
Appendix E

Technical Memorandum #5 – Evaluation of Alternative Design Concepts – Preliminary Preferred Location



New Dundee Water Supply System – Iron and Manganese Upgrades Class Environmental Assessment

Technical Memorandum #5

Evaluation of Alternative Design
Concepts- Preliminary Preferred
Location

Final

Prepared for:

Region of Waterloo

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RVA 194591

September 27, 2022



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September 27, 2022

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Region of Waterloo
Transportation and Environmental Services
Design and Construction Division
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Attention: Kaoru Yajima

Dear Mr. Yajima:

Re: Technical Memorandum #5 – Evaluation of Alternative Design Concepts- Preliminary Preferred Location – Draft 2, New Dundee Water Supply Iron and Manganese Treatment Upgrades Class Environmental Assessment

Please see the enclosed Technical Memorandum #5, Draft 2 as a submittal for the New Dundee Water Supply Iron and Manganese Treatment Upgrades Class Environmental Assessment. This submittal has been revised in response to Region review and PCC #3.

Yours very truly,

R.V. ANDERSON ASSOCIATES LIMITED



Jonathan Rudyk, P.Eng
Process Engineer



Kirk Worounig, P.Eng., PMP
Project Manager

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Technical Memorandum #5
Evaluation of Alternative Design Concepts- Preliminary Preferred Location

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1.0 INTRODUCTION

The purpose of this technical memorandum is to evaluate the location design concepts for the new iron and manganese treatment facility for the New Dundee Iron and Manganese Removal Class EA and recommend a preferred location, based on the following Technical Memoranda:

- Technical Memorandum #1, Project Background and Existing Conditions (TM #1): existing conditions review, and confirmation of treatment system capacity and removal requirements
- Technical Memorandum #2, Evaluation Criteria (TM #2): criteria and scoring method
- Technical Memorandum #3, Develop and Evaluate Alternative Solutions (TM #3): the preferred treatment and residual management solutions for the New Dundee Water Supply System
- Technical Memorandum #4, Develop Alternative Design Concepts – Facility Sizing and Short-Listed Locations (TM #4): estimated footprint requirements and short-listed locations

2.0 FACILITY REQUIREMENTS FOR THE PREFERRED TREATMENT TECHNOLOGY AND RESIDUAL MANAGEMENT SOLUTION

The recommended treatment alternative from TM #3 was conventional oxidation and filtration using chlorine oxidation and pressure filtration. The residual management solution for the facility included a backwash equalization tank with recycling of the supernatant back into the raw water supply header, and trucking settled solids to a Regional hauled waste disposal facility as required.

For purpose of determining area of property required, as part of TM #4, RVA worked with the Region to develop a conservative building size. After initial review of TM #4, the Region proposed an additional review of the treatment design capacity of the new facility, because historical flows in the system had never reached the original treatment design capacity of 11.4 L/s (the listed PTTW for the existing facility). After completing the analysis, a new treatment design capacity was identified, and the building was resized to 15 m by 12 m from 19 m by 14 m, an approximate 30% building size reduction. Additional space on site was included

for driveway access for deliveries and sludge holding tank. For access purposes the sludge holding tank needs to be located on what would be considered the front of the building to allow for easier truck access. The preliminary building layout is shown in **Figure 2.1**.

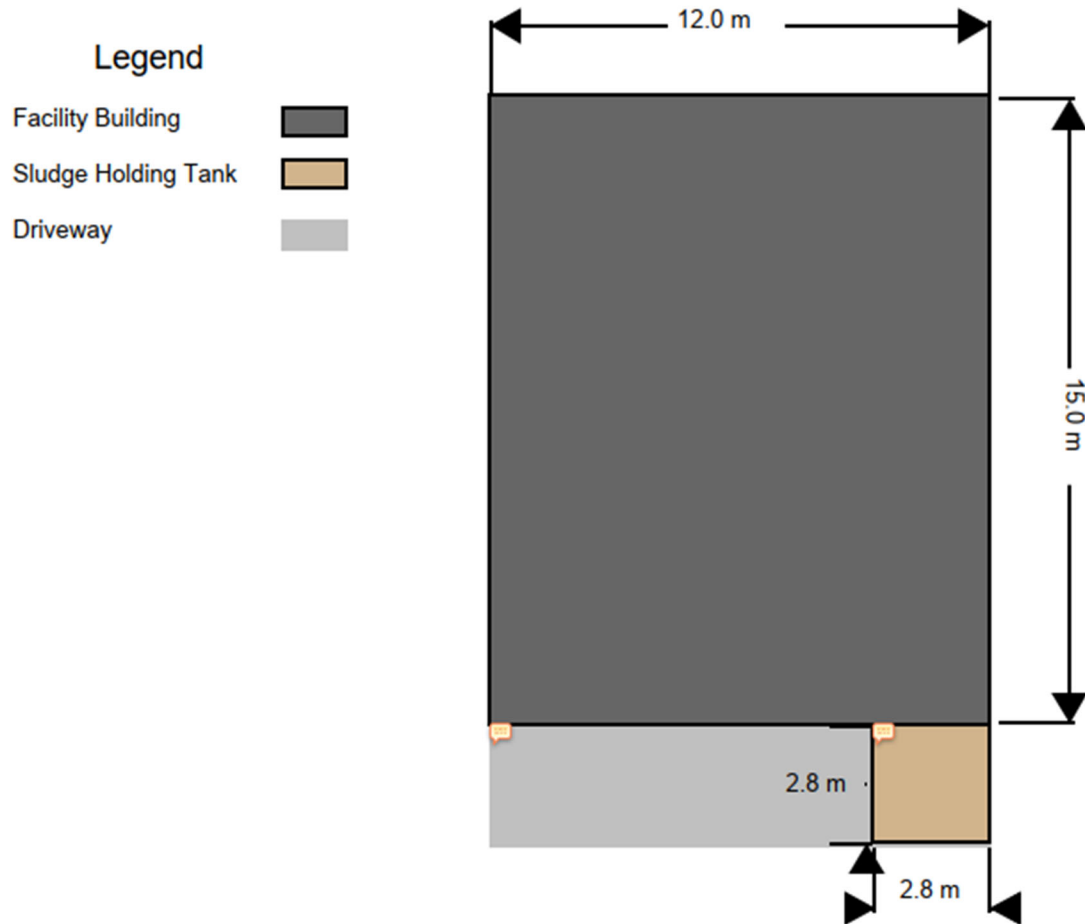


Figure 2.1: Preliminary Building Layout

3.0 LOCATION DESIGN ALTERNATIVES EVALUATION

Based on the preliminary building layout, five preliminary locations for the iron and manganese facility were identified as shown in **Figure 3.1** and in **Appendix A**. The potential sites were identified based on considerations for:

- Available land size
- Proximity to the existing water supply facility

- Environmental, cultural heritage, and areas of archeological potential, based on an Existing Conditions Report, Natural Sciences Report, and Stage 1 Archeological Assessment
- Existing and potential land uses
- Stakeholder comments received to date during public consultation periods

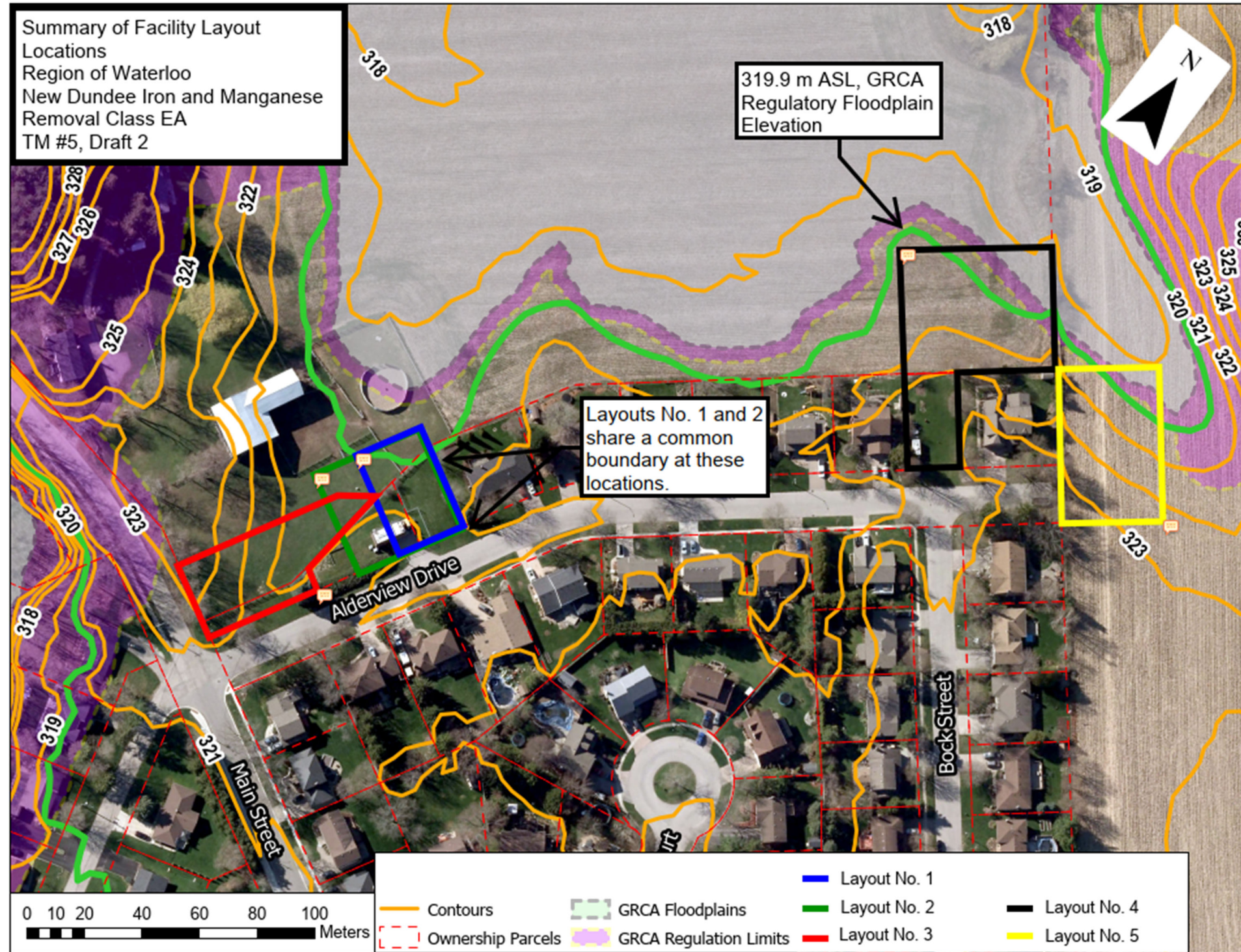


Figure 3.1: Five Alternative Locations

3.1 Facility Location Alternatives Site Investigations and Considerations

As part of TM #1, natural environment and archeological desktop studies were conducted within 1 km radius surrounding the New Dundee Water Supply System site. Considerations were also made regarding the Source Protection Policies in the area, and stakeholder comments made during public consultation periods.

3.1.1 Natural Sciences Report

To supplement the natural environment existing conditions study, a Natural Sciences Report was completing including field visits in May and June 2021, at the location alternatives for a visual assessment of the habitat, flora, and fauna. Measures were recommended to mitigate impact during construction. The ‘New Dundee Water Supply System Iron and Manganese Upgrades Natural Sciences Report’ is included in **Appendix B**.

The wildlife habitat where the five alternatives are located consist mainly of agriculture and manicured areas, with some deciduous and coniferous trees throughout. These trees and shrubs are mostly ornamental or hedgerows, and no plant species at risk were identified in or around the five alternative locations.

For fauna species at risk, one possible habitat for barn swallows was identified in the barn at 328 Main Street. Barn swallow habitat is defined through three categories. Category 1 is the nest location and has the highest level of habitat disturbance intolerance. Category 2 is a 5 m diameter around the nest and has the next highest disturbance intolerance. Category 3 is the 5 – 200 m diameter from the nest and has the most tolerance for disturbance. Alternative locations 1 – 3 are located within this category, while Alternatives 4 and 5 are not located in any.

To construct in a Category 3 location, an Information Gathering Form (IGF) is required for submittal to the MECP. An IGF is a document completed by the proponent which describes the site and its surroundings, provides information on the ecological communities, forest types, and surrounding activity, provides a schedule and summary of the proposed site activities, and a description of the site how the activities may positively or negatively affect the species at risk. Depending on consultation with the local Ministry of Natural Resources office, Species at Risk surveys may be required as well. A sample Information Gathering Form is available at this link on the Province of Ontario’s website:

<https://www.forms.ssb.gov.on.ca/mbs/ssb/forms/ssbforms.nsf/MinistryDetail?OpenForm&ACT=RDR&TAB=PROFILE&ENV=WWE&NO=018-0180E>.

3.1.2 Stage 1 Archaeological Assessment

Based on Stage 1 archeological assessment (AA) completed and included in TM #1, all five locations were identified as retaining archeological potential and further archeological assessment is required through a Stage 2 AA. As part of the Stage 2 AA, any active or recently cultivated agricultural land must be ploughed before the site is visited by an archeologist. Any other land that has not been disturbed requires test pit surveys, at 5 m spacings. As part of the consultation process, First Nation and Indigenous groups should be notified about any future archaeological studies.

A full map and denotation of areas that have archaeological potential is provided in Figure 3.2. For the evaluation, it was assumed that all five sites are equal in archeological potential.

