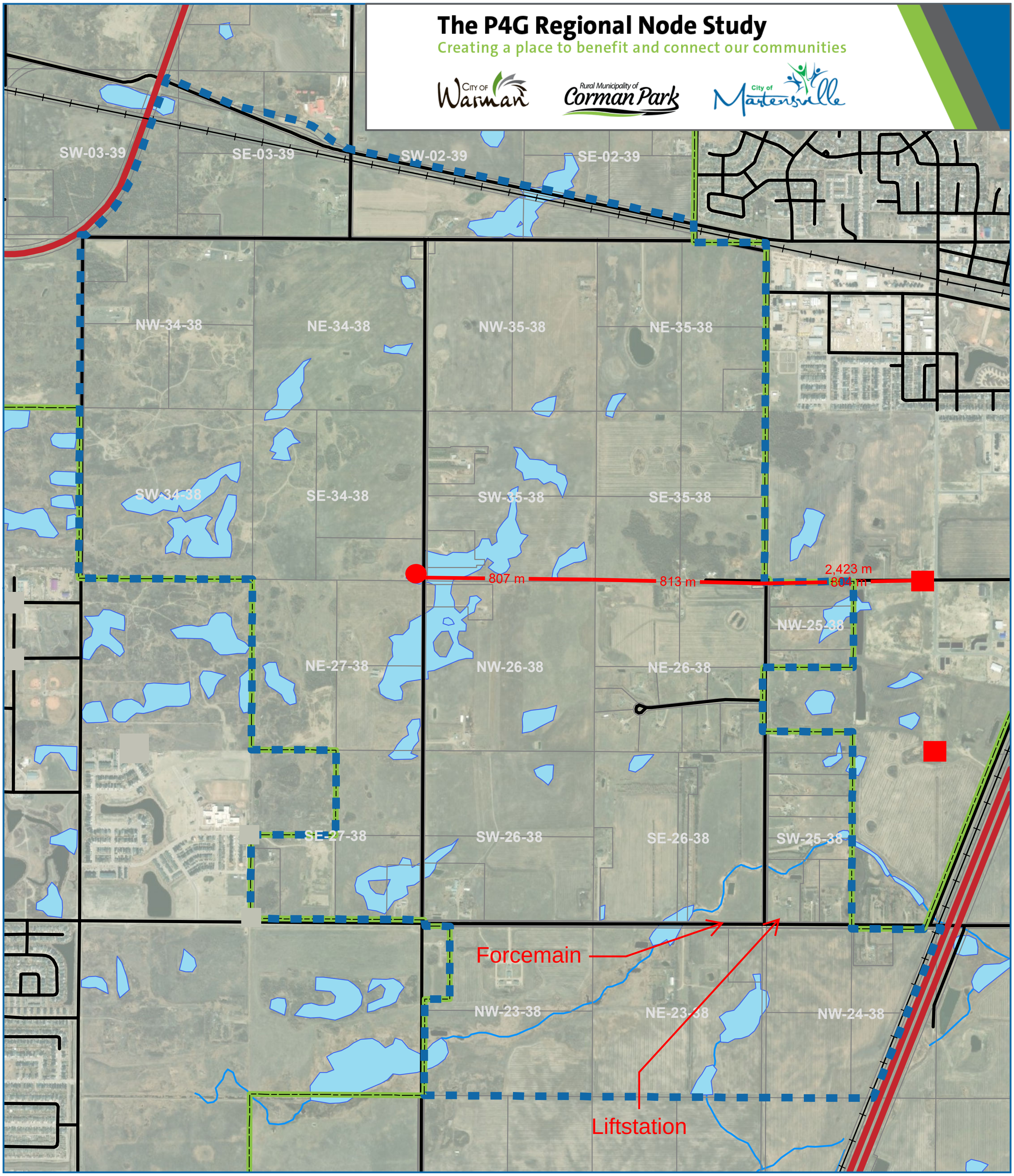

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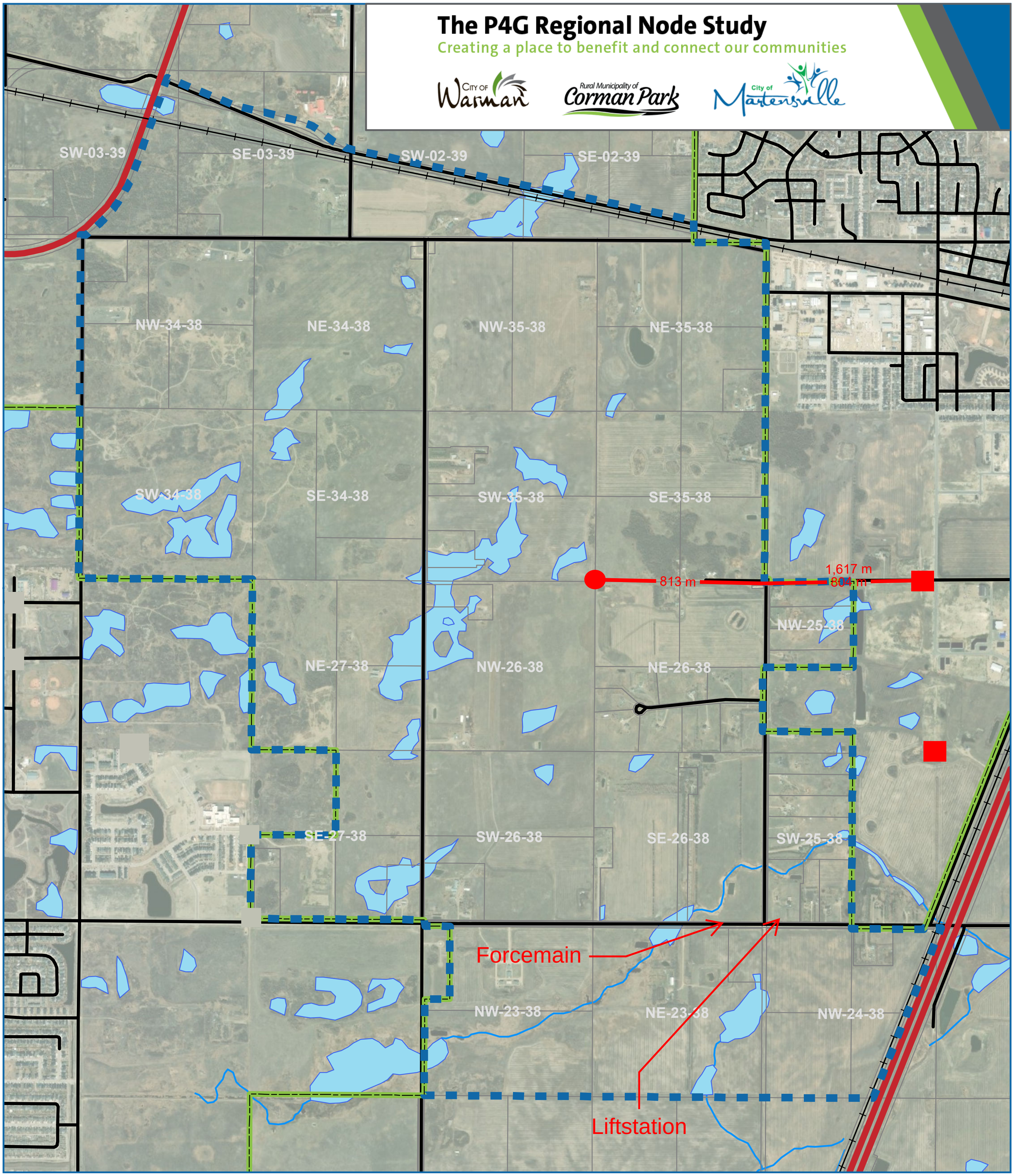
APPENDIX F: WARMAN WASTEWATER SERVICING BY PLANNING UNIT



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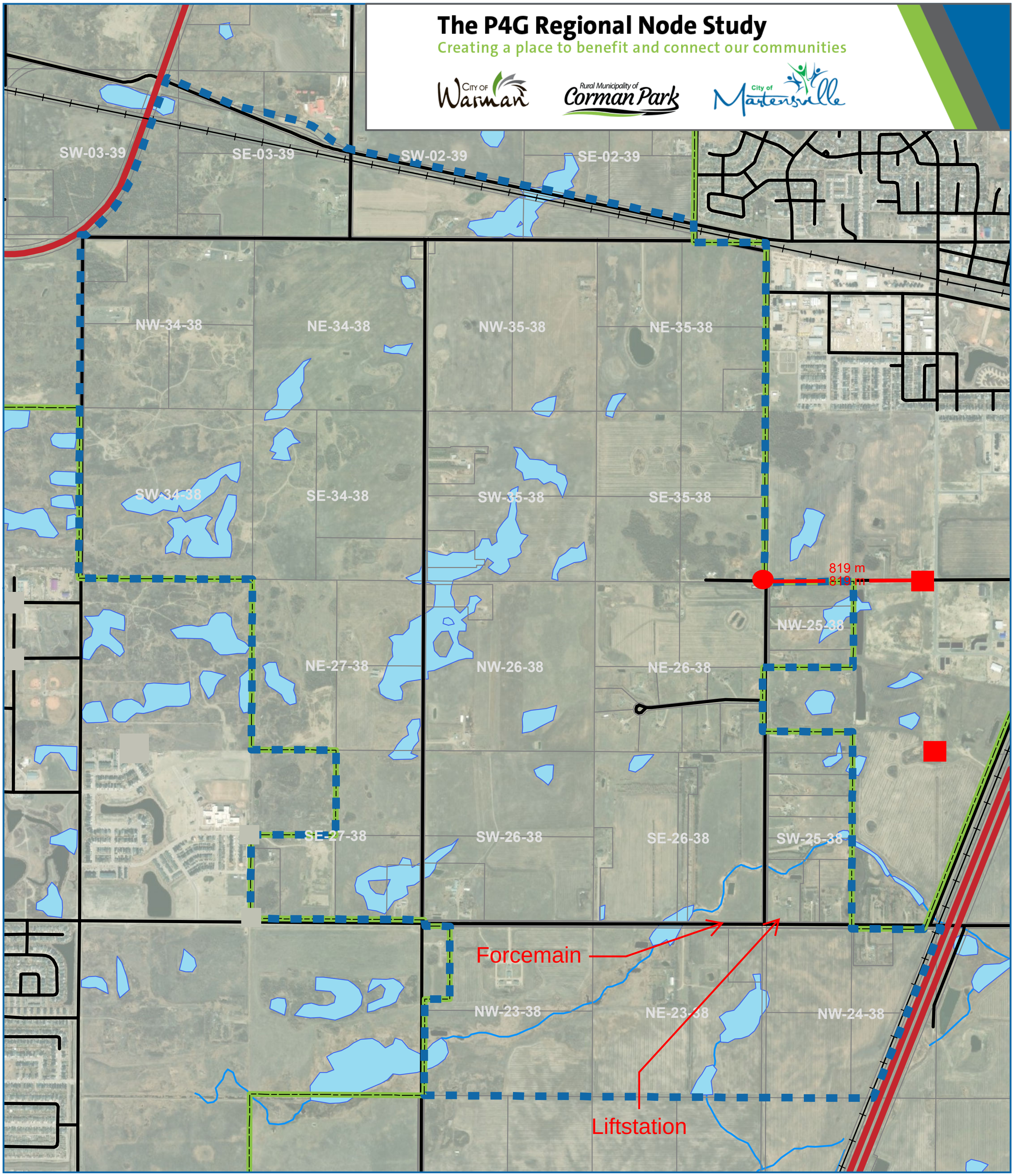