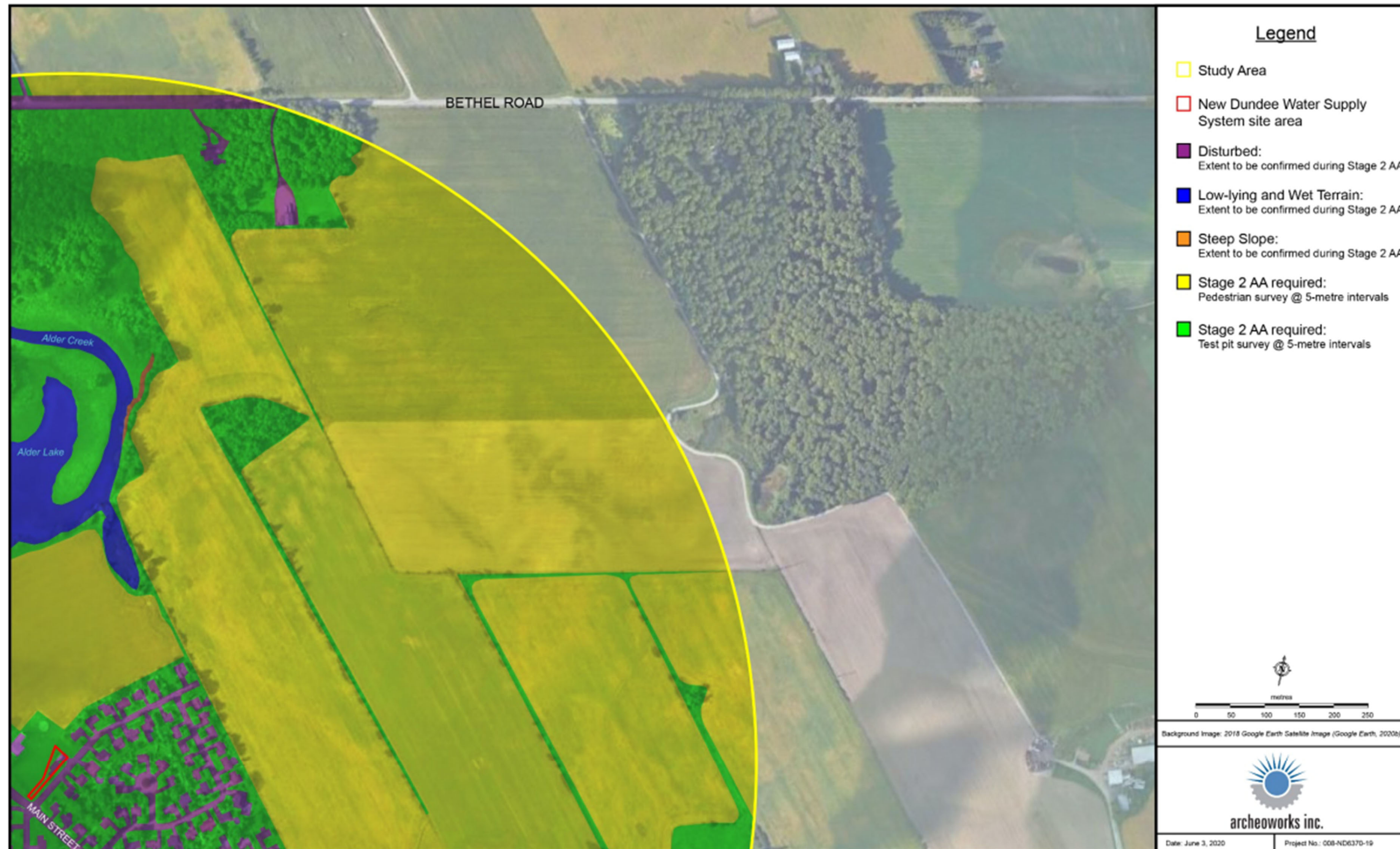


Figure 3.2: Stage 2 AA Area Requirements

3.1.3 Source Protection Policies

Source water protection planning is an integral part of the Region’s strategy for protecting the principal water source in the Region, which is groundwater. As part of the policy, the Region identifies and quantifies locations based on their influence on local groundwater supply and vulnerability. Depending on this metric, different activities or land uses are prohibited or require risk management plans.

In further discussions with the Region of Waterloo’s Risk Management team, and confirmed through available Regional mapping, Layouts 1 – 3 are all located within 100 m of the existing New Dundee wells, placing them in the most vulnerable locations, and possibly subject to the largest number of source protection plan policies. These policies include restrictions for applying de-icing salt, discharge from a stormwater facility, and the storage and handling of fuel. Layouts 4 and 5 are located further away from the wells, and their respective zones of influence, so may not be subject to as many restrictions. However, in discussing with the Region, none of the future operational activities are subject to or are classified as prohibited, and if any new activities arise during detailed design, these can be captured through a risk management plan, in consultation with the Region.

3.1.4 Comments Received from Stakeholders

Over the course of the project, and specifically in response to Public Consultation Centre (PCC) #2, numerous responses and comments have been provided that relate to the selection of the preferred site. A summary of these comments is provided in **Table 3.1** below.

Table 3.1: Stakeholder Comments Summary

Comment	Comment / Request	Project Team Resolution
Local Residents	Multiple stakeholders had concerns about the architectural aesthetic of the new facility.	An architectural rendering was prepared as part of PCC #3 for public comment. The architectural rendering focuses on maintaining a pastoral aesthetic of the area.

Comment	Comment / Request	Project Team Resolution
Local Residents	What type of landscaping will be considered as part of this design?	A landscape architect will be retained for a landscape plan, that matches the aesthetic of the existing neighbourhood.
Local Residents	The scoring for the sites should greater reflect community interests, weighing of criteria should not be equal.	The initial evaluation in Section 3.3 was done with equal weighting for Technical, Natural Heritage, Social, and Financial criteria categories. The sensitivity analysis in Section 3.5 shows greater weighting for Social, with less emphasis on Financial, which ultimately yields the same results.
Local Residents	Multiple comments have been submitted regarding the obstructed view of the existing farm at 328 Main Street by the new facility, specifically Layout Option 3, as it would sit on the corner of Main Street and Alderview Drive, obstructing foot and vehicle sightlines at that corner.	These comments have been factored into the evaluation process by giving alternatives that may occupy this space a lower social criteria score.
Local Residents	There were numerous comments about preferences for the location, with some residents preferring layouts 4 and 5, and others preferring layouts 1-3.	Due to the volume of these comments and their equal distribution among the different sites, the Region will weigh these comments equally.

Comment	Comment / Request	Project Team Resolution
Local Residents	Pasturelands provide greater environmental value than croplands, and this should be considered in scoring and evaluation.	To better assess this metric, multiple field investigations were completed to determine the environmental value of these specific sites, for evaluation purposes. The findings conclude that the pastureland in question is not large enough to support the SAR that inhabit it, therefore, they both contain the same environmental potential.
Grand River Conservation Authority	Provided an estimated contour for the floodplain.	This line has been included in the layout drawings.

3.2 Facility Location Alternatives Initial Evaluation

The initial location alternatives evaluation is used to remove any of the location alternatives that are unacceptable from an operational, natural heritage, cultural heritage, archaeological, or social standpoint. After an initial evaluation, two location alternatives are removed:

- Location 4:** This is considered a remote location from the existing site, with a large amount of land acquisition required (compared to other alternatives), and therefore cost, associated with it. Furthermore, new electric utilities, telecommunication utilities, process water piping to and from the existing site, and a new standby generator are required for the site. This creates a large amount of new infrastructure to keep in a state of good repair, results in extra time and costs for the Region’s operations staff to maintain two separate sites, rather than one. Therefore, this alternative will not be considered in the detailed evaluation.
- Location 5:** Like Location 4, this is considered a remote location from the existing site, with a large amount of land acquisition required (compared to other alternatives), and therefore cost, associated with it. Furthermore, new electric utilities, telecommunication utilities, process water piping to and from the existing site, and a new standby generator are required for the site. This creates a large amount of new infrastructure to keep in a state of good






repair, results in extra time and costs for the Region’s operations staff to maintain two separate sites, rather than one. Therefore, this alternative will not be considered in the detailed evaluation.

As a result, Location Alternatives 4 and 5 are dropped and Location Alternatives 1, 2, and 3 are carried forward to the detailed evaluation.

3.3 Facility Location Alternatives Detailed Evaluation

The alternative facility locations were evaluated following the evaluation criteria outlined in TM #2. **Table 3.2** below gives an example of the five possible scorings and their meanings relative to each other. The evaluation scoring is provided in **Table 3.3** to **Table 3.6** for technical, natural environmental, social, and financial categories. An overall summary of the evaluation is provided and summarized in **Table 3.7**.
















Table 3.2: Example Scoring Graphics

				
1	2	3	4	5
Low Alignment with Criteria	Not Well Aligned with Criteria	Somewhat Aligned with Criteria	Well Aligned with Criteria	Very Well Aligned with Criteria

3.3.1 Lifecycle Cost Analysis

As part of the financial criteria evaluation, a lifecycle cost analysis over 50 years was completed for the detailed evaluation of each location alternative. The lifecycle cost includes capital construction costs for each of the three new facilities, property acquisition costs, and operation and maintenance costs over the facility’s design life. This analysis is available in **Appendix C** of this TM, with a summary of the findings provided in **Table 3.6**.

Table 3.3: Evaluation of Location Alternatives- Technical Category

Criteria	Percentage	Location 1	Location 2	Location 3
Provides Reliable Service	3.57%	<ul style="list-style-type: none"> This location is directly adjacent to the existing site, reducing the underground infrastructure requirements, and reduces the chance of service interruptions. This location would require construction directly adjacent to the wells, requiring more complex construction techniques 	<ul style="list-style-type: none"> This location is directly adjacent to the existing site, reducing the underground infrastructure requirements, and reduces the chance of service interruptions. 	<ul style="list-style-type: none"> This location is adjacent to the existing site, but further away than Location 1 and 2. This somewhat increases the underground infrastructure requirements, and increases the chance of service interruptions. 
Meets Existing and Future Needs	3.57%	<p>Location meets current and future needs for drinking water supply.</p> 	<ul style="list-style-type: none"> Location meets current and future needs for drinking water supply. 	<ul style="list-style-type: none"> Location meets current and future needs for drinking water supply. 
Aligns with Existing and Planned Infrastructure	3.57%	<ul style="list-style-type: none"> Location can connect with existing distribution system Location would be more difficult to interconnect with existing facility than Location 2. 	<ul style="list-style-type: none"> Location can connect with existing distribution system 	<ul style="list-style-type: none"> Location can connect with existing distribution system Facility location further away from existing facility than Locations 1 or 2. 
Aligns with Existing and Future Land Use	3.57%	<ul style="list-style-type: none"> Location is within 100 m of the existing municipal wells. 	<ul style="list-style-type: none"> Location is within 100 m of the existing municipal wells. 	<ul style="list-style-type: none"> Location is within 100 m of the existing municipal wells. 
Aligns with Approval and Permitting Process	3.57%	<ul style="list-style-type: none"> Standard permits and approvals are required. 	<ul style="list-style-type: none"> Standard permits and approvals are required. 	<ul style="list-style-type: none"> Standard permits and approvals are required. 










Criteria	Percentage	Location 1	Location 2	Location 3
Manages and Minimizes Construction Risks	3.57%	<ul style="list-style-type: none"> Location constructed close to existing structures and wells, would require additional shoring and dewatering considerations. 	<ul style="list-style-type: none"> Location constructed close to existing structures and wells, would require additional shoring and dewatering considerations. 	<ul style="list-style-type: none"> Location not constructed close to existing structures and wells, less construction risk than Locations 1 or 2. Additional underground works required for utility connections. 
Ability to Adapt to Climate Change	3.57%	<ul style="list-style-type: none"> Location will not be constructed in the GRCA floodplain. 	<ul style="list-style-type: none"> Location will not be constructed in the GRCA floodplain. 	<ul style="list-style-type: none"> Location will not be constructed in the GRCA floodplain. 
Overall Technical Score	25%			

Table 3.4: Evaluation of Location Alternatives- Natural Environment Category




























Criteria	Percentage	Location 1	Location 2	Location 3
Protects Environmental Features	6.3%	<ul style="list-style-type: none"> Construction of facility at this location has minimal impacts to environmental features, such as Alder Creek, Alder Marsh, and Alder Lake. 	<ul style="list-style-type: none"> Construction of facility at this location has minimal impacts to environmental features, such as Alder Creek, Alder Marsh, and Alder Lake. 	<ul style="list-style-type: none"> Construction of facility at this location has minimal impacts to environmental features, such as Alder Creek, Alder Marsh, and Alder Lake. 
Protects Wildlife and Species at Risk	6.3%	<ul style="list-style-type: none"> Per Section 3.1.1, this alternative is in Category 3 of the barn swallow habitat. An Information Gathering Form should be submitted for this alternative, if it is preferred, during detailed design. No SAR tree species were found in this alternative location. 	<ul style="list-style-type: none"> Per Section 3.1.1, this alternative is in Category 3 of the barn swallow habitat. An Information Gathering Form should be submitted for this alternative, if it is preferred, during detailed design. No SAR tree species were found in this alternative location. 	<ul style="list-style-type: none"> Per Section 3.1.1, this alternative is in Category 3 of the barn swallow habitat. An Information Gathering Form should be submitted for this alternative, if it is preferred, during detailed design. No SAR tree species were found in this alternative location. 
Protects Groundwater, Streams and Rivers	6.3%	<ul style="list-style-type: none"> New facility to be constructed within 100 m of an existing municipal well. Mitigation and risk management measures will be implemented to reduce risk of contamination during construction. 	<ul style="list-style-type: none"> New facility to be constructed within 100 m of an existing municipal well. Mitigation and risk management measures will be implemented to reduce risk of contamination during construction. 	<ul style="list-style-type: none"> New facility to be constructed within 100 m of an existing municipal well. Mitigation and risk management measures will be implemented to reduce risk of contamination during construction. 
Minimizes Climate Change Impacts	6.3%	<ul style="list-style-type: none"> No relative difference between locations with respect to possible climate change impacts. 	<ul style="list-style-type: none"> No relative difference between locations with respect to possible climate change impacts. 	<ul style="list-style-type: none"> No relative difference between locations with respect to possible climate change impacts. 
Overall Natural Heritage Score	25%			

Table 3.5: Evaluation of Location Alternatives- Social Category

Criteria	Percentage	Location 1	Location 2	Location 3
Minimizes Impacts to Residents Related to Noise, Odour, Traffic, and Aesthetics	4.2%	<ul style="list-style-type: none"> Location is closest to the existing residence at 182 Alderview Drive, which creates the largest potential for impacts due to noise and traffic. Location reduces line-of-sight from Alderview Dr. to the hobby farm. 	<ul style="list-style-type: none"> Location is a medium distance away from the residence at 182 Alderview Drive, creates a medium potential for impacts due to noise and traffic. Location would not impair line-of-sight from Alderview Dr. to the hobby farm. 	<ul style="list-style-type: none"> Location is a far distance away from the residence at 182 Alderview Drive, creates a low potential for impacts due to noise and traffic. Location would greatly impair line-of-sight from Alderview Dr. and Main Street to the hobby farm. The site is on one of the busiest corners in the village 
Minimizes Impacts to Businesses	4.2%	<ul style="list-style-type: none"> Location is in a residential neighbourhood, no businesses would be affected. 	<ul style="list-style-type: none"> Location is in a residential neighbourhood, no businesses would be affected. 	<ul style="list-style-type: none"> Location is in adjacent to a main road, construction may impact main road access/cleanliness. 
Manages and Minimizes Construction Impact	4.2%	<ul style="list-style-type: none"> Construction laydown area able to be located partially within the site, and partially on the west boulevard of Alderview Drive. 	<ul style="list-style-type: none"> Construction laydown area able to be located partially within the site, and partially on the west boulevard of Alderview Drive 	<ul style="list-style-type: none"> Location requires the greatest amount of excavation works, causing the greatest construction impact. 
Protects Cultural Heritage Features	4.2%	<ul style="list-style-type: none"> Location encroaches upon a possible future Cultural Heritage Landscape (CHL), and blocks line-of-sight to the possible future CHL from Alderview Drive. 	<ul style="list-style-type: none"> Location encroaches upon a possible future Cultural Heritage Landscape (CHL) but does not block line-of-sight to the possible future CHL from Alderview Drive. 	<ul style="list-style-type: none"> Location encroaches upon a possible future Cultural Heritage Landscape (CHL), and greatly blocks line-of-sight to the possible future CHL from Alderview Drive and from Main Street. 































Criteria	Percentage	Location 1	Location 2	Location 3
Protects Archaeological Features	4.2%	<ul style="list-style-type: none"> Location has archaeological potential. 	<ul style="list-style-type: none"> Location has archaeological potential. 	<ul style="list-style-type: none"> Location has the greatest area of archaeological potential, due to the amount of property acquisition. 
Protects Health and Safety	4.2%	<ul style="list-style-type: none"> Region staff health and safety will not be negatively impacted by the site location. Public health and safety will not be negatively impacted by this location. 	<ul style="list-style-type: none"> Region staff health and safety will not be negatively impacted by the site location. Public health and safety will not be negatively impacted by this location. 	<ul style="list-style-type: none"> Region staff health and safety will not be negatively impacted by the site location. Public health and safety will not be negatively impacted by this location. 
Overall Social Score	25%			

Table 3.6: Evaluation of Location Alternatives- Financial Category

Criteria	Percentage	Location 1	Location 2	Location 3
Provides Low Lifecycle Costs	25%	<ul style="list-style-type: none"> • Lifecycle cost of \$8.2 million dollars • Requires the least land acquisition. 	<ul style="list-style-type: none"> • Lifecycle cost of \$8.2 million dollars • Requires the second most land acquisition. 	<ul style="list-style-type: none"> • Lifecycle cost of \$8.3 million dollars • Requires the most land acquisition. 
Overall Financial Score	25%			

3.4 Preferred Facility Location Alternative

Table 3.7: Summary of Evaluation Criteria Location Alternatives

Evaluation Category	Percentage	Location 1	Location 2	Location 3
Technical	25%			
Natural Heritage	25%			
Social	25%			
Financial	25%			
Overall				

Location 2 is the preferred location for the new facility.

3.5 Sensitivity Analysis

The three locations considered are in a subdivision that is part of the village of New Dundee, bordered on one end by an old hobby farm. As such, there have been many comments through the public consultation events, namely PCC #1 and PCC #2, which provide context that local residents would like the pastoral aesthetic to be maintained, prioritizing the least intrusive option.

As such, a number of sensitivity analyses were completed on the evaluation categories, to alter the weightings to better align with community concerns as follows:

- Technical 25%, Natural Heritage 25%, Social 40%, Financial 10%.
- Technical 33%, Natural Heritage 33%, Social 33%, Financial 0%.
- Technical 20%, Natural Heritage 40%, Social 40%, Financial 0%.

The findings for each analysis yield the preferred location, Location 2, remains the preferred location.

4.0 ARCHITECTURAL RENDERING

The preferred location is shown as an architectural rendering in **Figure 4.1** below.



Figure 4.1: Rendering of preferred alternative, from Alderview Drive looking west

5.0 NEXT STEPS

Following the finalization of TM #5, PCC #3 will be conducted to present the findings from TM#5 and receive public input and feedback.

After TM#5 and PCC#3 is complete, the final site selection will be made, and the Environmental Study Report (ESR) will be completed to document project information and the decision-making process. Region of Waterloo Council will provide approval to file the Environmental Study Report for a 30-day review period for public comment.

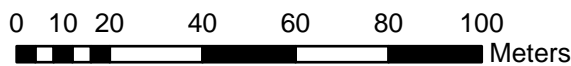
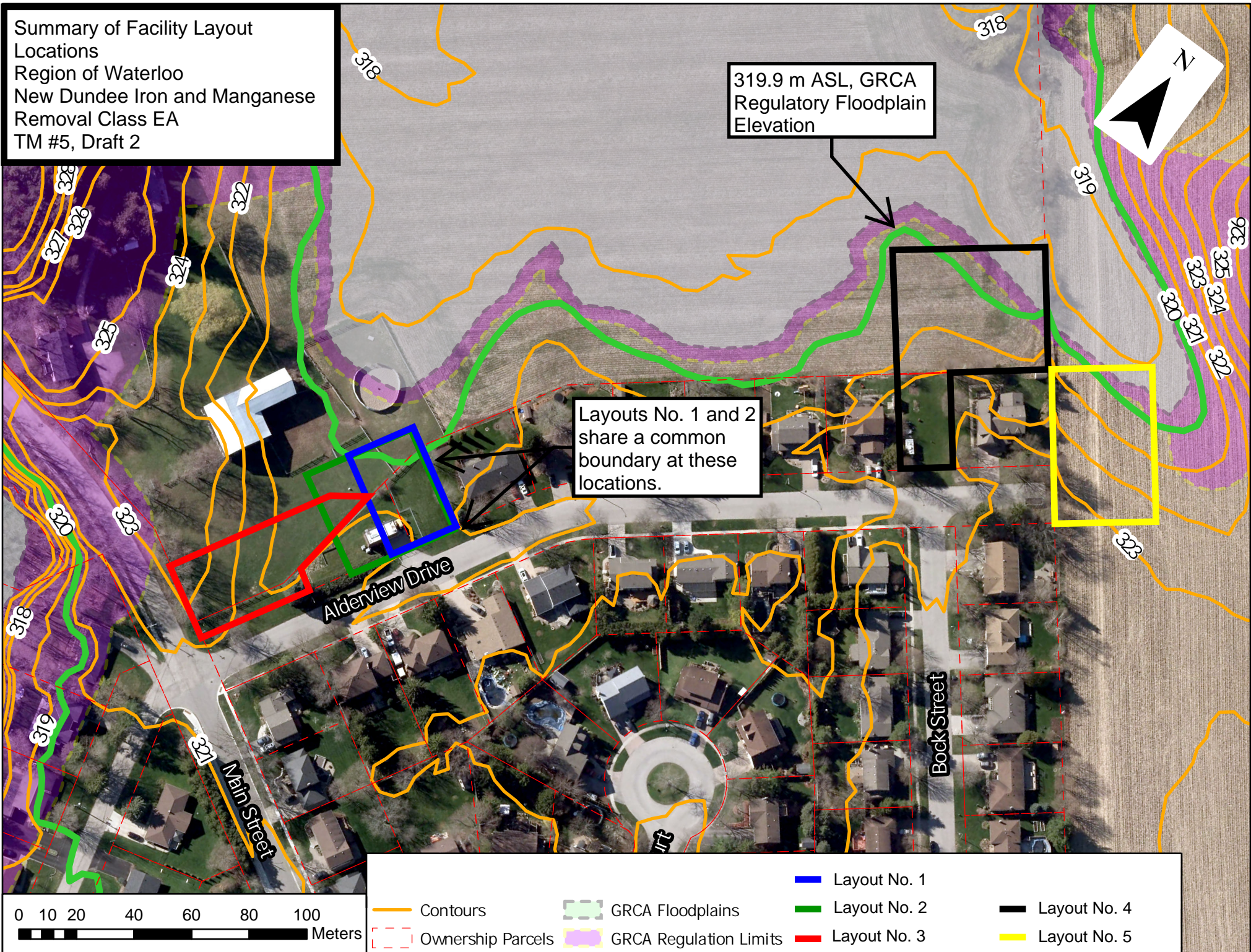
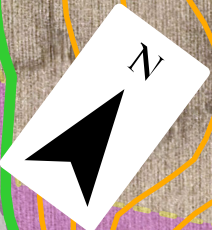
Following the 30-day review period, unless there is further comment from the various stakeholders, the project can proceed into the detailed design phase.

APPENDIX A:
Facility Location Alternatives

Summary of Facility Layout Locations
 Region of Waterloo
 New Dundee Iron and Manganese Removal Class EA
 TM #5, Draft 2

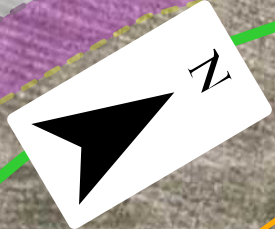
319.9 m ASL, GRCA
 Regulatory Floodplain
 Elevation

Layouts No. 1 and 2
 share a common
 boundary at these
 locations.

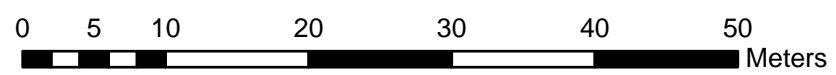
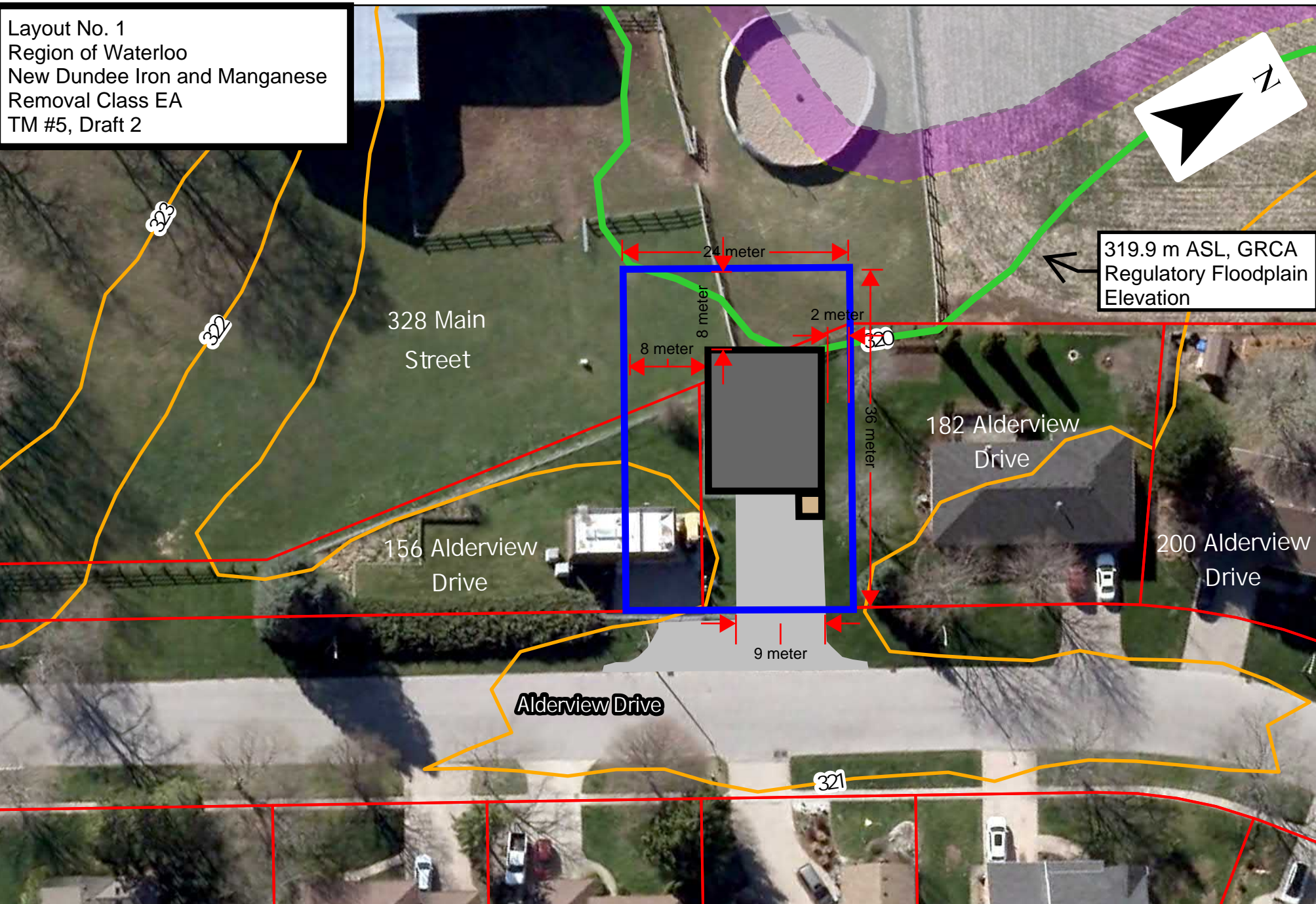


- Contours
- GRCA Floodplains
- Layout No. 1
- GRCA Regulation Limits
- Layout No. 2
- Layout No. 3
- Ownership Parcels
- Layout No. 4
- Layout No. 5

Layout No. 1
 Region of Waterloo
 New Dundee Iron and Manganese
 Removal Class EA
 TM #5, Draft 2

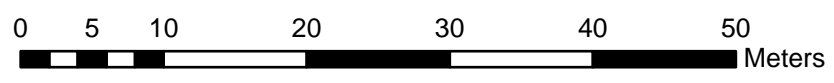
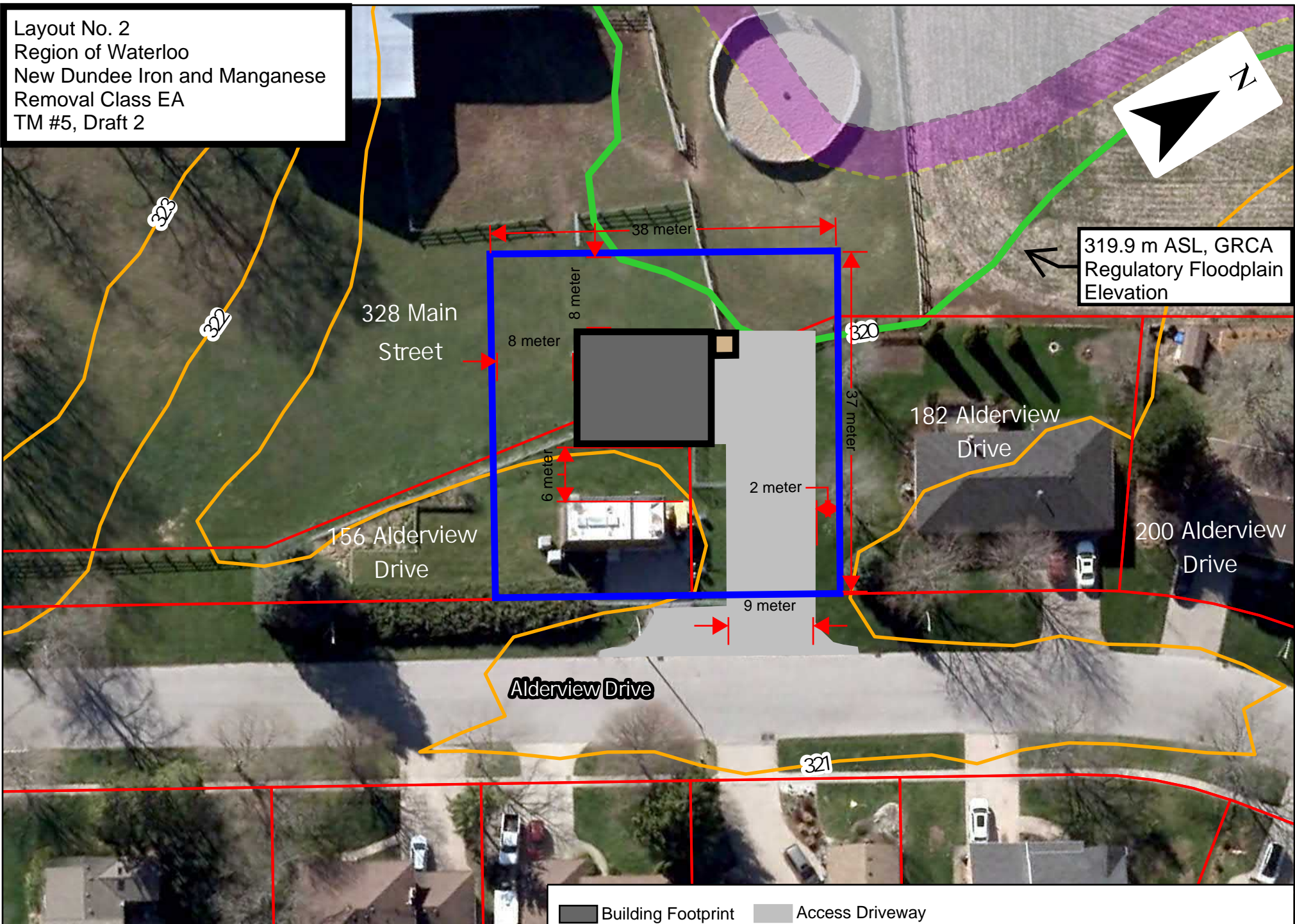
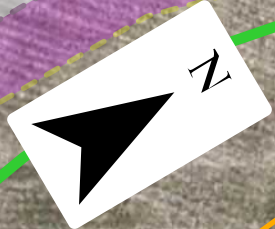