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

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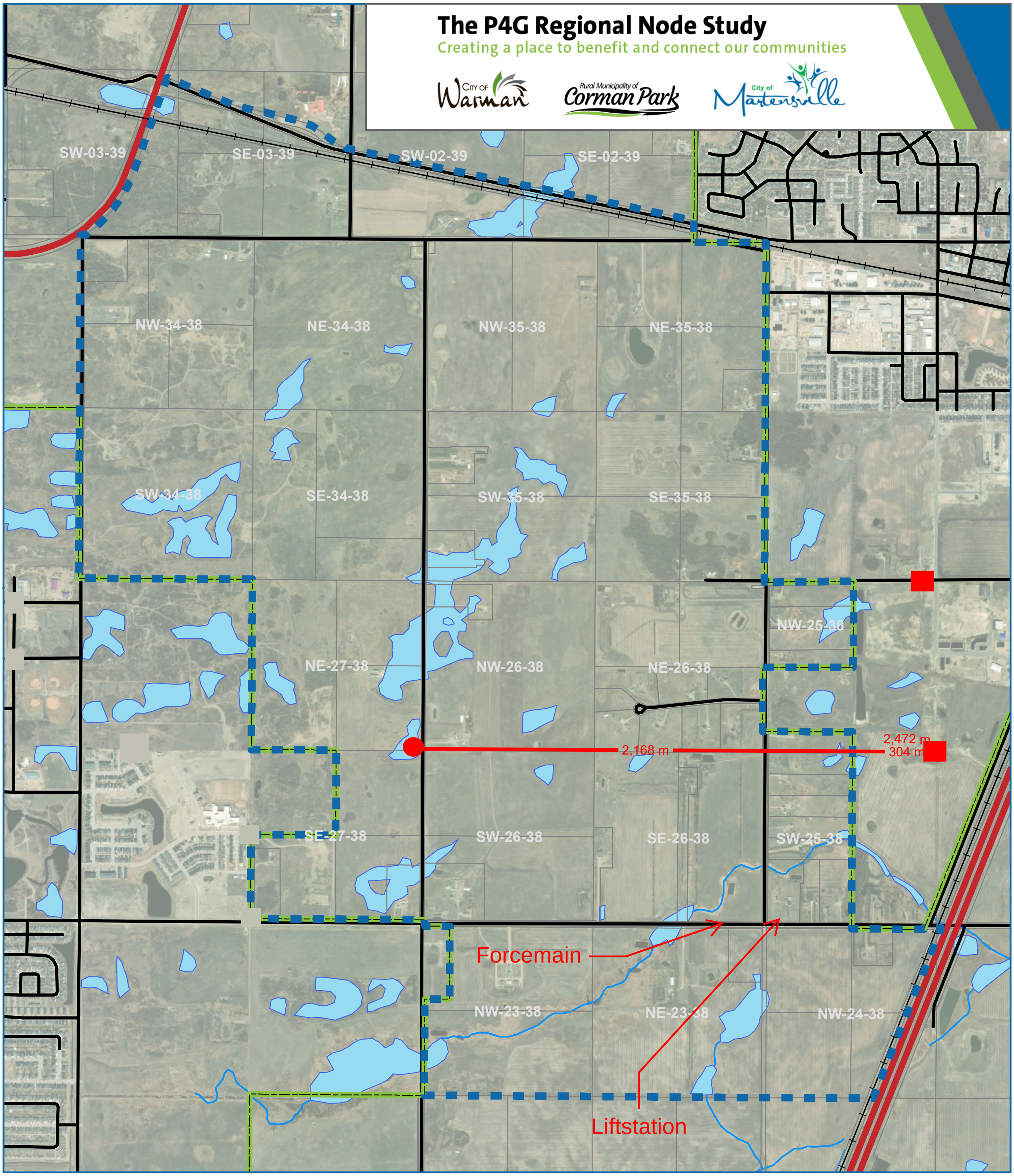

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ISL

N

Study Area	Highway
Municipal Boundary	Roadway
Parcel	Watercourse
Railway	Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

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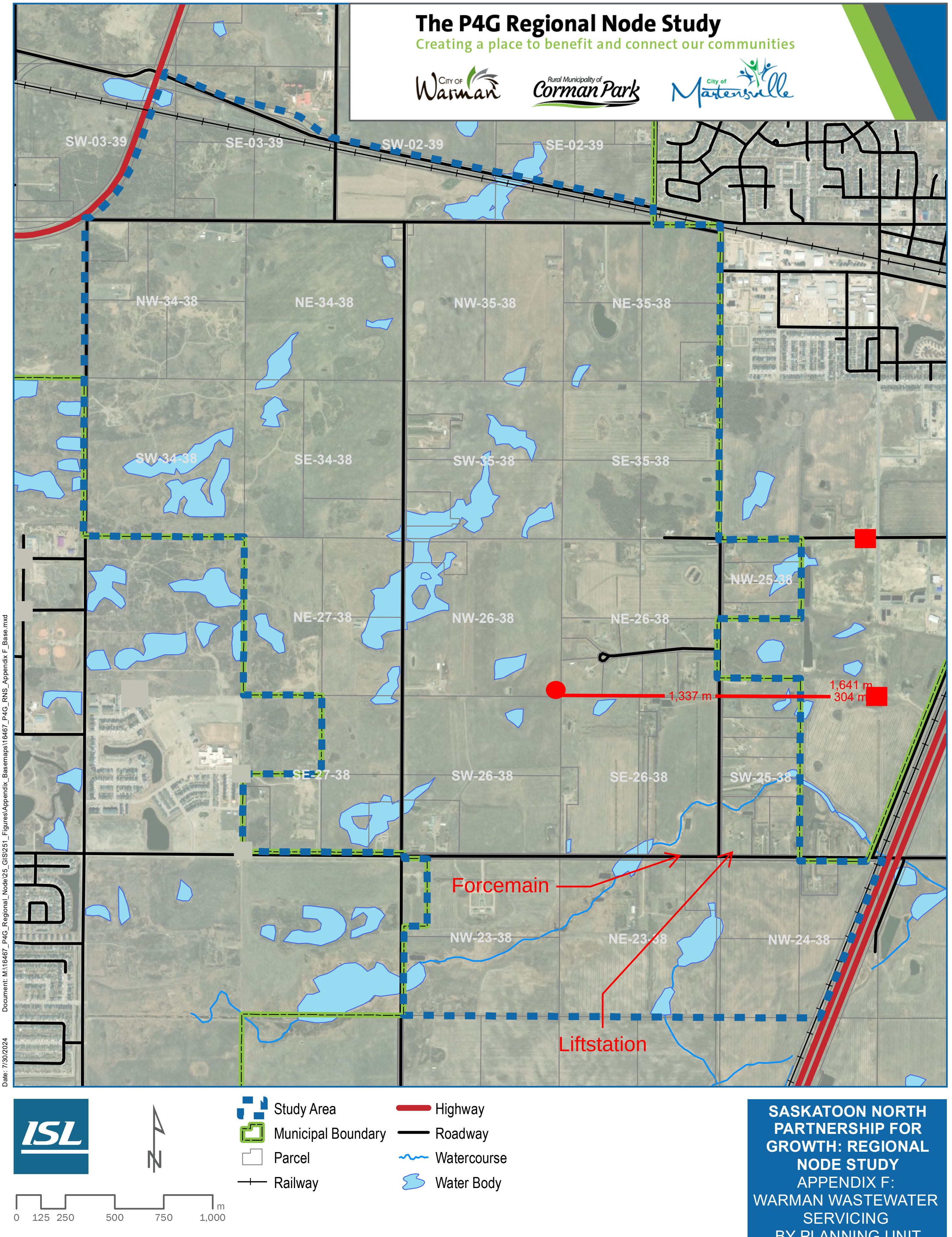

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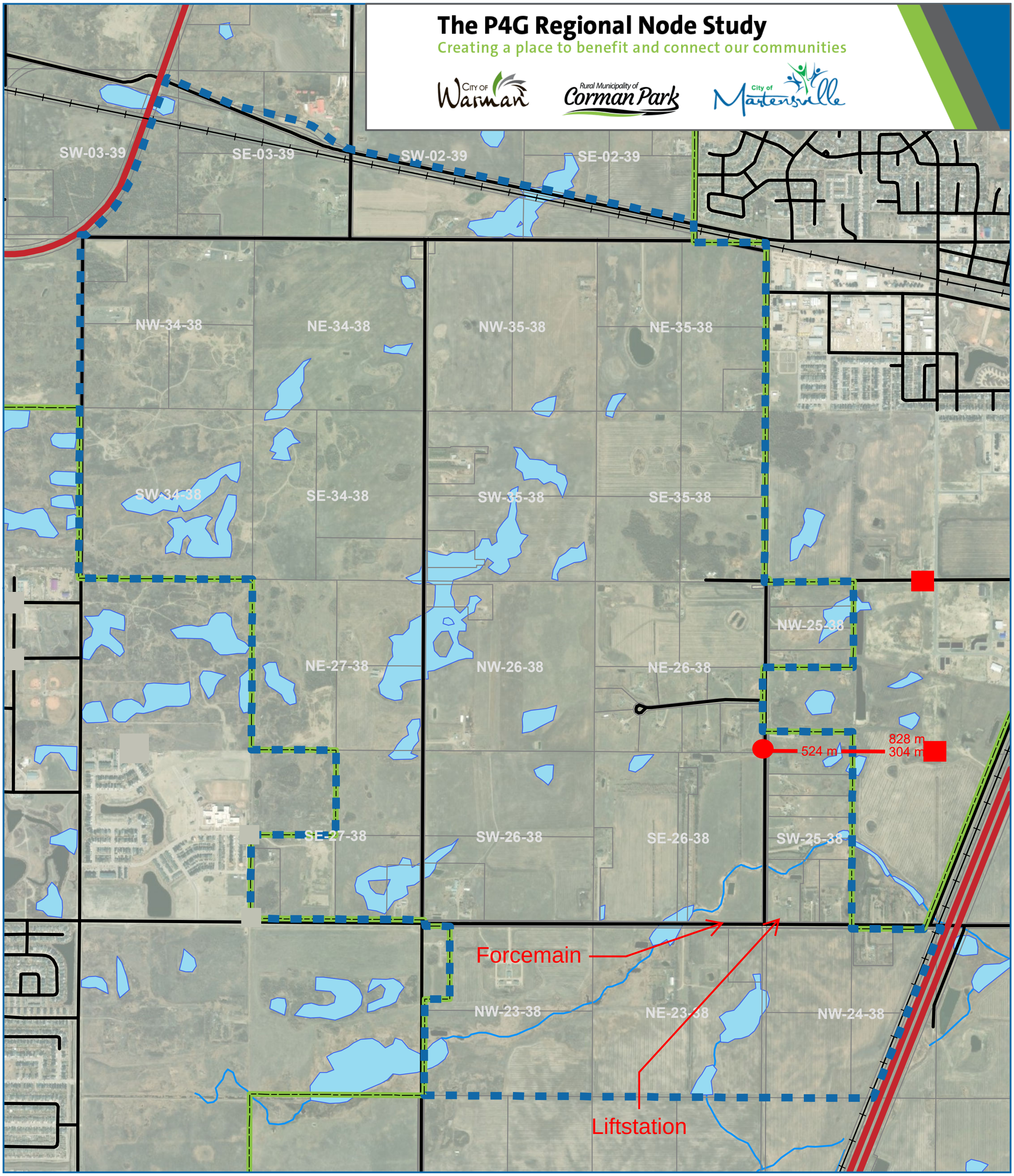
APPENDIX F: WARMAN WASTEWATER SERVICING BY PLANNING UNIT



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ISL

N

- Study Area
- Municipal Boundary
- Parcel
- Railway
- Highway
- Roadway
- Watercourse
- Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY
APPENDIX F:
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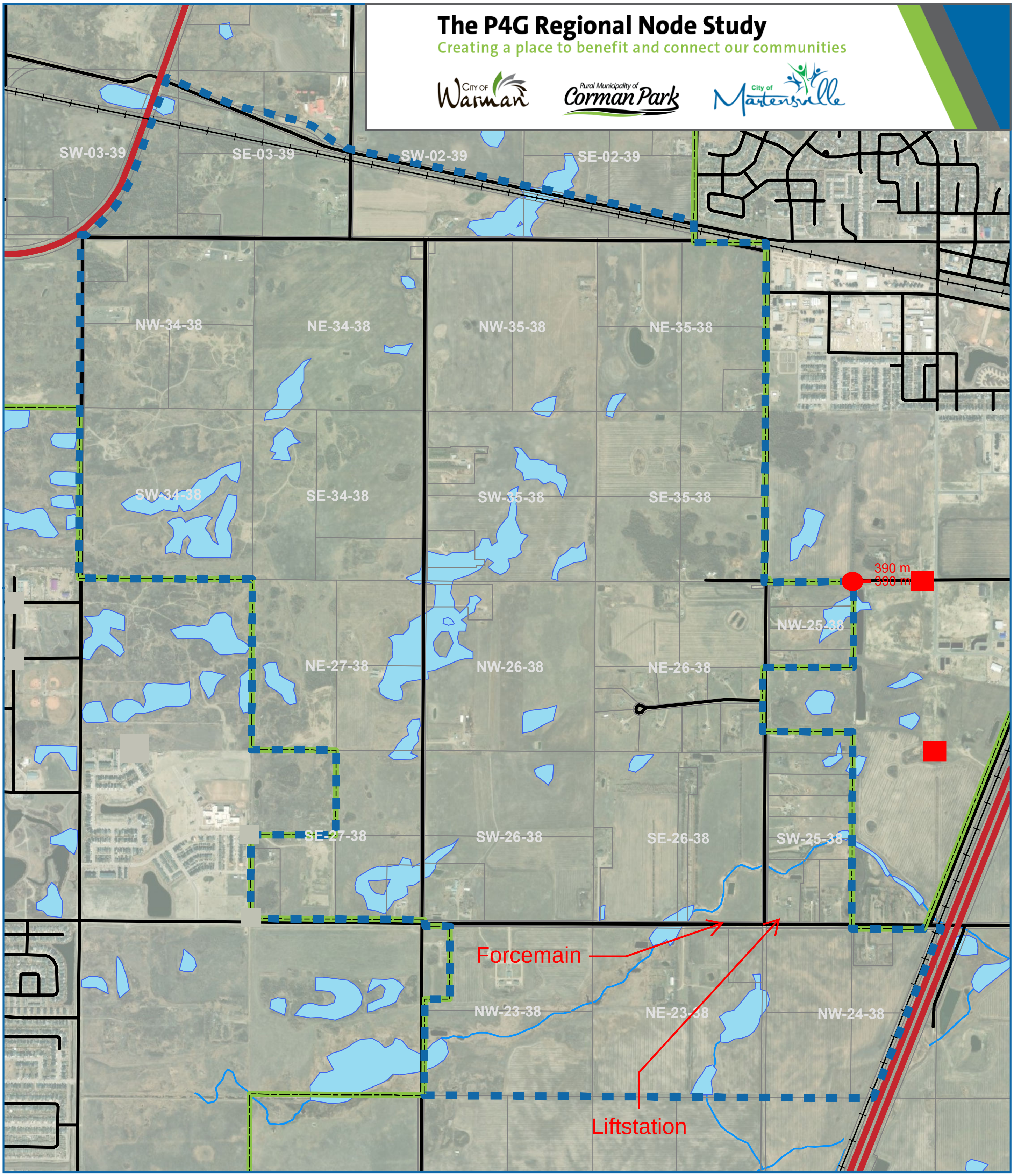
BY PLANNING UNIT



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ISL

N

Study Area	Highway
Municipal Boundary	Roadway
Parcel	Watercourse
Railway	Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

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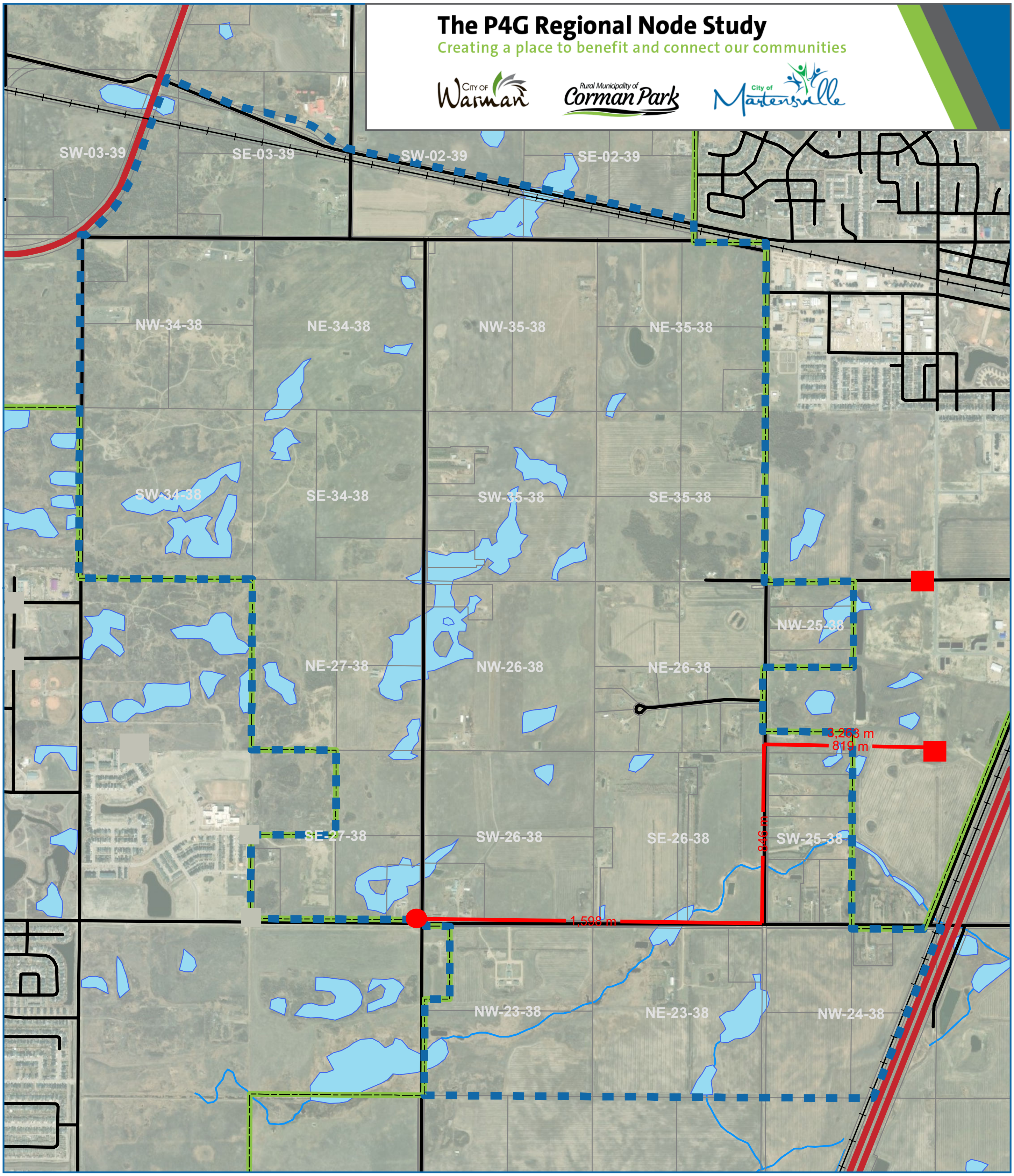