319.9 m ASL, GRCA
 Regulatory Floodplain
 Elevation



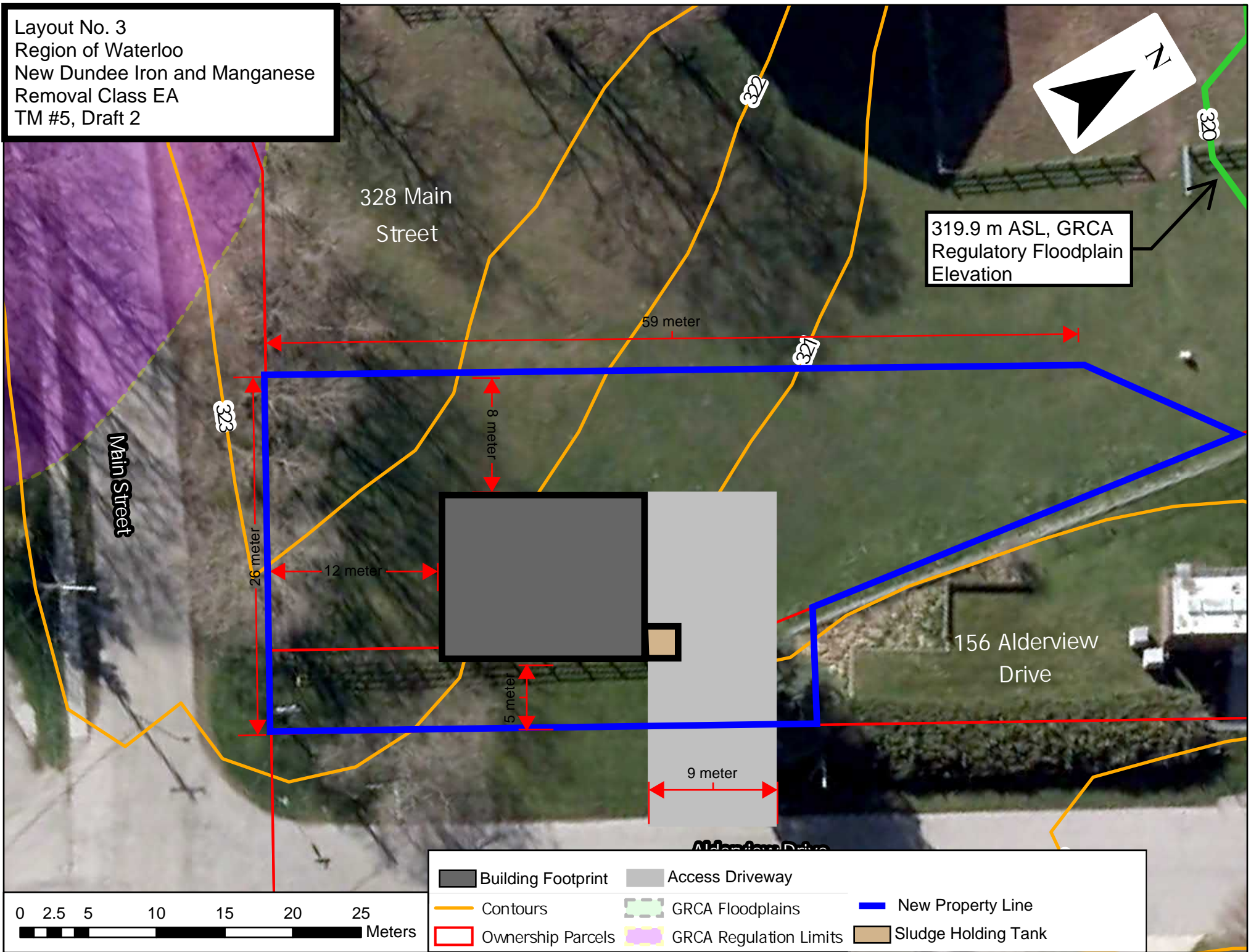
- | | | |
|--------------------|------------------------|---------------------|
| Building Footprint | Access Driveway | New Property Line |
| Contours | GRCA Floodplains | Sludge Holding Tank |
| Ownership Parcels | GRCA Regulation Limits | |

Layout No. 2
 Region of Waterloo
 New Dundee Iron and Manganese
 Removal Class EA
 TM #5, Draft 2



- | | | |
|--------------------|------------------------|---------------------|
| Building Footprint | Access Driveway | New Property Line |
| Contours | GRCA Floodplains | Sludge Holding Tank |
| Ownership Parcels | GRCA Regulation Limits | |

Layout No. 3
 Region of Waterloo
 New Dundee Iron and Manganese
 Removal Class EA
 TM #5, Draft 2



328 Main Street

319.9 m ASL, GRCA
 Regulatory Floodplain
 Elevation

59 meter

8 meter

26 meter

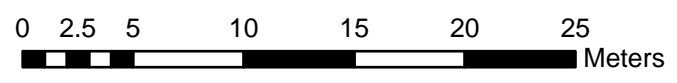
12 meter

5 meter

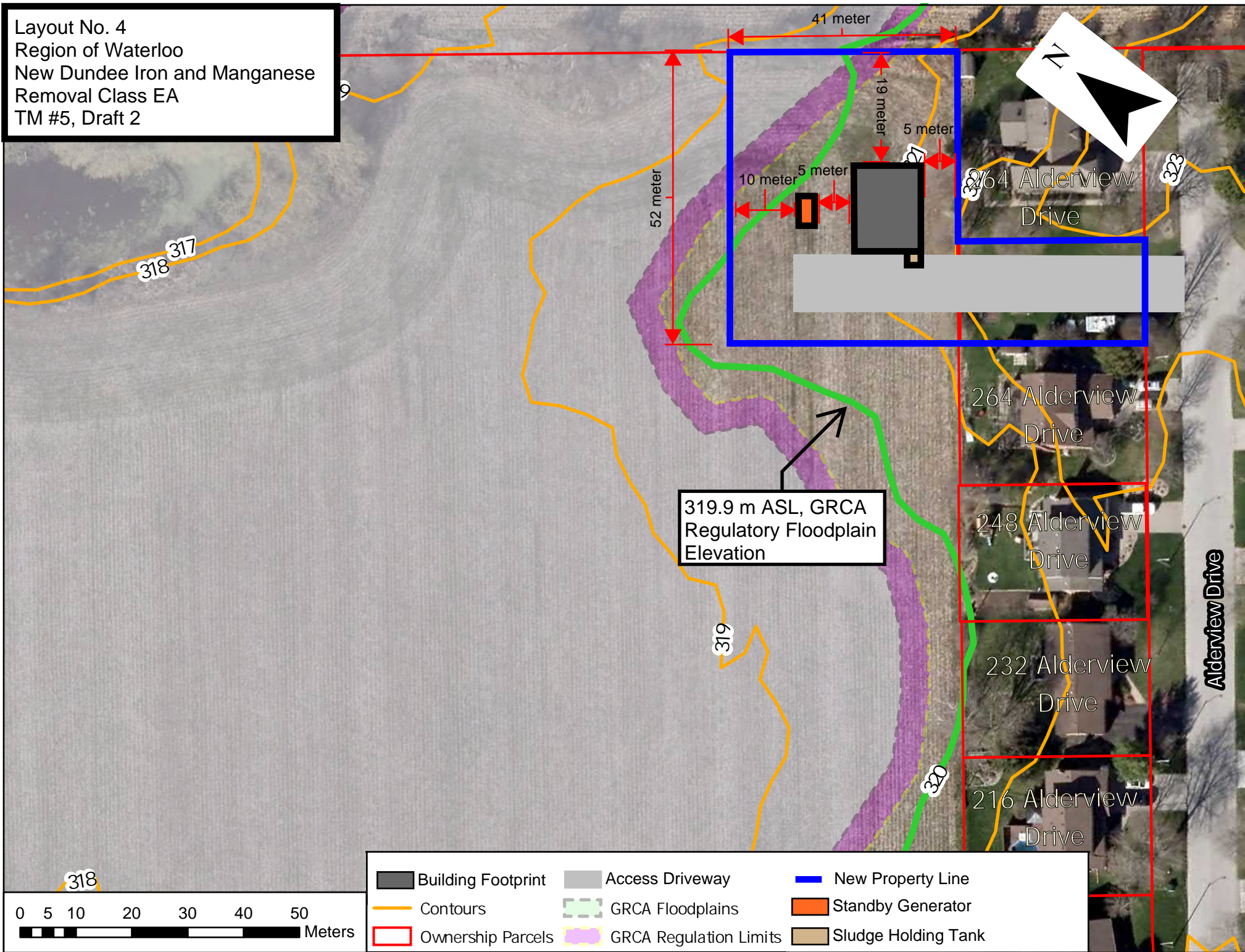
9 meter

156 Alderview Drive

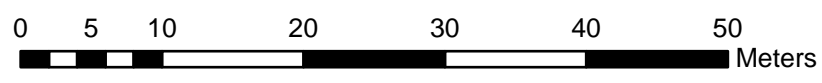
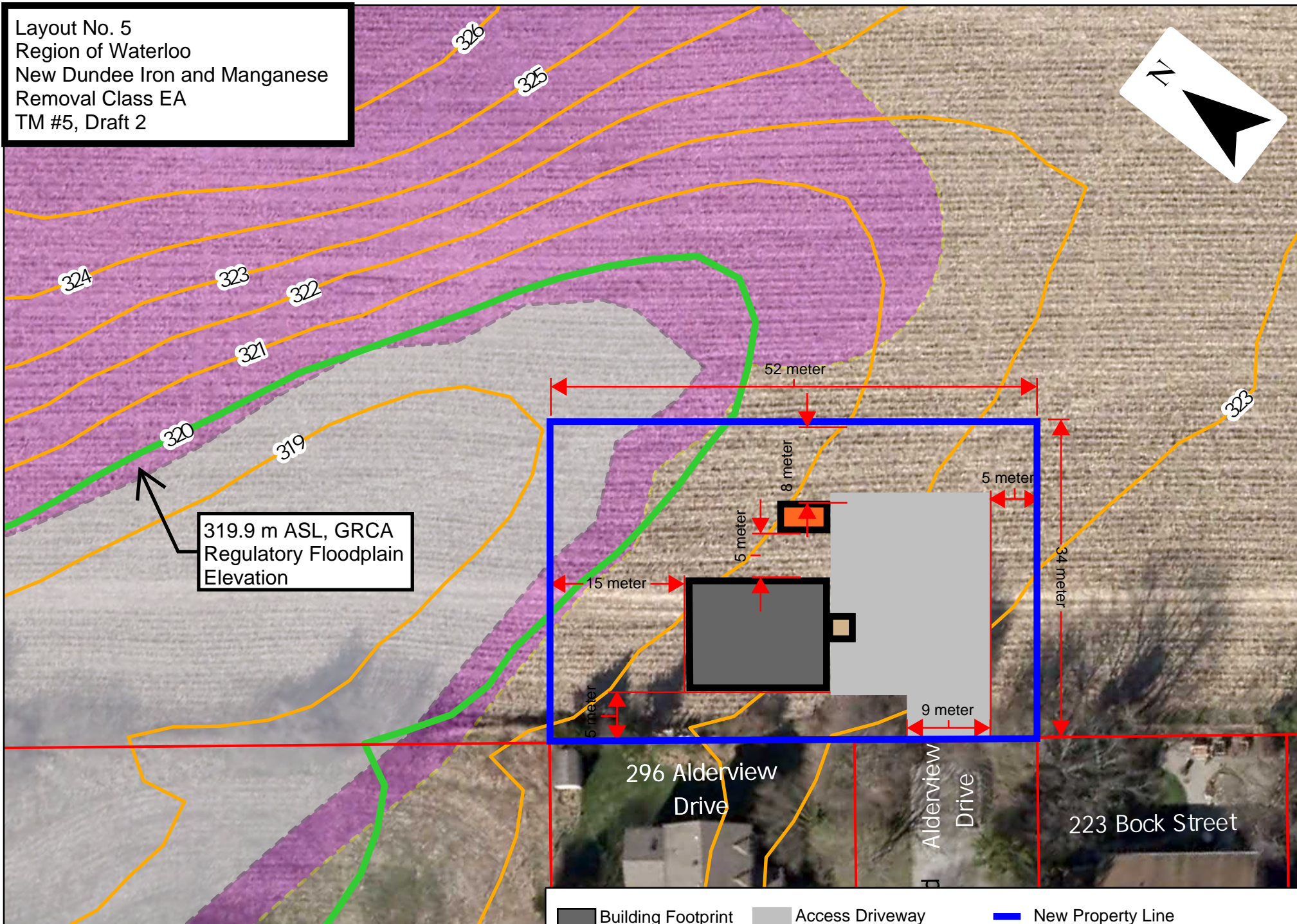
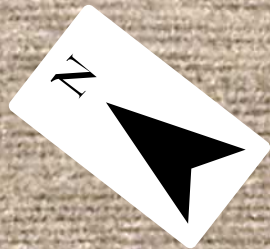
- Building Footprint
- Access Driveway
- Contours
- GRCA Floodplains
- New Property Line
- Ownership Parcels
- GRCA Regulation Limits
- Sludge Holding Tank



Layout No. 4
 Region of Waterloo
 New Dundee Iron and Manganese
 Removal Class EA
 TM #5, Draft 2



Layout No. 5
 Region of Waterloo
 New Dundee Iron and Manganese
 Removal Class EA
 TM #5, Draft 2



- | | | |
|--------------------|------------------------|---------------------|
| Building Footprint | Access Driveway | New Property Line |
| Contours | GRCA Floodplains | Standby Generator |
| Ownership Parcels | GRCA Regulation Limits | Sludge Holding Tank |

APPENDIX B:

**New Dundee Natural Sciences Report (LGL Limited,
September 2021)**

New Dundee Water Supply System Iron and Manganese Upgrades

for:

R.V. Anderson Associates Limited

by:

**LGL Limited
environmental research associates**


**May 2020
LGL File TA8978**



New Dundee Water Supply System Iron and Manganese Upgrades

Background Natural Sciences Report

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May 2020
LGL File TA8978

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1.0 Introduction

LGL Limited (LGL) has been retained by R.V. Anderson Associates Ltd (RVA) to provide natural sciences support for the Municipal Class Environmental Assessment (EA) of the New Dundee Water Supply System (WSS) Iron and Manganese Upgrades in the Township of Wilmot Ontario. The project is proceeding as a Schedule C Municipal EA.

The study area is located at 156 Alderview Drive in New Dundee, Ontario. The main natural heritage features in the study area are Alder Lake, Alder Creek, Alder Lake Marsh, and the Alder Creek Wetland Complex. These features, while not on the subject property, are adjacent to the property.

LGL's Background Natural Sciences Report (BNSR) provides a summary of the environmental sensitivities present within the study area and provides direction on protecting these features. The BNSR is for use by the Project Team and to aid in the selection of alternatives and to support the permit approval process. The list of alternatives was not available at the time of this report.

Where the need for an Environmental Management Plan (EMP) is identified by the project team, LGL's technical input as provided in this BNSR will be incorporated by RVA into the overall project EMP. LGL's BNSR describes existing conditions for natural heritage as determined through background screening and does not include primary data collect through field surveys. Once further details of design are available to LGL, new facility locations, the locations and limits of staging/laydown areas, erosion and sediment controls, etc. will be reviewed to identify potential impacts, and appropriate mitigation and management measures to protect natural heritage features such as fish habitat, vegetation, wetlands, and Species at Risk .