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ISL

Study Area
Municipal Boundary
Parcel
Railway
Highway
Roadway
Watercourse
Water Body

0 125 250 500 750 1,000 m

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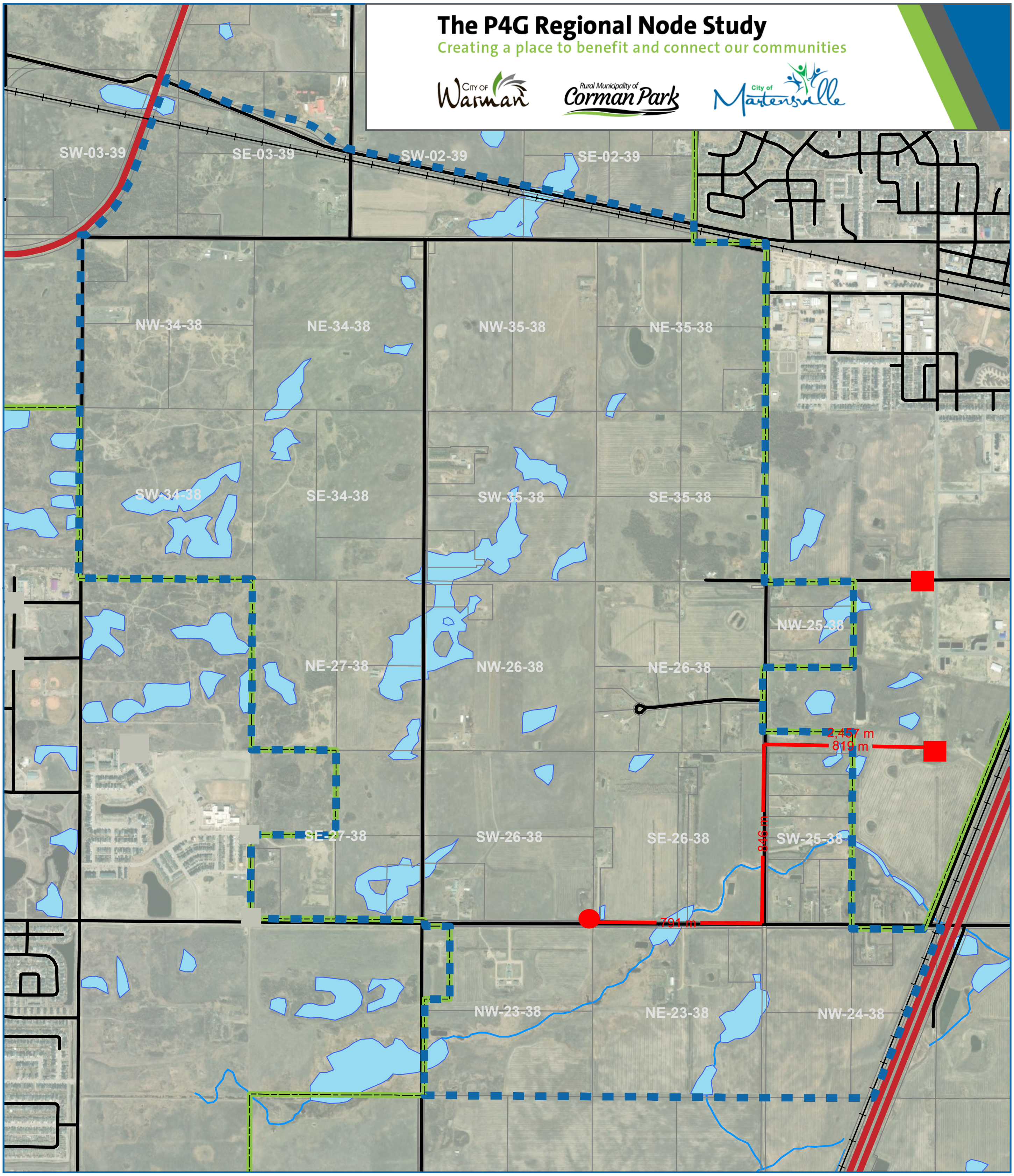
APPENDIX F: WARMAN WASTEWATER SERVICING BY PLANNING UNIT



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ISL

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Study Area
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Parcel
Railway
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Water Body

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APPENDIX F: WARMAN WASTEWATER SERVICING BY PLANNING UNIT

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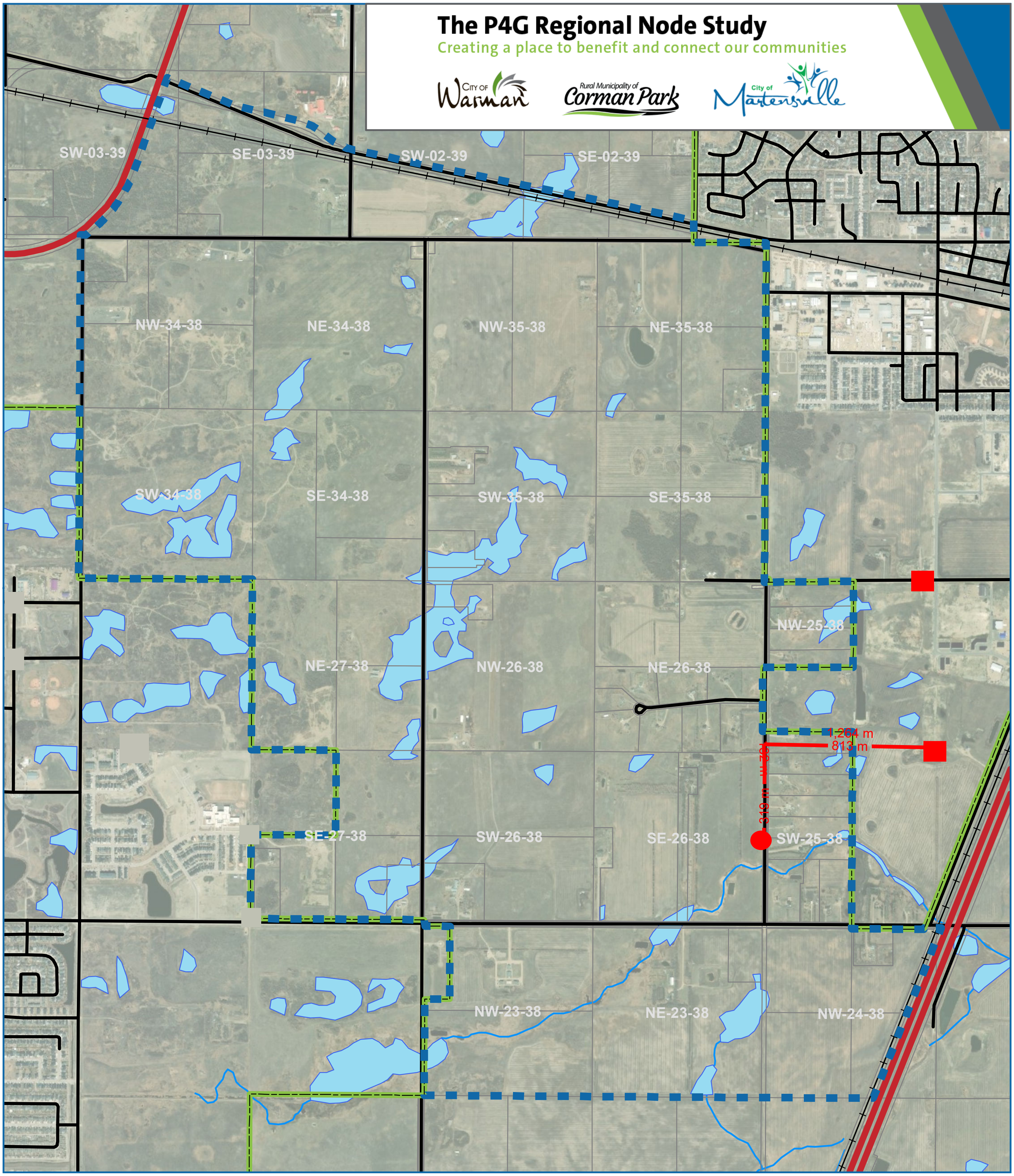

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ISL

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Study Area
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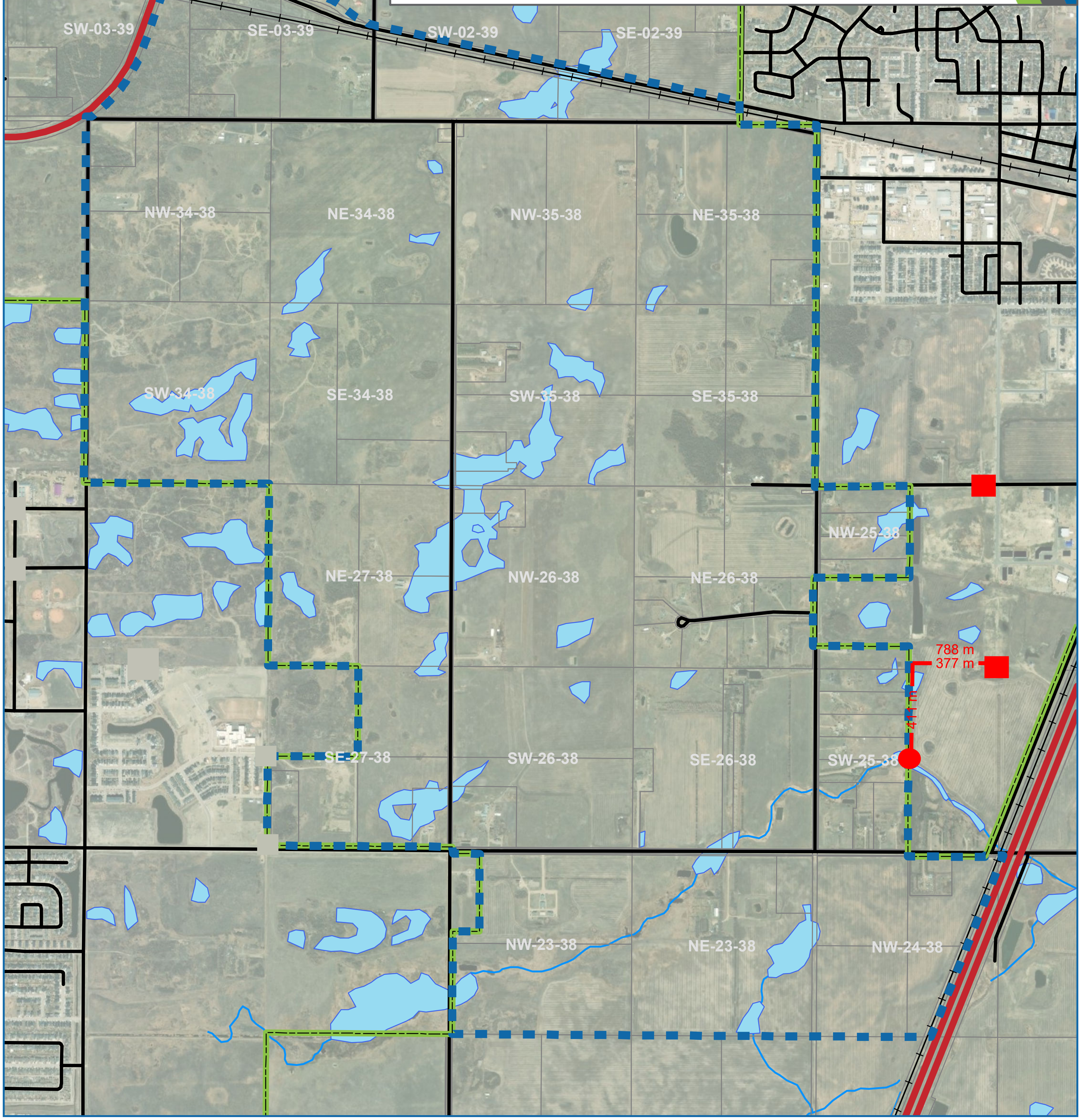

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ISL

N

- Study Area
- Municipal Boundary
- Parcel
- Railway
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- Roadway
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0 125 250 500 750 1,000 m

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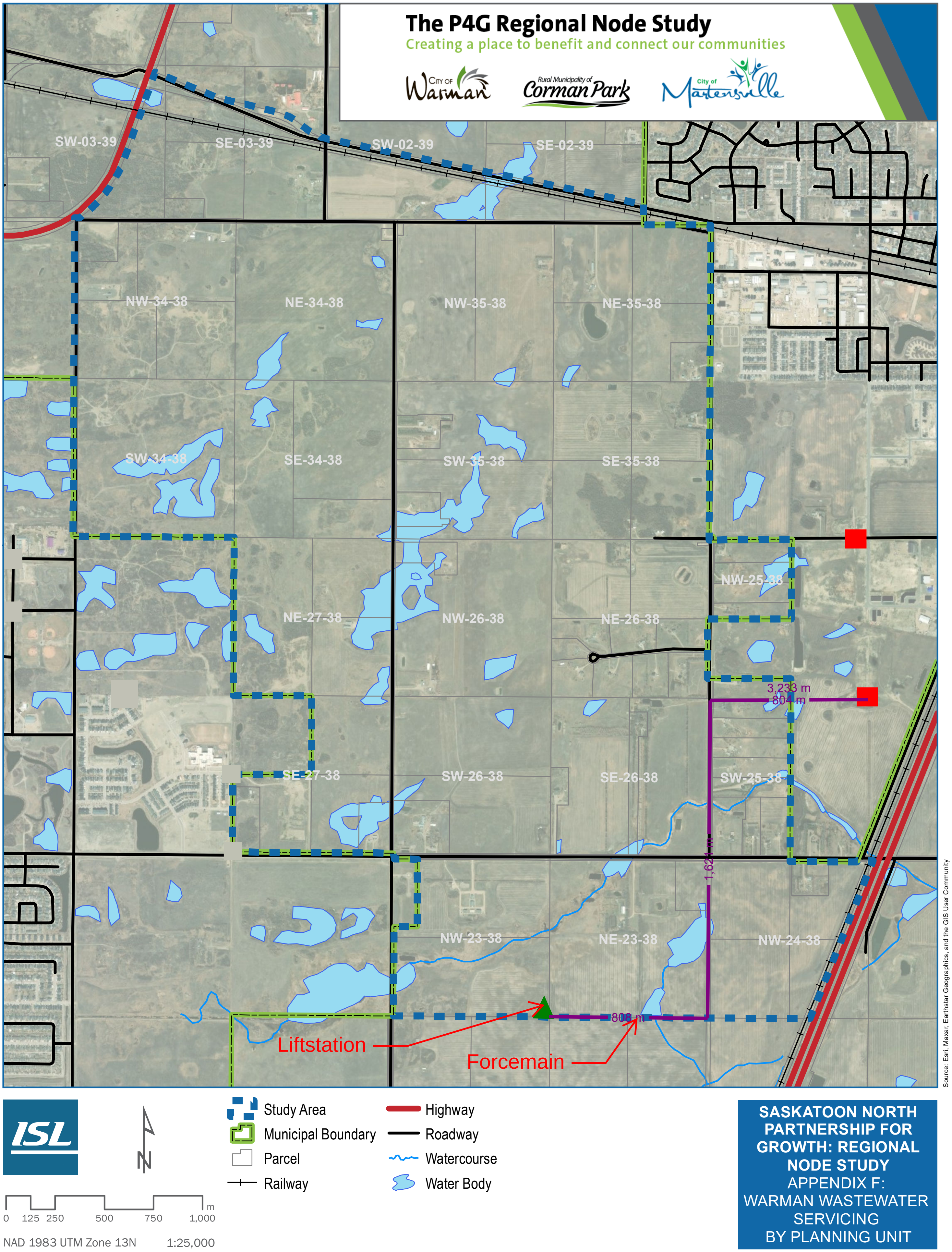

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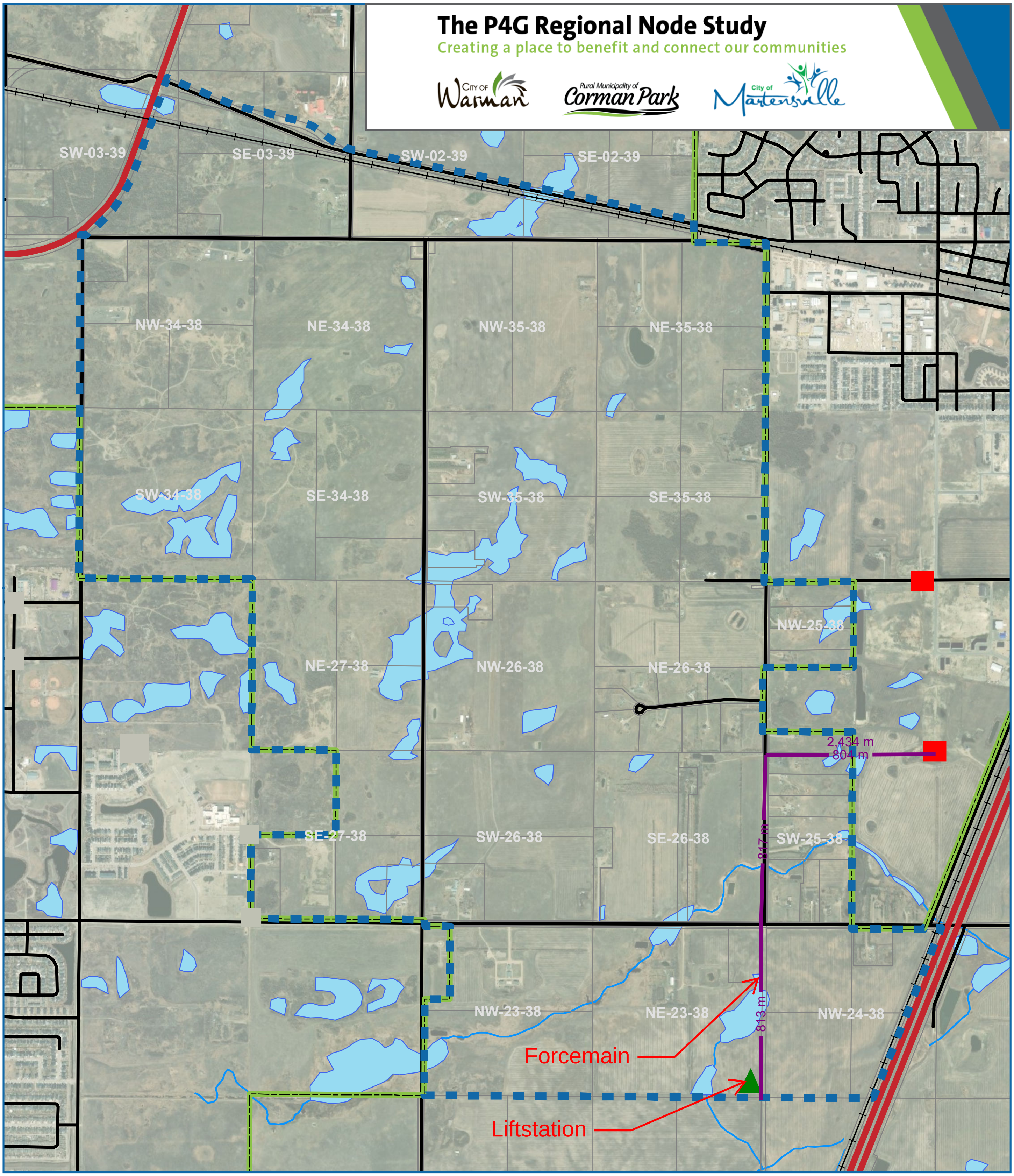