1.1 Project Summary

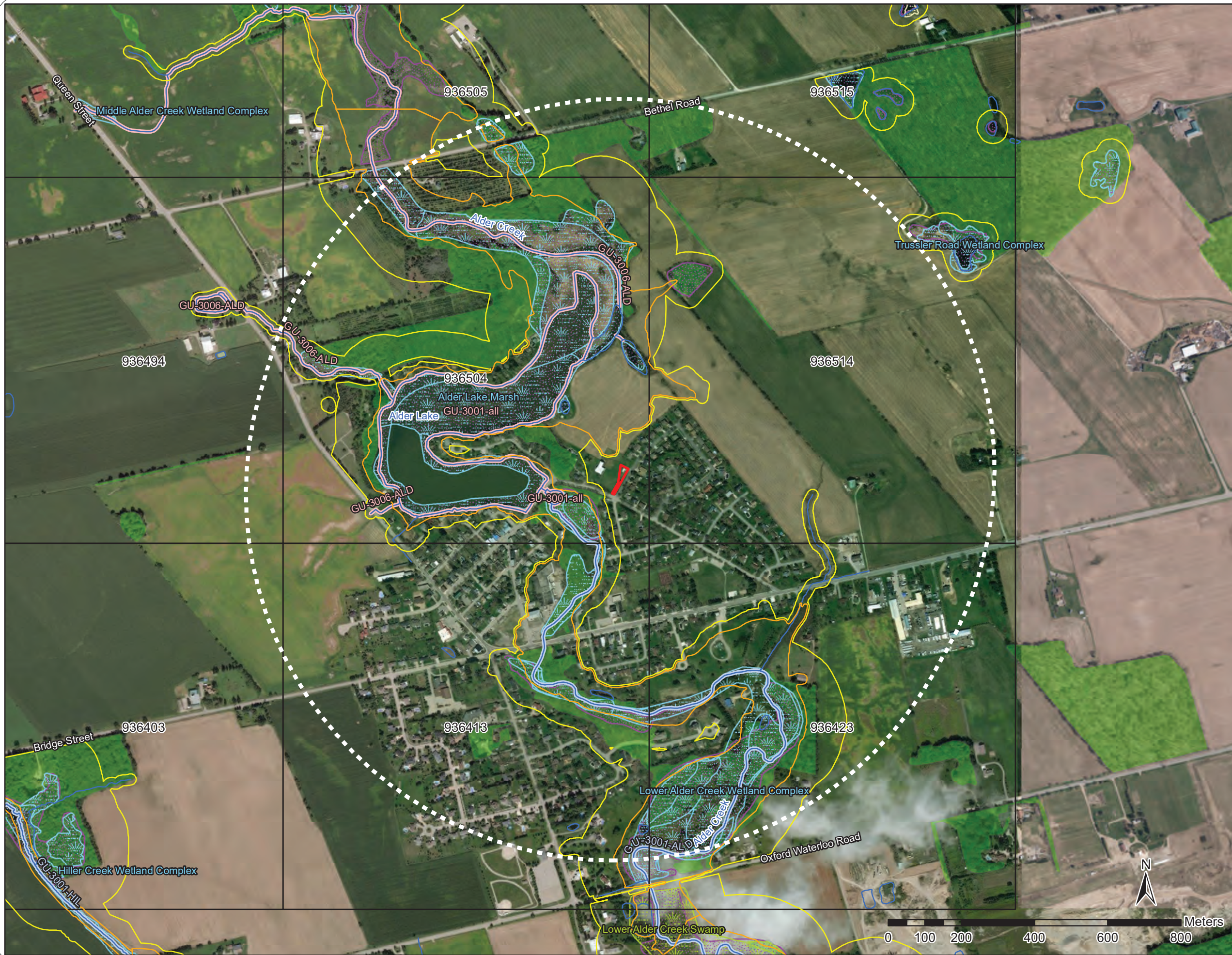
Upgrades to the New Dundee WSS are necessitated by potential changes to the aesthetic Ontario Drinking Water Standards for manganese. A location, footprint, and treatment process will be confirmed through the Class EA process. Options may include a new treatment facility filter on the existing property or adjacent to the existing property. Objectives of the Class EA are to determine to preferred treatment approach, preferred location for the treatment facility, and determine a conceptual layout and design.

2.0 Background Information Records Review

To characterize the study area, LGL has gathered information from available background sources. Information where available was requested or collected from:

- Region of Waterloo;
- Grand River Conservation Authority (GRCA);
- Land Information Ontario (LIO) database;
- Ministry of the Environment, Conservation, and Parks (MECP);
- Natural Heritage Information Centre (NHIC);
- Ministry of Natural Resources and Forestry (MNRF);
- Ontario Breeding Bird Atlas (OBBA); and,
- iNaturalist.

This background review was used to identify the known constraints present within the study area. From there, field surveys will be completed to verify the limits and extent of features identified through background review in relation to the subject property.



Legend

- Subject Property
- 1km Buffer around Property
- Provincially Tracked Species 1x1 km Square (LIO)
- Regulation Limit (GRCA)
- Regulatory Floodplain (GRCA)
- Provincially Significant Wetland (LIO)
- Other Wetland (LIO)
- Wetland (GRCA)
- Watercourse (LIO)
- Waterbody (LIO)
- Wooded Area (LIO)

Aquatic Resource Area Summary (LIO)
Thermal Regime

- Cold
- Warm

Contains Information made available under Grand River Conservation Authority's Open Data Licence v2.0.
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Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Background Existing Conditions



Project	TA8978	Figure	1
Date	April 2020	Prepared By:	KC
Scale	1:10,000	Verified By:	DCO

3.0 Natural Heritage Existing Conditions

3.1 Physiography, Soils, Hydrogeology

The study area is located in the south end of Waterloo County. The area was subject to many glacier advancements and retreats from various locations during the Pleistocene ice age (Presant and Wicklund, 1971). As a result of these ice lobes, the formation of massive moraine deposits developed as well as many unsorted or poorly sorted mixtures of clay, silt, sand, gravel and boulder glacial till. Waterloo moraine bisects a large portion of the county and found within the study area. The moraine contains sandy and silty deposits with occasional layers of clay and gravel. The soils within the study area are from the Grand-Kirkland, Burford-Fox, Bennington-Bookington, and Brant-Waterloo series and are developed on range of gravel loam to loamy sand over clay (Presant and Wicklund, 1971). These soils have low water holding capacity and low fertility.

3.2 Designated Natural Areas

Natural areas designated as Regional Core Environmental Features are found within the study area (Map 4 of Regional Official Plan 2015). The subject Natural area associated with Alder Lake and Alder Marsh are part Core Environmental Features. To the east of the subject property, lands are part of Regional Recharge Area. The subject property is mapped as a significant valley on Map 9 (Regional Environmental Features) of the City of Cambridge Official Plan (2018).

3.2.1 Alder Lake and Alder Lake Marsh

Alder Lake is an artificial reservoir created by the New Dundee Dam. Associated with the lake is the Alder Lake Marsh, which contains wetland habitat. The marsh is not designated locally or provincially, though it is regulated by the GRCA. Regulation limits are shown in yellow on Figure 1.

3.2.2 Lower Alder Creek Wetland Complex

The Lower Alder Creek Wetland Complex is associated with Alder Creek, south of the lake, and north of Oxford Waterloo Road. This wetland is comprised of swamp and marsh habitat. This wetland complex is not designated locally or provincially, though it is regulated by the GRCA. Regulation limits are shown in yellow on Figure 1.

3.3 Vegetation and Vegetation Communities

The composition, structure and function of vegetation communities within the subject property were identified through air photo interpretation. Air photos were interpreted to determine the limits and characteristics of the vegetation communities in the study area.

3.3.1 Vegetation Communities

The property is surrounded by residential and agricultural properties. Natural vegetation features are valley and floodplain of Alder Creek. Tableland forests adjacent to the valley consist of deciduous, mix forest and conifer plantations. Wetland communities consist of marshes and swamps (See Figure 2).

3.3.2 Species at Risk

No plant species that are regulated under the Ontario Endangered Species Act (ESA) or the Canada Species at Risk Act (SARA) as Endangered or Threatened were found in the background screening within the project area through the MNRF Natural Heritage Information Centre. Records for Butternut (*Juglans cinerea*) are known in the Region. Butternut are endangered in Ontario.

3.4 Wildlife and Wildlife Habitat

3.4.1 Background Information




Available background information from the Ontario Breeding Bird Atlas (OBBA 2020) and eBird was reviewed for the broader project area. A summary of the database searches is provided in Appendix A. Data from these sources provide data for an area 10km², therefore, while these species have some potential to be found in a larger area, there may not be available habitat for them on site within the subject property.

3.4.1.1 Wildlife Habitat

With the study area being located in a predominantly residential and agricultural setting, wildlife habitat in the immediate vicinity of the subject property is somewhat limited. Wildlife habitat is limited to the Alder Creek corridor, including Alder Lake and associated woodlands and wetlands. These areas provide habitat for a variety of wildlife species including birds, mammals, amphibians, and reptiles.



Legend

-  Subject Property
-  1km Buffer around Property
-  ELC Communities Boundary
- FOG** Coniferous Forest
- FOD** Deciduous Forest
- FOM** Mixed Forest
- MAM** Meadow Marsh
- MAM2** Mineral Meadow Marsh
- MAM2-2** Reed-canary Grass Mineral Meadow Marsh
- SWD** Deciduous Swamp
- SWM** Mixed Swamp
- SWT** Thicket Swamp
- AOO** Open Aquatic
- CUM** Cultural Meadow
- CUP** Plantation
- CUP3** Coniferous Plantation
- AG** Agricultural
- H** Hedgerow
- M** Manicured

Data Source: LGL Limited field investigations.
 Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Vegetation Communities



Project	TA8978	Figure	2
Date	April 2020	Prepared By:	KC
Scale	1:10,000	Verified By:	DCO

3.4.2 Species at Risk

Through background research, and knowledge of the study area there is potential for the following wildlife Species at Risk (SAR):

- Butternut (*Juglans cinerea*);
- Bald Eagle (*Haliaeetus leucocephalus*);
- Barn Swallow (*Hirundo rustica*);
- Bobolink (*Dolichonyx oryzivorus*);
- Chimney Swift (*Chaetura pelagica*);
- Eastern Meadowlark (*Sturnella magna*);
- Eastern Wood-Pewee (*Contopus virens*);
- Grasshopper Sparrow (*Ammodramus savannarum*);
- Horned Grebe (*Podiceps auritus*);
- Red-headed Woodpecker (*Melanerpes erythrocephalus*);
- Wood Thrush (*Hylocichla mustelina*);
- Blanding's Turtle (*Emydoidea blandingii*);
- Eastern Ribbonsnake (*Thamnophis sauritus sauritus*);
- Northern Map Turtle (*Graptemys geographica*);
- Snapping Turtle (*Chelydra serpentina*);
- Eastern Small-footed Bat (*Myotis leibii*);
- Little Brown Bat (*Myotis lucifugus*);
- Northern Long Eared Bat (*Myotis septentrionalis*); and,
- Tri-Colored Bat (*Perimyotis subflavus*).

A summary of all potential species at risk identified through screening, their habitat requirements, and their potential to be onsite is provided in Section 4.0.

3.5 Aquatic Habitat and Communities

3.5.1 Background Information

There is no aquatic habitat in the vicinity of the current property, however there are several aquatic habitat features in the greater study area, namely Alder Lake to the north west, and Alder Creek to the south east. Alder Creek flows into Alder Lake in the northern portion of the study area and flows south from the Alder Lake Outlet to the Nith River further south. North of the lake, Alder Creek is managed as a warmwater system, however south of the lake, it is managed as a coldwater system and supports various coldwater species such a Brook Trout (*Salvelinus fontinalis*) (see Table 1).

Table 1 Fish Resources in the Study Area.

Common Name	Scientific Name	Thermal Regime	Alder Creek (ARA)	Alder Creek (DFO)	Alder Lake (ARA)
Black Crappie	<i>Pomoxis nigromaculatus</i>	Coolwater	x		
Blackside Darter	<i>Percina maculata</i>	Coolwater	x		
Bluntnose Minnow	<i>Pimephales notatus</i>	Warmwater			x
Brassy Minnow	<i>Hybognathus hankinsoni</i>	Coolwater	x		
Brook Stickleback	<i>Culaea inconstans</i>	Coolwater	x		
Brook Trout	<i>Salvelinus fontinalis</i>	Coldwater	x		
Brown Bullhead	<i>Ameirus nebulosus</i>	Warmwater			x
Brown Trout	<i>Salmo trutta</i>	Coldwater	x		
Central Mudminnow	<i>Umbra limi</i>	Coolwater	x		
Common Carp	<i>Cyprinus carpio</i>	Warmwater	x		x
Common Shiner	<i>Luxilus cornutus</i>	Coolwater	x		x
Creek Chub	<i>Semotilus atromaculatus</i>	Coolwater	x		
Fathead Minnow	<i>Pimephales promelas</i>	Warmwater	x		
Golden Redhorse	<i>Moxostoma erythrurum</i>	Warmwater	x		
Golden Shiner	<i>Notemigonus crysoleucas</i>	Coolwater	x		x
Hornyhead Chub	<i>Nocomis biguttatus</i>	Coolwater	x		
Largemouth Bass	<i>Micropterus salmoides</i>	Warmwater	x		x
Longnose Dace	<i>Rhinichthys cataractae</i>	Coolwater	x		
Northern Hogsucker	<i>Hypentelium nigricans</i>	Warmwater	x		
Pumpkinseed	<i>Lepomis gibbosus</i>	Warmwater	x		x
Rainbow Trout	<i>Oncorhynchus mykiss</i>	Coldwater	x		
Rockbass	<i>Ambloplites rupestris</i>	Coolwater	x		

Common Name	Scientific Name	Thermal Regime	Alder Creek (ARA)	Alder Creek (DFO)	Alder Lake (ARA)
Rosyface Shiner	<i>Notropis rubellus</i>	Warmwater	x		
Silver Shiner	<i>Notropis photogenis</i>	Coolwater		x	
Smallmouth Bass	<i>Micropterus dolomieu</i>	Coolwater	x		
Stonecat	<i>Noturus flavus</i>	Warmwater	x		
Striped Shiner	<i>Luxilus chrysocephalus</i>	Coolwater	x		
White Sucker	<i>Catostomus commersonii</i>	Coolwater	x		x

Given the subject site’s distance from these features, aquatic impacts are not anticipated, with appropriate site selection and the implementation of best management practices for silt and sediment controls.

3.5.2 Species at Risk

Alder Creek provides habitat for Silver Shiner (*Notropis photogenis*), which is listed as threatened under the provincial Endangered Species Act. Section 4.0 elaborates on Species at Risk in the study area. They prefer to live in medium to large streams with clean cobble and boulders.

4.0 Species at Risk Summary

The *Endangered Species Act* (2007) is administered by the ministry of the Environment, Conservation, and Parks (MECP). A table of potential SAR species (see Table 2) has been compiled using information from various sources such as NHIC, OBBA, Ontario Nature, DFO Aquatic SAR Mapping. Several SAR species have the potential to be in the study area, though none have been confirmed. When a short list of alternatives is determined, they will be screened for potential SAR.