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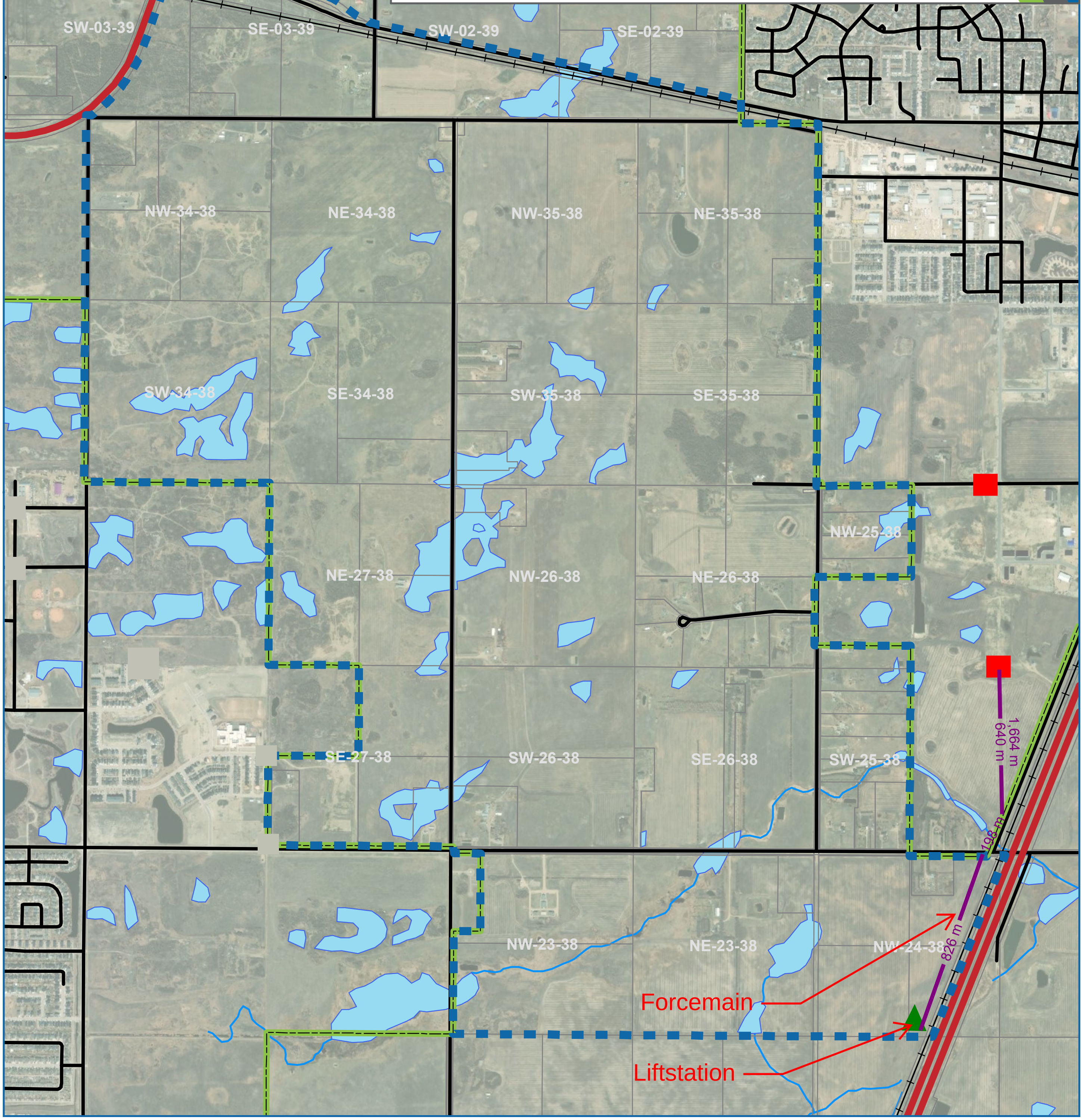

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ISL

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Legend	
Study Area	Highway
Municipal Boundary	Roadway
Parcel	Watercourse
Railway	Water Body

0 125 250 500 750 1,000 m

NAD 1983 UTM Zone 13N 1:25,000

SASKATOON NORTH PARTNERSHIP FOR GROWTH: REGIONAL NODE STUDY

APPENDIX F:
WARMAN WASTEWATER SERVICING
BY PLANNING UNIT

APPENDIX G
Transportation Cost Estimate Details

Table D1 Estimated Arterial Road Paving Cost

800 m of Range Road 3051 and 3052 adjacent to the Regional Node

Cost Item	Depth (mm)	Quantity	Unit	Unit Price
Remove and Dispose of Existing Gravel Roadway Structure	350	1600	sq.m	$ 20.00
Subgrade Preparation	150	1600	sq.m	$ 10.00
Sub Base Course	350	1600	sq.m	$ 50.00
Base Course	200	1600	sq.m	$ 40.00
Asphalt Roadway	100	1600	sq.m	$ 40.00
			Cost per m^2	$ 160.00
			Cost per l.m (8.6 m width)	$ 1,376.00
			Subtotal	**$ 2,201,600.00**
			Engineering (15%)	$ 330,240.00
			Subtotal	**$ 2,531,840.00**
			Contingency (30%)	$ 759,552.00
			Total	**$ 3,291,392.00**

Table D2 Estimated Multi-Use Path Cost

800 m along one side of Range Road 3051 and 3052 adjacent to the Regional Node

1600 m along north side of Mierau Road adjacent to Regional Node

Cost Item	Depth (mm)	Quantity	Unit	Unit Price
Earthworks	-	-	L.S	$ 277,714.29
Subgrade Preparation	150	2700	sq.m	$ 10.00
Base Course	150	2700	sq.m	$ 30.00
Asphalt Path	50	2700	sq.m	$ 20.00
			Cost per m2 (Subgrade, Base, and Asphalt)	$ 60.00
			Cost per l.m (3.0 m width inclusive)	$ 282.86
			Subtotal	**$ 763,714.29**
			Engineering (15%)	$ 114,557.14
			Subtotal	**$ 878,271.43**
			Contingency (30%)	$ 263,481.43
			Total	**$ 1,141,752.86**

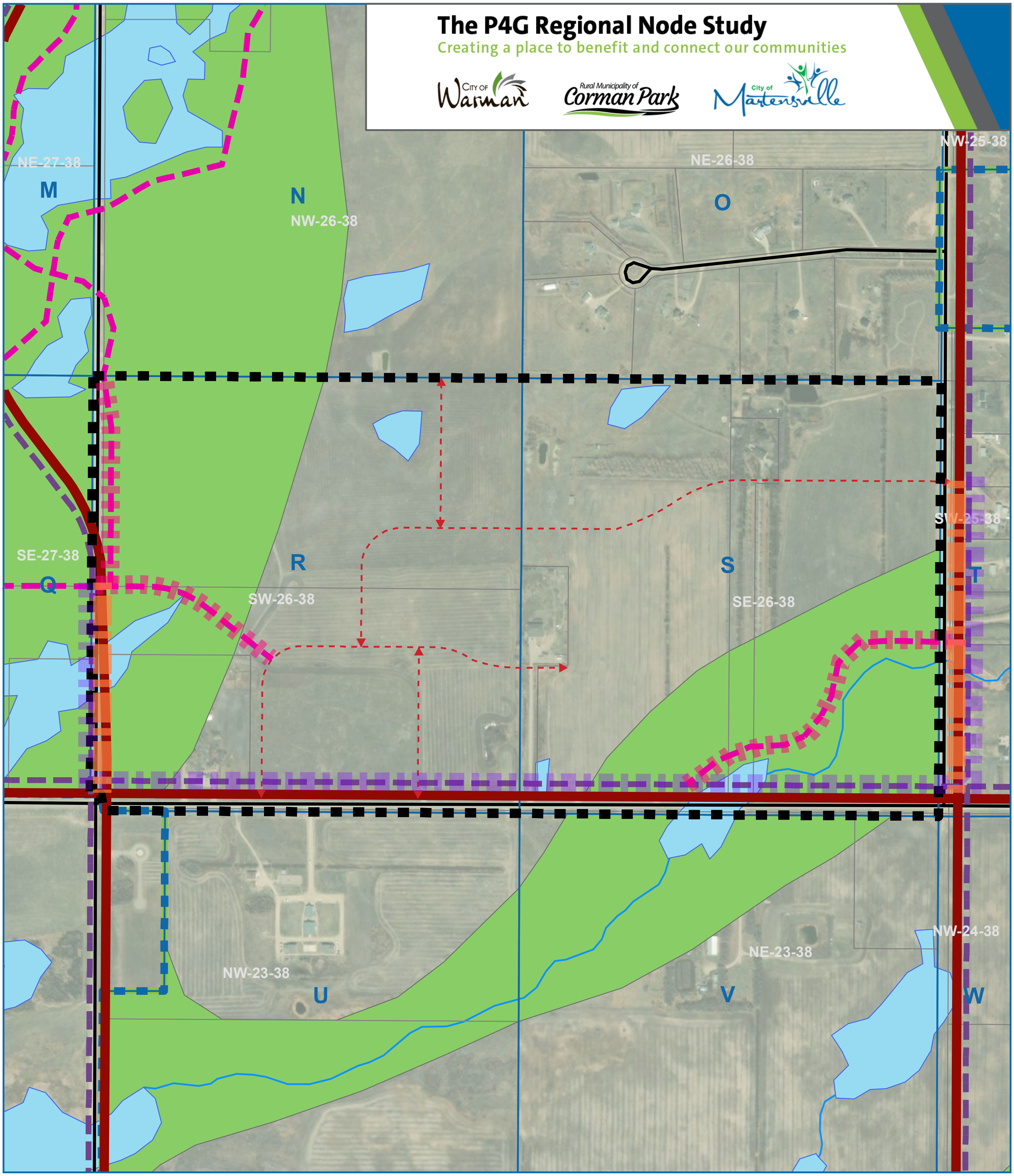
Table D3 Nature Trail in Green Network Study Area

Cost Item	Depth (mm)	Quantity	Unit	Unit Price
1.0 m Wood Mulch Nature Trail	N/A	1500	m^2	$ 40.00
			Subtotal	**$ 60,000.00**
			Engineering (15%)	$ 9,000.00
			Subtotal	**$ 69,000.00**
			Contingency (30%)	$ 20,700.00
			Total	**$ 89,700.00**

Total Transportation Servicing Cost for Regional Node	$ 4,522,844.86

Notes

1. Depths based on CoM Arterial Roadway Pavement Structure and Asphalt Pathways Pavement Structure.
2. Land acquisition not included.
3. Assumed 8.6 m paved arterial surface based on R.M Corman Park Grid Road.
4. Assume rural paved cross section.
5. Assumed 3.0 m multi-use path.
6. Survey, mobilization/ demobilization, traffic accommodation, utility coordination, and hydrovac not included.
7.Earthworks estimate for shared use path based on similar tender for path along rural (ditch) cross section.



Study Area
Planning Unit
Municipal Boundary
Parcel
Water Body
Watercourse
Recommended Node
Green Network Study Area
Arterial
Potential Internal Collector
Multi-Use Trail
Recreational Trail
Arterial Paving Included in Cost Estimate
Multi-Use Trail Included in Cost Estimate
Trail Included in Cost Estimate

0 50 100 200 300 400 m

NAD 1983 UTM Zone 13N 1:10,094

Date: 7/30/2024 Document: M:\16467_P4G_Regional_Node\25_GIS\251_Figures\Appendix_Basemaps\16467_P4G_RNS_Appendix G_Base.mxd

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

APPENDIX H
Policy Recommendations

Proposed Amendments

10.3.5 Special Policy Areas, Locations and Nodes

(h) *Regional Community Services Node* is a development node that is intended to accommodate a compatible mix of future community service, institutional, recreational, and commercial uses.

15A. Regional Community Services Node

15A.1 Introduction

The Regional Community Services Node is envisioned to facilitate development of community service, institutional, recreational, and commercial uses for regional or intermunicipal benefit.

15A.2 Objectives

a) Provide for joint planning between the P4G municipalities to encourage regional or intermunicipal facilities and amenities that support growth;
b) Coordinate regional infrastructure to support development of the node; and
c) Provide support for community service, institutional, recreational, and commercial uses based on needs, market demand, and servicing capability.

15A.3 Policies

15A.3.1. Identification of the Regional Community Services Node

The Regional Community Services Node may be permitted in the conceptual location identified on Schedule B – District Land Use Map.

15A.3.2. Detailed Planning for the Regional Community Services Node

A Comprehensive Development Review is required for development approval within the Regional Community Services Node that must include the following, at minimum:

a) Evaluate and mitigate potential implications on the Green Network Study Area;
b) Identify intermunicipal servicing requirements;
c) Ensure compatibility with urban design standards; and
d) Include development standards to support phasing of development based on intermunicipal agreements.

15A.3.3. Future Urban Growth

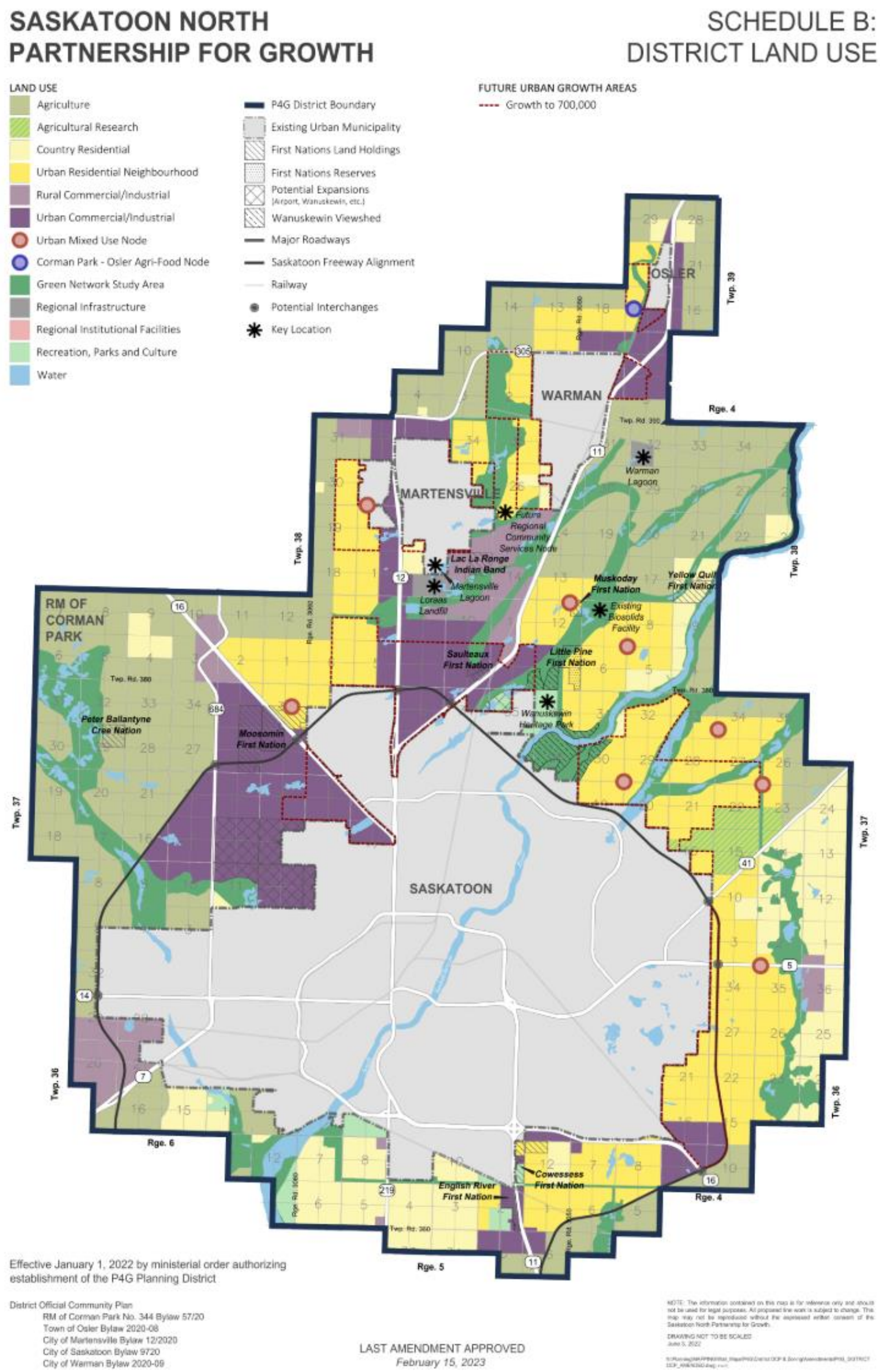
The Regional Community Services Node should be planned to allow for community service, institutional, recreational, and commercial uses that are compatible with each other. This should consider integration with the surrounding areas and necessary buffers, where applicable. Uses should be planned to enable phasing of development to full build-out over time.

The balance of the quarter sections that are not developed as part of the Regional Community Services Node will remain planned for the future land uses as shown in Schedule B – District Land Use Map.