Table 2 Species at Risk Screening for the Project.

Species	MNRF NHIC (April 2020)	iNaturalist (2020)	OBBA (2001-2005)	eBird (2020)	DFO SAR Map (April 2020)	Provincial Designation	Habitat	Potential for Habitat/Screening Conducted by LGL	Next Steps Recommended
Butternut (<i>Juglans cinerea</i>)						Endangered	Generally grows in rich, moist, and well-drained soils often found along streams. It may also be found on well-drained gravel sites, especially those made up of limestone. It is also found, though seldom, on dry, rocky and sterile soils. In Ontario, the Butternut generally grows alone or in small groups in deciduous forests as well as in hedgerows	Potential habitat found in study area within woodlands.	ELC survey of proposed alternative locations.
Bald Eagle (<i>Haliaeetus leucocephalus</i>)				X		Special Concern	Nests in a variety of habitats, usually forests near open water where they can hunt for fish.	Potential habitat in woodlands near Alder Lake	None
Bank Swallow (<i>Riparia riparia</i>)			X			Threatened	Nests in the vertical surfaces of silt and sand substrates. Often these surfaces are found on the banks of waterbodies or gravel pits.	No nesting habitat in study area.	None
Barn Swallow (<i>Hirundo rustica</i>)			X	X		Threatened	Prefers farmland; lake/river shorelines; wooded clearings; urban populated areas; rocky cliffs; and wetlands. They nest inside or outside buildings; under bridges and in road culverts; on rock faces and in caves etc.	Habitat for this species is abundant in the study area	ELC survey and breeding bird survey of proposed alternative locations.
Bobolink (<i>Dolichonyx oryzivorus</i>)			X	X		Threatened	This species occurs in tallgrass prairies, open meadows, and fallow agricultural fields. It is also often found in hay fields.	Preferred habitat for this species may be found in study area if agricultural fields are hay or pasture.	ELC survey and breeding bird survey of proposed alternative locations.
Canada Warbler (<i>Wilsonia canadensis</i>)				X		Special Concern	Nests in deciduous and mixed conifer forests with shrubs and mosses frequently near water.	Potential habitat for this species in the study area.	ELC survey and breeding bird survey of proposed alternative locations.

Species	MNRF NHIC (April 2020)	iNaturalist (2020)	OBBA (2001-2005)	eBird (2020)	DFO SAR Map (April 2020)	Provincial Designation	Habitat	Potential for Habitat/Screening Conducted by LGL	Next Steps Recommended
Chimney Swift (<i>Chaetura pelagica</i>)				X		Threatened	Historically found in deciduous and coniferous, usually wet forest types, all with a well-developed, dense shrub layer; now most are found in urban areas in large uncapped chimneys.	Potential habitat for this species in the study area.	ELC survey and breeding bird survey of proposed alternative locations.
Common Nighthawk (<i>Chordeiles minor</i>)				X			Open habitats with little to no plants. Examples included rock barrens, forest clearings, and logged areas.	Preferred habitat for this species not found in study area.	None
Eastern Meadowlark (<i>Sturnella magna</i>)				X		Threatened	This species occurs in tallgrass prairies, open meadows, and fallow agricultural fields.	Preferred habitat for this species may be found in study area if agricultural fields are hay or pasture.	ELC survey and breeding bird survey of proposed alternative locations.
Eastern Wood-Pewee (<i>Contopus virens</i>)			X	X		Special Concern	Mixed and deciduous forests in the mid-canopy layer near forest clearings and edges. The forests usually have little understory vegetation.	Potential habitat found in study area within woodlands.	ELC survey and breeding bird survey of proposed alternative locations.
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)				X		Special Concern	This species occurs in tallgrass prairies, open meadows, and fallow agricultural fields. It is also often found in hay fields.	Preferred habitat for this species may be found in study area if agricultural fields are hay or pasture.	ELC survey and breeding bird survey of proposed alternative locations.
Horned Grebe (<i>Podiceps auritus</i>)				X		Special Concern	This species nests in ponds, marshes, and bays with emergent vegetation. It prefers natural habitat rather than reservoirs and man-made ponds.	Potential habitat found in the study area associated with Alder lake	ELC survey and breeding bird survey of proposed alternative locations.
Red-headed Woodpecker (<i>Melanerpes erythrocephalus</i>)				X		Special Concern	Open woodlands and woodland edges. Sometimes found in cemeteries, parks and golf courses.	Potential habitat found in study area within woodlands.	ELC survey and breeding bird survey of proposed alternative locations.
Wood Thrush (<i>Hylocichla mustelina</i>)						Special Concern	Mature deciduous and mixed woods. Nests regularly in Sugar Maple and American Beech.	Potential habitat found in study area within woodlands.	ELC survey and breeding bird survey of proposed alternative locations.

Species	MNRF NHIC (April 2020)	iNaturalist (2020)	OBBA (2001-2005)	eBird (2020)	DFO SAR Map (April 2020)	Provincial Designation	Habitat	Potential for Habitat/Screening Conducted by LGL	Next Steps Recommended
Silver Shiner (<i>Notropis photogenis</i>)					X	Threatened	Habitat includes large streams with swift currents and gravel or boulder substrates	Habitat for this species in Alder Creek.	Avoid Alder Creek corridor if possible. Ensure appropriate ESC measures applied to protect species in Alder Creek.
Blandings Turtle (<i>Emydoidea blandingii</i>)						Threatened	Found in shallow aquatic habitat such as wetlands, rivers, and lakes	Habitat for this species available in the study area.	Avoid aquatic habitat if possible. Ensure appropriate ESC measures applied to protect species.
Northern Map Turtle (<i>Graptemys geographica</i>)						Special Concern	They inhabit rivers and lakes that support molluscs (for prey).	Habitat for this species available in the study area.	Avoid aquatic habitat if possible. Ensure appropriate ESC measures applied to protect species.
Snapping Turtle (<i>Chelydra serpentina</i>)	X					Special Concern	Aquatic setting such as lakes, ponds, bays and inlets. This is a highly aquatic species but may leave the water to seek out new aquatic habitats or to lay eggs.	Habitat for this species available in the study area.	Avoid aquatic habitat if possible. Ensure appropriate ESC measures applied to protect species.
Eastern Ribbonsnake (<i>Thamnophis sauritus</i>)						Special Concern	They are a semi aquatic species. Their habitat is forests near water, particularly marsh habitat within a forest.	Habitat for this species available in the study area.	Avoid aquatic habitat if possible. Ensure appropriate ESC measures applied to protect species.

Species	MNRF NHIC (April 2020)	iNaturalist (2020)	OBBA (2001-2005)	eBird (2020)	DFO SAR Map (April 2020)	Provincial Designation	Habitat	Potential for Habitat/Screening Conducted by LGL	Next Steps Recommended
Eastern Small-footed Bat (<i>Myotis leibii</i>)						Endangered	Overwintering habitat: Caves and mines Maternal Roosts: Caves, tree cavities, rock outcrops, bridges and buildings	Potential habitat occurs for Maternal roosting sites within the woodlands/forests and in individual trees with suitable cavities. No potential for hibernacula identified.	While not specifically observed, SAR bat species have high potential to occur in woodland communities and may also occur in open grown trees. Consultation for mitigation associated with pruning or tree removal within woodland (no works April 15 to September 30) should be discussed with MECP to ensure compliance under the ESA if tree removals are required.
Little Brown Bat (<i>Myotis lucifugus</i>)						Endangered	Overwintering habitat: Caves and mines that remain above 0°C. Maternal Roosts: Often associated with buildings (attics, barns etc.). Occasionally found in trees (25-44 cm dbh).	Potential habitat occurs for Maternal roosting sites within the woodlands/forests and in individual trees with suitable cavities. No potential for hibernacula identified.	While not specifically observed, these SAR bat species have high potential to occur in woodland communities and may also occur in open grown trees. Consultation for mitigation associated with pruning or tree removal within woodland (no works April 15 to September 30) should be discussed with MECP to ensure compliance under the ESA if tree removals are required.

Species	MNRF NHIC (April 2020)	iNaturalist (2020)	OBBA (2001-2005)	eBird (2020)	DFO SAR Map (April 2020)	Provincial Designation	Habitat	Potential for Habitat/Screening Conducted by LGL	Next Steps Recommended
Northern Long Eared Bat (<i>Myotis septentrionalis</i>)						Endangered	Overwintering habitat: Caves and mines that remain above 0°C. Maternal Roosts: Often associated with cavities of large diameter trees (25-44 cm dbh) with cavities and crevices. Occasionally found in structures (attics, barns etc.)	Potential habitat occurs for Maternal roosting sites within the woodlands/forests and in individual trees with suitable cavities. No potential for hibernacula identified.	While not specifically observed, these SAR bat species have high potential to occur in woodland communities and may also occur in open grown trees. Consultation for mitigation associated with pruning or tree removal within woodland (no works April 15 to September 30) should be discussed with MECP to ensure compliance under the ESA if tree removals are required.
Tri-Colored Bat (<i>Perimyotis subflavus</i>)						Endangered	Overwintering habitat: Caves and mines that remain above 0°C. Maternal Roosts: Often associated with clusters of dead leaves in large diameter Oak or Maple trees	Potential habitat occurs for Maternal roosting sites within the woodlands and in individual trees on property. No potential for hibernacula identified.	While not specifically observed, these SAR bat species have high potential to occur in woodland communities and may also occur in open grown trees. Consultation for mitigation associated with pruning or tree removal within woodland (no works April 15 to September 30) should be discussed with MECP to ensure compliance under the ESA.

5.0 Potential Impacts

Potential terrestrial impacts may be in the form of vegetation and tree removals. Wildlife and wildlife habitat in the project area is mainly associated with the Alder Creek corridor. Avoidance of vegetation removals in this area is the best option to avoid impacts to terrestrial habitat. Based on previous consultation with the MNRF on similar projects, the potential for SAR bat impacts can be mitigated by minimizing the extent of tree removals on the project, and through the application of timing windows for tree clearing activities if needed. Should building impacts be proposed, screening for bat use may be required depending on the building type. Potential impacts for SAR birds can be mitigated by avoiding construction in their habitat if possible or construction outside of the breeding window. If the project requires removal of SAR bird habitat or construction of permanent structures within SAR bird habitat, the project may require permits or approvals under the Endangered Species Act, 2007 from the MECP.

Impacts to aquatic habitat are not anticipated as it is assumed that avoidance of aquatic habitat will be achieved through appropriate site selection as well as mitigation measures such as timing windows, setbacks, and erosion and sediment control measures. Species associated with the aquatic habitat (mussels, fish, turtles) are not expected to be impacted at this time.

5.1 Proposed Mitigation

LGL has reviewed the information available for the project against the natural heritage information compiled above to make the following recommendations to reduce impacts on natural features through project design. The best mitigation would be avoidance of any natural heritage features if possible.

A standalone Erosion and Sediment Control (ESC) Plan should be developed and implemented for the site that minimizes risk of sediment transport into adjacent retained vegetation communities or to the aquatic habitat of Alder Creek during all phases of the project. This plan should include:

- Methods to isolate the construction area;
- Timing of effective ESC measures, where ESCs shall be installed before starting work to prevent the entry of sediment into the watercourse or adjacent areas. Inspect regularly during the course of construction and conduct regular maintenance and repairs as necessary;
- Clearly identified stockpiling and staging areas; and,

- A plan to dispose of any water accumulated onsite from dewatering or pooled stormwater.

Other mitigation measures should include:

- Minimize vegetation and tree removals through facility design;
- Minimize construction area to the extent possible;
- Use appropriate tree protection measures for any work around tree resources within the project area to help protect trees identified to be retained;
- Use previously disturbed areas for construction laydown and staging to the extent possible;
- No vegetation removal should occur between April 1 and August 30 of any given year in order to protect birds afforded protection under the Migratory Birds and Convention Act;
- No tree removal or pruning within the plantation should occur during the bat maternal roosting period for bats (April 15th to September 30th of any given year). Note, this timing window is weather dependant and should be confirmed by MECP once further project details are known;
- Locate site maintenance, vehicle washing and refuelling stations where contaminants are handled off site, and outside of the wellhead protection area; and,
- Ensure that a Spills Management Plan (including materials, instructions regarding their use, education of contract personnel, emergency contact numbers) is on-site at all times for implementation in event of an accidental spill during construction. An emergency spill kit shall be kept on site. A response plan shall also be developed that is to be implemented immediately in the event of a sediment release.

6.0 Recommendations for Selection of Alternatives

Alder Creek, its floodplain and associated wetlands are regulated by the GRCA under Ontario Regulation 150/06 Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses. Avoidance of these areas is advised in order to reduce potential impacts to these natural heritage communities. As more detailed information is determined for potential alternatives, LGL will provide further detail with regard to the selection of a short list of alternatives, the preferred alternative, and the potential for impacts to natural heritage features for each alternative.

7.0 References

Carpentier, G. 2018. eBird Checklist: [eBird Checklist Sunderland Lagoons](#) eBird, Ithaca, New York. Available: [eBird Checklist](#). (Accessed April 14, 2020)

Conservation Ontario. Aquatic Species at Risk Mapping_(Accessed April 14, 2020)

Ministry of Natural Resources and Forestry. Natural Heritage Information Centre Biodiversity Explorer. Website available online: [Natural Heritage Information Centre Biodiversity Explorer](#). Ministry of Natural Resources. Peterborough, Ontario. (Accessed April 14, 2020)

Ontario Breeding Bird Atlas. OBBA Point Count Data 2001-2005. (Accessed April 14, 2020)

Presant, E.W. and R.E. Wicklund. 1971. *Soils of Waterloo County. Report No. 44 of the Ontario Soil Survey*. The Ontario Department of Agriculture and Food. 147pp.

Region of Waterloo. 2015. Regional Official Plan.

Appendix A Wildlife List.