Figures

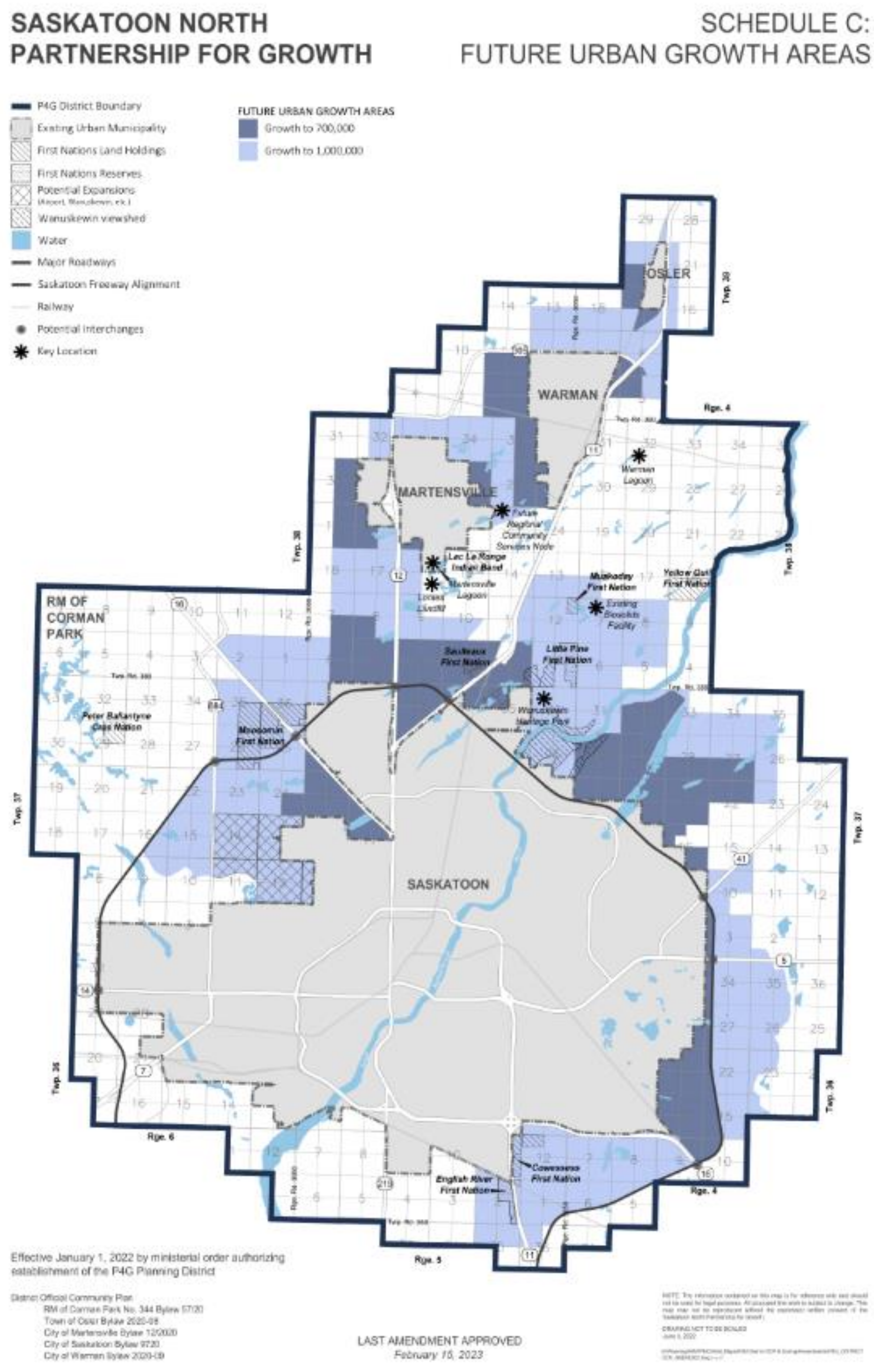
Schedule B – District Land Use Map

1. Assign new symbology for the Future Regional Community Services Node in alignment with Urban Mixed Use Node and Corman Park – Osler Agri-Food Node.
2. Remove existing Future Regional Community Services Node asterisk, replace with new symbology, and shift up to the recommended node area.
3. Add new symbology to the legend underneath Corman Park – Osler Agri-Food Node.
4. Symbolize the entirety of the proposed Regional Node area using the *Growth to 700,000* (dashed red) symbology


SASKATOON NORTH
PARTNERSHIP FOR GROWTH
SCHEDULE B:
DISTRICT LAND USE
LAND USE
Agriculture
Agricultural Research
Country Residential
Urban Residential Neighbourhood
Rural Commercial/Industrial
Urban Commercial/Industrial
Urban Mixed Use Node
Corman Park - Osler Agri-Food Node
Green Network Study Area
Regional Infrastructure
Regional Institutional Facilities
Recreation, Parks and Culture
Water
P4G District Boundary
Existing Urban Municipality
First Nations Land Holdings
First Nations Reserves
Potential Expansions
(Airport, Wanuskewin, etc.)
Wanuskewin Viewshed
Major Roadways
Saskatoon Freeway Alignment
Railway
Potential Interchanges
Key Location
FUTURE URBAN GROWTH AREAS
Growth to 700,000
OSLER
WARMAN
MARTENSVILLE
RM OF CORMAN PARK
SASKATOON
Warman Lagoon
Future Regional Community Services Node
Lac La Ronge Indian Band
Martensville Lagoon
Loraas Landfill
Muskoday First Nation
Existing Biosolids Facility
Yellow Quill First Nation
Saulteaux First Nation
Little Pine First Nation
Wanuskewin Heritage Park
Peter Ballantyne Cree Nation
Moosomin First Nation
English River First Nation
Cowessess First Nation
Twp. 39
Twp. 38
Twp. 37
Twp. 36
Rge. 4
Rge. 5
Rge. 6
Effective January 1, 2022 by ministerial order authorizing establishment of the P4G Planning District
District Official Community Plan
RM of Corman Park No. 344 Bylaw 57/20
Town of Osler Bylaw 2020-08
City of Martensville Bylaw 12/2020
City of Saskatoon Bylaw 9720
City of Warman Bylaw 2020-09
LAST AMENDMENT APPROVED
February 15, 2023

Schedule C – Future Urban Growth Areas

1. Remove existing Future Regional Community Services Node asterisk.
2. Symbolize the entirety of the proposed Regional Node area using the *Growth to 700,000* (dark blue) symbology



Subsequent Amendment Considerations

P4G North Concept Plan

- Section 4.3, Cell 3 (bottom of page 30) references the existing placement of the Future Regional Community Services Node. This wording should be removed as the recommended node location is outside of the North Concept Plan.

P4G Zoning Bylaw

- Review the Community Services (DCS), Recreation (DRec), and Arterial Commercial 2 (DC2) districts to confirm if permitted and discretionary uses align with intended node uses.
- Regional retail, institutional, and infrastructure are not included within the current zoning bylaw. Review current districts to confirm which ones support the recommended DOCP direction and if any amendments are required for alignment.

Municipal Bylaws (OCPs and Zoning)

- The current Official Community Plans and Zoning Bylaws for Corman Park, Martensville, and Warman each define “Community Service” differently and include different permitted and discretionary uses. The partners may consider reviewing these uses and definitions to identify alignment with the approach taken for the P4G DOCP and Zoning Bylaw, if desired (See Table 1).

Table 1: Municipal Community Service District Comparison Table

<table>
<tr><th>Municipality</th><th>OCP</th><th>Zoning Bylaw</th></tr>
<tr><td>Corman Park</td><td>- No definition for Community Services</td><td>- Zoning bylaw definition: Churches, community centres, art barns and other gathering places</td></tr>
<tr><td>Martensville</td><td>- Schools, libraries, recreational facilities, and other community amenities</td><td>Community Service District uses include:
<table>
<tr><th colspan="2">Community Service Uses</th><th></th></tr>
<tr><td>(1)</td><td>Ambulance stations</td><td>P</td></tr>
<tr><td>(2)</td><td>Cemeteries</td><td>P</td></tr>
<tr><td>(3)</td><td>Community centres</td><td>P</td></tr>
<tr><td>(4)</td><td>Cultural institutions</td><td>P</td></tr>
<tr><td>(5)</td><td>Custodial care facilities</td><td>D</td></tr>
<tr><td>(6)</td><td>Educational institutions</td><td>P</td></tr>
<tr><td>(7)</td><td>Offices accessory to another permitted or discretionary use</td><td>P</td></tr>
<tr><td>(8)</td><td>Municipal facilities</td><td>P</td></tr>
<tr><td>(9)</td><td>Parks and playgrounds</td><td>P</td></tr>
<tr><td>(10)</td><td>Places of worship</td><td>P</td></tr>
<tr><td>(11)</td><td>Public elementary and high schools</td><td>P</td></tr>
<tr><td>(12)</td><td>Public works, excluding warehouses, storage yards, and sewage lagoons</td><td>P</td></tr>
<tr><td>(13)</td><td>Public hospitals</td><td>P</td></tr>
<tr><td>(14)</td><td>Public recreational facilities</td><td>P</td></tr>
<tr><td>(15)</td><td>Special care homes</td><td>P</td></tr>
<tr><td>(16)</td><td>Telecommunication towers</td><td>D</td></tr>
<tr><th colspan="2">Commercial Uses</th><th></th></tr>
<tr><td>(1)</td><td>Adult day cares – type I and II</td><td>P</td></tr>
<tr><td>(2)</td><td>Clubs</td><td>P</td></tr>
<tr><td>(3)</td><td>Commercial recreation facilities</td><td>P</td></tr>
<tr><td>(4)</td><td>Day care centres and preschools</td><td>P</td></tr>
<tr><td>(5)</td><td>Farmers' Markets</td><td>D</td></tr>
<tr><td>(6)</td><td>Health care clinics</td><td>P</td></tr>
<tr><td>(7)</td><td>Medical, dental and optical laboratories</td><td>P</td></tr>
<tr><td>(8)</td><td>Parking lots</td><td>D</td></tr>
<tr><td>(9)</td><td>Private schools</td><td>P</td></tr>
<tr><td>(12)</td><td>Race tracks</td><td>D</td></tr>
</table></td></tr>
<tr><td>Warman</td><td>- Institutional, recreational and open space uses and public works servicing the community</td><td>Community Service District uses include:

The following are permitted uses in the CS - Community Service District:

(1) Assembly halls
(2) Cemeteries
(3) Clubs
(4) Community centres
(5) Cultural institutions
(6) Day care centres
(7) Dog park
(8) Educational institutions
(9) Golf courses
(10) Governmental offices
(11) Group care facilities
(12) Hospitals
(13) Indoor recreational facilities
(14) Medical, offices and clinics
(15) Special care homes
(16) Off-Leash Dog Park
(17) Outdoor recreation facilities
(18) Parks and playgrounds
(19) Personal care home
(20) Places of worship
(21) Protective and emergency services
(22) Public utilities (excluding sewage lagoons and landfills; offices, warehouses, shops and storage yards)
(23) Tourist campgrounds and tourist information centres</td></tr>
</table>