Scientific Name	Common Name	G-Rank	S-Rank	SARA Schedule	COSEWIC	SARA	SARO	FWCA	MBCA	GRCA	Waterloo Region	Priority Species Waterloo	OBBA 2001-2005	eBird (2020)
<i>Anas rubripes</i>	American Black Duck	G5	S4						X	CP	RS			X
<i>Corvus brachyrhynchos</i>	American Crow	G5	S5B										X	X
<i>Carduelis tristis</i>	American Goldfinch	G5	S5B						X	CP		level 3	X	
<i>Falco sparverius</i>	American Kestrel	G5	S4					P		CP		level 2		X
<i>Turdus migratorius</i>	American Robin	G5	S5B						X				X	X
<i>Spizella arborea</i>	American Tree Sparrow	G5	S4B						X					X
<i>Anas americana</i>	American Widgeon	G5	S4								RS			X
<i>Haliaeetus leucocephalus</i>	Bald Eagle	G5	S2N,S4B		NAR		SC	P						X
<i>Icterus galbula</i>	Baltimore Oriole	G5	S4B						X					X
<i>Riparia riparia</i>	Bank Swallow	G5	S4B	Schedule 1	THR		THR		X	CP		level 2		X
<i>Hirundo rustica</i>	Barn Swallow	G5	S4B	Schedule 1	THR		THR		X	CP		level 3	X	X
<i>Strix varia</i>	Barred Owl	G5	S5					P		CP	RS	level 1		X
<i>Ceryle alcyon</i>	Belted Kingfisher	G5	S4B					P			RS			X
<i>Dendroica fusca</i>	Blackburnian Warbler	G5	S5B						X	CP		level 3		X
<i>Poecile atricapillus</i>	Black-capped Chickadee	G5	S5						X	CP		level 4	X	X
<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron	G5	S3B,S3N						X		RS	level 1		X
<i>Dendroica virens</i>	Black-throated Green Warbler	G5	S5B						X	CP	RS	level 1		X
<i>Cyanocitta cristata</i>	Blue Jay	G5	S5					P					X	X
<i>Dolichonyx oryzivorus</i>	Bobolink	G5	S4B	Schedule 1	THR		THR		X	CP		level 2	X	X
<i>Certhia americana</i>	Brown Creeper	G5	S5B						X	CP	RS	level 2		X
<i>Toxostoma rufum</i>	Brown Thrasher	G5	S4B						X	CP	RS	level 1		X
<i>Molothrus ater</i>	Brown-headed Cowbird	G5	S4B										X	X
<i>Branta canadensis</i>	Canada Goose	G5	S5						X					X
<i>Wilsonia canadensis</i>	Canada Warbler	G5	S4B	Schedule 1	THR	THR	SC		X	CP	RS	level 2		X
<i>Bombycilla cedrorum</i>	Cedar Waxwing	G5	S5B						X				X	X
<i>Spizella passerina</i>	Chipping Sparrow	G5	S5B						X				X	X
<i>Petrochelidon pyrrhonota</i>	Cliff Swallow	G5	S4B						X	CP		level 3		X
<i>Quiscalus quiscula</i>	Common Grackle	G5	S5B										X	X
<i>Mergus merganser</i>	Common Merganser	G5	S5B,S5N						X		RS			X
<i>Chordeiles minor</i>	Common Nighthawk	G5	S4B	Schedule 1	THR	THR	SC		X	CP	RS	level 1		X
<i>Corvus corax</i>	Common Raven	G5	S5					P						X
<i>Carduelis flammea</i>	Common Redpoll	G5	S4B						X					X
<i>Geothlypis trichas</i>	Common Yellowthroat	G5	S5B						X				X	X
<i>Accipiter cooperii</i>	Cooper's Hawk	G5	S4		NAR			P		CP	RS	level 3		X
<i>Junco hyemalis</i>	Dark-eyed Junco	G5	S5B						X	CP				X
<i>Picoides pubescens</i>	Downy Woodpecker	G5	S5						X					X
<i>Sialia sialis</i>	Eastern Bluebird	G5	S5B		NAR				X	CP	RS	level 1		X
<i>Tyrannus tyrannus</i>	Eastern Kingbird	G5	S4B						X	CP		level 3		X
<i>Sturnella magna</i>	Eastern Meadowlark	G5	S4B	Schedule 1	THR		THR		X	CP		level 2		X
<i>Sayornis phoebe</i>	Eastern Phoebe	G5	S5B						X	CP		level 3		X

Scientific Name	Common Name	G-Rank	S-Rank	SARA Schedule	COSEWIC	SARA	SARO	FWCA	MBCA	GRCA	Waterloo Region	Priority Species Waterloo	OBBA 2001-2005	eBird (2020)
<i>Megascops asio</i>	Eastern Screech-Owl	G5	S4		NAR			P						X
<i>Pipilo erythrophthalmus</i>	Eastern Towhee	G5	S4B						X	CP		level 2		X
<i>Contopus virens</i>	Eastern Wood Pewee	G5	S4B	Schedule 1	SC		SC		X				X	X
<i>Sturnus vulgaris</i>	European Starling	G5	SNA										X	X
<i>Spizella pusilla</i>	Field Sparrow	G5	S4B						X	CP		level 3	X	X
<i>Passerella iliaca</i>	Fox Sparrow	G5	S4B						X	CP		level 3		X
<i>Regulus satrapa</i>	Golden-crowned Kinglet	G5	S5B						X	CP	RS	level 3		X
<i>Ammodramus savannarum</i>	Grasshopper Sparrow	G5	S4B						X	CP	RS	level 3		X
<i>Dumetella carolinensis</i>	Gray Catbird	G5	S4B						X	CP		level 4	X	X
<i>Ardea herodias</i>	Great Blue Heron	G5	S4						X		RS			X
<i>Myiarchus crinitus</i>	Great Crested Flycatcher	G5	S4B						X				X	X
<i>Ardea alba</i>	Great Egret	G5	S2B						X					X
<i>Bubo virginianus</i>	Great Horned Owl	G5	S4					P						X
<i>Tringa melanoleuca</i>	Greater Yellowlegs	G5	S4B,S4N						X					X
<i>Butorides virescens</i>	Green Heron	G5	S4B							CP	RS	level 4		X
<i>Picoides villosus</i>	Hairy Woodpecker	G5	S5						X		RS			X
<i>Catharus guttatus</i>	Hermit Thrush	G5	S5B											X
<i>Larus argentatus</i>	Herring Gull	G5	S5B, S5N											X
<i>Podiceps auritus</i>	Horned Grebe	G5	S1B,S4N	No Schedule	SC		SC		X					X
<i>Eremophila alpestris</i>	Horned Lark	G5	S5B						X	CP		level 3	X	X
<i>Carpodacus mexicanus</i>	House Finch	G5	SNA						X					X
<i>Passer domesticus</i>	House Sparrow	G5	SNA											X
<i>Troglodytes aedon</i>	House Wren	G5	S5B						X				X	X
<i>Passerina cyanea</i>	Indigo Bunting	G5	S4B						X				X	X
<i>Charadrius vociferus</i>	Killdeer	G5	S5B,S5N						X				X	X
<i>Empidonax minimus</i>	Least Flycatcher	G5	S4B						X	CP	RS	level 3	X	
<i>Dendroica magnolia</i>	Magnolia Warbler	G5	S5B						X	CP	RS	level 2		X
<i>Anas platyrhynchos</i>	Mallard	G5	S5						X				X	X
<i>Falco columbarius</i>	Merlin	G5	S5B		NAR			P						X
<i>Zenaida macroura</i>	Mourning Dove	G5	S5						X				X	X
<i>Oporornis philadelphia</i>	Mourning Warbler	G5	S4B						X	CP	RS	level 2		X
<i>Vermivora ruficapilla</i>	Nashville Warbler	G5	S5B						X	CP	RS	level 2		X
<i>Cardinalis cardinalis</i>	Northern Cardinal	G5	S5						X				X	X
<i>Colaptes auratus</i>	Northern Flicker	G5	S4B						X					X
<i>Accipiter gentilis atricapillus</i>	Northern Goshawk	G5	S4		NAR			P		CP	RS	level 3		X
<i>Circus cyaneus</i>	Northern Harrier	G5	S4B		NAR			P		CP	RS	level 4		X
<i>Mimus polyglottos</i>	Northern Mockingbird	G5	S4						X	CP	RS	level 1		X
<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow	G5	S4B						X	CP		level 2	X	X
<i>Anas clypeata</i>	Northern Shoveler	G5	S4						X					X
<i>Lanius excubitor</i>	Northern Shrike	G5	SNA						X					X

Scientific Name	Common Name	G-Rank	S-Rank	SARA Schedule	COSEWIC	SARA	SARO	FWCA	MBCA	GRCA	Waterloo Region	Priority Species Waterloo	OBBA 2001-2005	eBird (2020)
<i>Seiurus noveboracensis</i>	Northern Waterthrush	G5	S5B						X	CP	RS	level 2		x
<i>Icterus spurius</i>	Orchard Oriole	G5	S4B						X	CP	RS	level 3		x
<i>Pandion haliaetus</i>	Osprey	G5	S5B					P		CP	RS	level 3		x
<i>Seiurus aurocapilla</i>	Ovenbird	G5	S4B						X	CP	RS	level 4		x
<i>Podilymbus podiceps</i>	Pied-billed Grebe	G5	S4B,S4N						X	CP	RS	level 1		x
<i>Dryocopus pileatus</i>	Pileated Woodpecker	G5	S5						X	CP	RS	level 2		x
<i>Pinicola enucleator</i>	Pine Grosbeak	G5	S4B						X					x
<i>Dendroica pinus</i>	Pine Warbler	G5	S5B						X	CP	RS	level 3		x
<i>Carpodacus purpureus</i>	Purple Finch	G5	S4B						X	CP	RS	level 2		x
<i>Melanerpes carolinus</i>	Red-bellied Woodpecker	G5	S4						X	CP	RS	level 3		x
<i>Sitta canadensis</i>	Red-breasted Nuthatch	G5	S5						X	CP	RS	level 3		x
<i>Vireo olivaceus</i>	Red-eyed Vireo	G5	S5B						X					x
<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	G5	S4B	Schedule 1	THR	THR	SC		X	CP	RS	level 1		x
<i>Buteo lineatus</i>	Red-shouldered Hawk	G5	S4B	Schedule 3	NAR	SC		P		CP	RS	level 1		x
<i>Buteo jamaicensis</i>	Red-tailed Hawk	G5	S5		NAR			P						x
<i>Agelaius phoeniceus</i>	Red-winged Blackbird	G5	S4										x	x
<i>Larus delawarensis</i>	Ring-billed Gull	G5	S5B,S4N						X					x
<i>Columba livia</i>	Rock Dove (Pigeon)	G5	SNA										x	x
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak	G5	S4B						X					x
<i>Buteo lagopus</i>	Rough Legged Hawk	G5	S1B,S4N		NAR		NAR	P						x
<i>Archilochus colubris</i>	Ruby-throated Hummingbird	G5	S5B						X	CP	RS	level 3		x
<i>Passerculus sandwichensis</i>	Savannah Sparrow	G5	S4B						X	CP		level 1	x	x
<i>Piranga olivacea</i>	Scarlet Tanager	G5	S4B						X	CP	RS	level 2		x
<i>Accipiter striatus</i>	Sharp-shinned Hawk	G5	S5		NAR			P		CP	RS	level 2		x
<i>Plectrophenax nivalis</i>	Snow Bunting	G5	SNA						X					x
<i>Chen caerulescens</i>	Snow Goose	G5	S5B						X					x
<i>Tringa solitaria</i>	Solitary Sandpiper	G5	S4B						X					x
<i>Melospiza melodia</i>	Song Sparrow	G5	S5B						X				x	x
<i>Actitis macularius</i>	Spotted Sandpiper	G5	S5						X	CP		level 3		x
<i>Melospiza georgiana</i>	Swamp Sparrow	G5	S5B						X	CP	RS	level 2		x
<i>Tachycineta bicolor</i>	Tree Swallow	G5	S4B						X				x	x
<i>Cygnus columbianus</i>	Tundra Swan	G5	S4						X					x
<i>Cathartes aura</i>	Turkey Vulture	G5	S5B					P		CP	RS	level 4		x
<i>Catharus fuscescens</i>	Veery	G5	S4B						X	CP	RS	level 2		x
<i>Poocetes gramineus</i>	Vesper Sparrow	G5	S4B						X	CP	RS	level 2		x
<i>Vireo gilvus</i>	Warbling Vireo	G5	S5B						X		RS			x
<i>Sturnella neglecta</i>	Western Meadowlark	G5	S3B						X	CP	RS	level 2		x
<i>Sitta carolinensis</i>	White-breasted Nuthatch	G5	S5						X					x
<i>Zonotrichia albicollis</i>	White-throated Sparrow	G5	S5B						X	CP				x

Scientific Name	Common Name	G-Rank	S-Rank	SARA Schedule	COSEWIC	SARA	SARO	FWCA	MBCA	GRCA	Waterloo Region	Priority Species Waterloo	OBBA 2001-2005	eBird (2020)
<i>Loxia leucoptera</i>	White-winged Crossbill	G5	S5B						X	CP	RS	level 1		x
<i>Meleagris gallopavo</i>	Wild Turkey	G5	S5					G						x
<i>Gallinago delicata</i>	Wilson's Snipe	G5	S5B							CP				x
<i>Troglodytes troglodytes</i>	Winter Wren	G5	S5B						X		RS	level 3		x
<i>Aix sponsa</i>	Wood Duck	G5	S5						X			level 4		x
<i>Helmitheros vermivorum</i>	Worm-eating Warbler	G5	SNA						X					x
<i>Dendroica petechia</i>	Yellow Warbler	G5	S5B						X				x	x
<i>Dendroica coronata</i>	Yellow-rumped Warbler	G5	S5B						X			level 3		x

Appendix A Wildlife List Definitions

G-Rank (Global Rank)

G1- extremely rare; usually 5 or fewer occurrences in the overall range or very few remaining individuals or because of some factor (s) making it especially vulnerable

G2-very rare; usually between 5-20 occurrences in the range or with many individuals in fewer occurrences or because of some factor (s) making it vulnerable to extinction

G3- rare to uncommon; usually between 20 and 100 occurrences; may have fewer occurrences but with a large number of individuals in some populations or may be susceptible to large-scale disturbances

G4-common; usually more than 100 occurrences, usually not susceptible to immediate threats

G5-very common; demonstrably secure under present conditions

S-Rank (Provincial Rank)

S1-critically imperiled; critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor (s)

such as very steep declines making it especially vulnerable to extirpation from the state/province

S2-imperiled; imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines

or other factors making it very vulnerable to extirpation from the nation or state/province

S3-vulnerable; vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines

or other factors making it vulnerable to extirpation

S4-apparently secure; uncommon but not rare; some cause for long-term concern due to declines or other factors

S5-secure; common, widespread and abundant in the nation or state/province

SNA- not applicable; a conservation status rank is not applicable because species is not a suitable target for conservation activities

SZB-breeding migrants/vagrants

SZN-non-breeding migrants/vagrants

COSEWIC (Committee on the Status of Endangered Wildlife in Canada)

NAR- not at risk; a wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances

THR-threatened; a wildlife species likely to become endangered if limiting factors are not reversed

END-endangered; a wildlife species facing imminent extirpation or extinction

EXT-extirpated; a species no longer existing in the wild in Canada but occurring elsewhere

SC-special concern; a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats

DD-data deficient; a wildlife species for which there is inadequate information to make a direct, or indirect, assessment of its risk of extinction

SARA (Species at Risk Act)

Schedule 1- official list of wildlife species at risk

THR-threatened; a wildlife species likely to become endangered if limiting factors are not reversed

END-endangered; a wildlife species facing imminent extirpation or extinction

EXT-extirpated; a species no longer existing in the wild in Canada but occurring elsewhere

SC-special concern; a wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats

SARO (Species at Risk in Ontario)

END-Endangered; a species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's ESA

EXP-Extirpated; a species that no longer exists in the wild in Ontario but exists elsewhere

THR-Threatened; a species that is at risk of becoming endangered in Ontario if limiting factors are not reversed

SC-Special Concern; a species with characteristics that make it sensitive to human activities or natural events

FWCA (Fish and Wildlife Conservation Act)

P - protected species

G - game species

F- Furbearing

MBCA (Migratory Birds Convention Act)

X - Migrant species with afforded protection

SWH-TG (Significant Wildlife Habitat Technical Guide, 2000)

Conservation Priority

level 1-highest priority

level 4-lowest priority

Grand River Conservation Authority

CP= Conservation Priority

Region of Waterloo

RS=Regionally Significant

APPENDIX C:
Lifecycle Cost Analysis



New Dundee Lifecycle Cost Estimate Summary

	Alternative 1	Alternative 2	Alternative 3
Division 1	\$ 390,000	\$ 390,000	\$ 390,000
Division 2	\$ 710,000	\$ 750,000	\$ 800,000
Division 3	\$ 610,000	\$ 610,000	\$ 610,000
Division 4	\$ 60,000	\$ 60,000	\$ 60,000
Division 5	\$ 60,000	\$ 60,000	\$ 60,000
Divisions 6 - 10	\$ 300,000	\$ 300,000	\$ 300,000
Division 11	\$ 1,060,000	\$ 1,060,000	\$ 1,060,000
Division 13	\$ 200,000	\$ 200,000	\$ 200,000
Division 15	\$ 600,000	\$ 600,000	\$ 600,000
Division 16	\$ 210,000	\$ 210,000	\$ 210,000
Div 1-16	\$ 4,200,000	\$ 4,240,000	\$ 4,290,000
Class D Cost Estimate Allowance (30%)	\$ 1,260,000	\$ 1,272,000	\$ 1,287,000
Construction Contingency (20%)	\$ 840,000	\$ 848,000	\$ 858,000
Property Acquisition	\$ 13,000	\$ 18,000	\$ 21,000
Capital Cost Estimate	\$ 6,320,000	\$ 6,380,000	\$ 6,460,000
Maintenance and Replacement Cost Estimate			
	\$ 210,000	\$ 210,000	\$ 210,000
Operating Cost Estimate			
	\$ 1,660,000	\$ 1,660,000	\$ 1,660,000
50-year Lifecycle Cost			
	\$ 8,190,000	\$ 8,250,000	\$ 8,330,000



Class EA Lifecycle Cost Estimate - Location Alternative No. 1

Capital Cost Estimate			
Division	Item Descriptions	Total Price	Notes & References
Division 1 - General Requirements	Bonds		
	Insurance		
	Contractor Markups		
	Mobilization and Demobilization		
	Temporary Facilities		
	Erosion and Sediment Control		
	Equipment Startup and Commissioning		
	Total Div. 1 Cost	\$ 390,000	10% Construction Cost subtotal
Division 2 - Site Works	General Requirements	\$ 70,000	
	Excavation of New Facility	\$ 60,000	Includes disposal fees if required.
	Backfilling	\$ 20,000	
	Shoring	\$ 90,000	
	Yard Piping	\$ 60,000	
	Duct Banks	\$ 10,000	
	Paving	\$ 40,000	
	Landscaping	\$ 50,000	
	Waterproofing Existing Facility (Condition Assessment Proj. No. 2)	\$ 180,000	
	Dewatering	\$ 100,000	
	Fencing	\$ 30,000	
	Total Div. 2 Cost	\$ 710,000	
Division 3 - Concrete	General Requirements	\$ 60,000	
	Concrete Works	\$ 550,000	
	Total Div. 3 Cost	\$ 610,000	
Division 4 - Masonry	General Requirements	\$ 10,000	
	Masonry - Structural	\$ 50,000	
	Total Div. 4 Cost	\$ 60,000	
Division 5 - Metals	General Requirements	\$ 10,000	
	Metal Works	\$ 50,000	
	Total Div. 5 Cost	\$ 60,000	
Division 6 - 10 Architectural Works	General Requirements	\$ 30,000	
	Architectural Works	\$ 270,000	
	Total Div. 6 10 Cost	\$ 300,000	
Division 11 - Equipment	General Requirements	\$ 100,000	
	Pumps (Supernatant, Backwash Supply, Solids Handling)	\$ 130,000	
	Pressure Filters	\$ 800,000	
	Sodium Hypochlorite System and Tank	\$ 30,000	
	Total Div. 11 Cost	\$ 1,060,000	
Division 13 - Instrumentation	General Requirements	\$ 20,000	
	Instrumentation and Control Costs	\$ 180,000	
	Total Div. 13 Cost	\$ 200,000	
Division 15 - Mechanical	General Requirements	\$ 60,000	
	HVAC	\$ 210,000	
	Plumbing	\$ 50,000	
	Process Piping at Existing System (Condition Assessment Proj. No. 3)	\$ 160,000	
	Process Piping and Valving at New System	\$ 120,000	
	Total Div. 15 Cost	\$ 600,000	
Division 16 - Electrical	General Requirements	\$ 20,000	
	Electrical Equipment	\$ 190,000	
	Total Div. 16 Cost	\$ 210,000	
	Sub-Total Construction Cost (Div 2 - 16)	\$ 3,810,000	
	Sub-Total Construction Cost (Div 1 - 16)	\$ 4,200,000	
	Class D Cost Estimate (30%)	\$ 1,260,000	
	Construction Contingency Allowance (20%)	\$ 840,000	
	Property Acquisition	\$ 13,000	From RoW Real Estate team, 70K/acre
	Sub-Total Capital Cost, including Contingency	\$ 6,320,000	

Highlighted cells represent changes in costs between Location Alternatives.

Subtotal Capital Cost, including Contingency	\$ 6,320,000
Subtotal Maintenance and Replacement Cost	\$ 210,000
Subtotal Operations Cost	\$ 1,660,000
50-year Lifecycle Cost	\$ 8,190,000.00



Class EA Lifecycle Cost Estimate - Location Alternative No. 2

Capital Cost Estimate			
Division	Item Descriptions	Total Price	Notes & References
Division 1 - General Requirements	Bonds		
	Insurance		
	Contractor Markups		
	Mobilization and Demobilization		
	Temporary Facilities		
	Erosion and Sediment Control		
	Equipment Startup and Commissioning		
	Total Div. 1 Cost	\$ 390,000	10% Construction Cost subtotal
Division 2 - Site Works	General Requirements	\$ 70,000	
	Excavation of New Facility	\$ 60,000	Includes disposal fees if required.
	Backfilling	\$ 20,000	
	Shoring	\$ 90,000	
	Yard Piping	\$ 60,000	
	Duct Banks	\$ 10,000	
	Paving	\$ 70,000	
	Landscaping	\$ 50,000	
	Waterproofing Existing Facility (Condition Assessment Proj. No. 2)	\$ 180,000	
	Dewatering	\$ 100,000	
Fencing	\$ 40,000		
	Total Div. 2 Cost	\$ 750,000	
Division 3 - Concrete	General Requirements	\$ 60,000	
	Concrete Works	\$ 550,000	
	Total Div. 3 Cost	\$ 610,000	
Division 4 - Masonry	General Requirements	\$ 10,000	
	Masonry - Structural	\$ 50,000	
	Total Div. 4 Cost	\$ 60,000	
Division 5 - Metals	General Requirements	\$ 10,000	
	Metal Works	\$ 50,000	
	Total Div. 5 Cost	\$ 60,000	
Division 6 - 10 Architectural Works	General Requirements	\$ 30,000	
	Architectural Works	\$ 270,000	
	Total Div. 6 10 Cost	\$ 300,000	
Division 11 - Equipment	General Requirements	\$ 100,000	
	Pumps (Supernatant, Backwash Supply, Solids Handling)	\$ 130,000	
	Pressure Filters	\$ 800,000	
	Sodium Hypochlorite System and Tank	\$ 30,000	
	Total Div. 11 Cost	\$ 1,060,000	
Division 13 - Instrumentation	General Requirements	\$ 20,000	
	Instrumentation and Control Costs	\$ 180,000	
	Total Div. 13 Cost	\$ 200,000	
Division 15 - Mechanical	General Requirements	\$ 60,000	
	HVAC	\$ 210,000	
	Plumbing	\$ 50,000	
	Process Piping at Existing System (Condition Assessment Proj. No. 3)	\$ 160,000	
	Process Piping and Valving at New System	\$ 120,000	
	Total Div. 15 Cost	\$ 600,000	
Division 16 - Electrical	General Requirements	\$ 20,000	
	Electrical Equipment	\$ 190,000	
	Total Div. 16 Cost	\$ 210,000	
	Sub-Total Construction Cost (Div 2 - 16)	\$ 3,850,000	
	Sub-Total Construction Cost (Div 1 - 16)	\$ 4,240,000	
	Class D Cost Estimate (30%)	\$ 1,272,000	
	Construction Contingency Allowance (20%)	\$ 848,000	
	Property Acquisition	\$ 18,000	From RoW Real Estate team, 70K/acre
	Sub-Total Capital Cost, including Contingency	\$ 6,380,000	

Highlighted cells represent changes in costs between Location Alternatives.

Subtotal Capital Cost, including Contingency	\$ 6,380,000
Subtotal Maintenance and Replacement Cost	\$ 210,000
Subtotal Operations Cost	\$ 1,660,000
50-year Lifecycle Cost	\$ 8,250,000.00



Class EA Lifecycle Cost Estimate - Location Alternative No. 3

Capital Cost Estimate			
Division	Item Descriptions	Total Price	Notes & References
Division 1 - General Requirements	Bonds		
	Insurance		
	Contractor Markups		
	Mobilization and Demobilization		
	Temporary Facilities		
	Erosion and Sediment Control		
	Equipment Startup and Commissioning		
	Total Div. 1 Cost	\$ 390,000	10% Construction Cost subtotal
Division 2 - Site Works	General Requirements	\$ 72,000	
	Excavation of New Facility	\$ 60,000	Includes disposal fees if required.
	Backfilling	\$ 20,000	
	Shoring	\$ 90,000	
	Yard Piping	\$ 80,000	
	Duct Banks	\$ 30,000	
	Paving	\$ 40,000	
	Landscaping	\$ 50,000	
	Waterproofing Existing Facility (Condition Assessment Proj. No. 2)	\$ 180,000	
	Dewatering	\$ 100,000	
	Fencing	\$ 70,000	
	Total Div. 2 Cost	\$ 800,000	
Division 3 - Concrete	General Requirements	\$ 60,000	
	Concrete Works	\$ 550,000	
	Total Div. 3 Cost	\$ 610,000	
Division 4 - Masonry	General Requirements	\$ 10,000	
	Masonry - Structural	\$ 50,000	
	Total Div. 4 Cost	\$ 60,000	
Division 5 - Metals	General Requirements	\$ 10,000	
	Metal Works	\$ 50,000	
	Total Div. 5 Cost	\$ 60,000	
Division 6 - 10 Architectural Works	General Requirements	\$ 30,000	
	Architectural Works	\$ 270,000	
	Total Div. 6 10 Cost	\$ 300,000	
Division 11 - Equipment	General Requirements	\$ 100,000	
	Pumps (Supernatant, Backwash Supply, Solids Handling)	\$ 130,000	
	Pressure Filters	\$ 800,000	
	Sodium Hypochlorite System and Tank	\$ 30,000	
	Total Div. 11 Cost	\$ 1,060,000	
Division 13 - Instrumentation	General Requirements	\$ 20,000	
	Instrumentation and Control Costs	\$ 180,000	
	Total Div. 13 Cost	\$ 200,000	
Division 15 - Mechanical	General Requirements	\$ 60,000	
	HVAC	\$ 210,000	
	Plumbing	\$ 50,000	
	Process Piping at Existing System (Condition Assessment Proj. No. 3)	\$ 160,000	
	Process Piping and Valving at New System	\$ 120,000	
	Total Div. 15 Cost	\$ 600,000	
Division 16 - Electrical	General Requirements	\$ 20,000	
	Electrical Equipment	\$ 190,000	
	Total Div. 16 Cost	\$ 210,000	
	Sub-Total Construction Cost (Div 2 - 16)	\$ 3,900,000	
	Sub-Total Construction Cost (Div 1 - 16)	\$ 4,290,000	
	Class D Cost Estimate (30%)	\$ 1,287,000	
	Construction Contingency Allowance (20%)	\$ 858,000	
	Property Acquisition	\$ 21,000	From RoW Real Estate team, 70K/acre
	Sub-Total Capital Cost, including Contingency	\$ 6,460,000	

Highlighted cells represent changes in costs between Location Alternatives.

Subtotal Capital Cost, including Contingency	\$ 6,460,000
Subtotal Maintenance and Replacement Cost	\$ 210,000
Subtotal Operations Cost	\$ 1,660,000
50-year Lifecycle Cost	\$ 8,330,000.00



Class EA Lifecycle Cost Estimate - Operating and Maintenance Costs

Maintenance and Replacement Cost Estimate						
Item No.	Item Description	Present Day Cost	Years to Perform	Discount Rate	Total Price	Notes & References
	Watermain Repair / Replacement	\$ 10,000	20	4%	\$ 5,000	
	Watermain Repair / Replacement	\$ 10,000	40	4%	\$ 3,000	
	Process Valve Replacement	\$ 120,000	25	4%	\$ 46,000	Assume all valving and piping is replaced over the 50 years, realized at 25 years.
	Process Pump Replacement	\$ 130,000	30	4%	\$ 41,000	Assume all pumps are replaced after 30 years.
	Replace Media Every 10 Years	\$ 29,000.00	10	4%	\$ 20,000	
	Replace Media Every 10 Years	\$ 29,000.00	20	4%	\$ 14,000	
	Replace Media Every 10 Years	\$ 29,000.00	30	4%	\$ 9,000	
	Replace Media Every 10 Years	\$ 29,000.00	40	4%	\$ 7,000	
	Replace Media Every 10 Years	\$ 29,000.00	50	4%	\$ 5,000	
	Filter Underdrain Replacement	\$ 90,000.0	20	4%	\$ 37,000	
	Filter Underdrain Replacement	\$ 80,000.0	40	4%	\$ 17,000	
	Sub-Total Maintenance and Replacement Cost				\$ 210,000	

Operating Cost Estimate								
Item No.	Item Description	Unit	Quantity	Price per Unit	Yearly Cost	Discount Rate	Present Cost of 50 Years	Notes & Reference
1.1	Energy Consumption - Backwash Pump	kWhr/yr	167	\$ 0.17	\$ 28	4%	\$ 1,000	109.5 m ³ /hr, 5 m TDH, 2.5 kW, 11 minute runs, two runs / 2 days. Electrical price per Waterloo North Hydro rates, November 2021.
1.2	Energy Consumption - Backwash Air Blowers	kWhr/yr	681	\$ 0.17	\$ 116	4%	\$ 3,000	7.5 kW, 15 minute runs, two runs / 2 days. Electrical price per Waterloo North Hydro rates, November 2021.
1.3	Energy Consumption - Supernatant Recirculation Pumps	kWhr/yr	1139	\$ 0.17	\$ 194	4%	\$ 5,000	12.9 m ³ /hr, 12 hrs/day, 20 m TDH, 0.28 kW. Electrical price per Waterloo North Hydro rates, November 2021.
1.4	Energy Consumption - Settled Solids Handling Pumps	kWhr/yr	1.1	\$ 0.17	\$ 0.18	4%	\$ 100	18 m ³ /hr, 3 hrs/year, 5 m TDH, 0.35 kW. Electrical price per Waterloo North Hydro rates, November 2021.
2.1	Energy Consumption- HVAC for Filter Room	\$/m ³ /year	168	\$ 160	\$ 26,880	4%	\$ 578,000	\$80/m ³ /year if there is nat. gas, and \$160/m ³ /year without.
2.2	Energy Consumption - HVAC for Chemical Rooms	\$/m ³ /year	12	\$ 190	\$ 2,280	4%	\$ 49,000	
3.1	Operation & Maintenance Labour	hr/year	416	\$ 100.00	\$ 41,600	4%	\$ 894,000	8 hrs/week to maintain system
3.2	Haulage Costs	\$/hr	20	\$ 300.00	\$ 6,000	4%	\$ 129,000	5 trips/year, 4 hours per trip. Based on 2020 Hydrovac trucking rates.
	Sub-Total Annual Operations Cost						\$ 1,660,000	