

Appendix A

Knox Farm Suitability Report



Utilities Kingston

Knox Farm Suitability Report

Final

April 2023 - 22-4641

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Introduction

1.1

Background

Utilities Kingston operates three Wastewater Treatment Plants (WWTPs), Ravensview WWTP, Cataraqui Bay WWTP, and Cana WWTP, which are owned by the City of Kingston. Sludge is managed at two of the Ravensview and Cataraqui Bay WWTPs by on-site anaerobic digestion, dewatering of stabilized biosolids, and on-site storage until ultimate land application disposal. Sludge from the Cana WWTP is currently transported to the Ravensview WWTP for processing.

After digester expansion and upgrades were deferred for the Cataraqui Bay WWTP, and considering initiatives to generate “green energy” and reduce greenhouse gases, Utilities Kingston completed a 2020 *Master Plan for Enhanced Biosolids Management and Biogas Utilization* (the “Master Plan”) to review its long-term approach to biosolids management at all WWTPs. Consideration was also given to co-digest biosolids with Source Separated Organics (i.e., Green Bin materials or SSO) as a future management approach.

The Master Plan assessed five alternatives:

- Alternative 1 – Do nothing;
- Alternative 2 – Optimize Infrastructure at Cataraqui Bay;
- Alternative 3 – Optimize Infrastructure at Ravensview;
- Alternative 4 – Incorporate SSO at Cataraqui Bay; and,
- Alternative 5 – Integrate Processing of Biosolids and SSO at Knox Farm.

Based on the assessment, Alternative 5 was selected as the preferred alternative. This alternative involved the development of an integrated biosolids and SSO processing facility at a greenfield development site. The opportunity site for consideration was recommended within the property boundary of Knox Farm and assumed that additional organic feedstocks (i.e. beyond UK and City managed organics) would be acquired in order to maximize biogas production and benefit from the resultant greenhouse gas emission reductions.

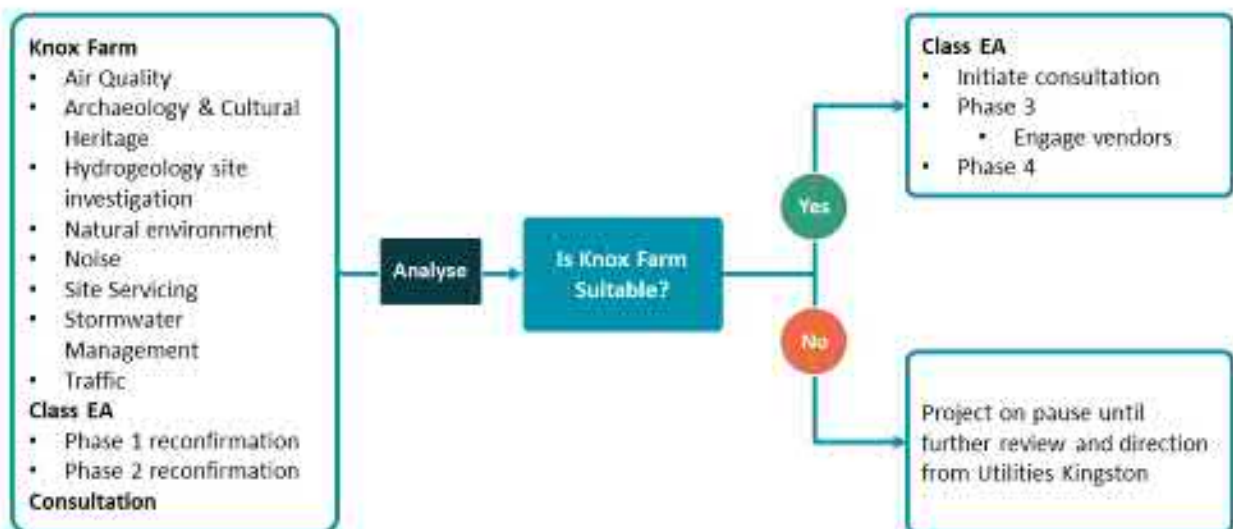
The reconfirmation of the previously identified preferred solution is captured under separate cover (Dillon, 2022; Phase 1 and 2 Reconfirmation: Problem/Opportunity Statement and Screening Process and Results Memo).

1.2 Report Purpose

Dillon Consulting Limited (Dillon) has been retained by Utilities Kingston to assess the feasibility of constructing an integrated biosolids and SSO processing facility (the Facility) at Knox Farm (**Figure 1**). The Project will follow the Municipal Class Environmental Assessment (MCEA) process as a Schedule "C" project and build upon work completed to date, including the Master Plan.

An important milestone of the Project is to conduct a detailed assessment of the Knox Farm property to determine if it is likely as a suitable site for the intended use. A number of technical assessments were completed (**Figure 2**), and the results of the assessment are documented in this report.

Figure 2: Knox Farm Suitability Assessment Process





UTILITIES KINGSTON

KINGSTON REGIONAL BIOSOLIDS AND BIOGAS FACILITY

PROJECT STUDY AREA

FIGURE 1

- Property Boundary
- Proposed Site Location
- Trail
- Road
- Contour (10m)
- City of Kingston, 2022
- Watercourse
- Waterbody

SCALE 1:8,000

0 200 400 m



MAP DRAWING INFORMATION: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
DATA PROVIDED BY: DILLON CONSULTING LIMITED, MNRF, UTILITIES KINGSTON, CITY OF KINGSTON

MAP CREATED BY: RS/SPS
MAP CHECKED BY: JW
MAP PROJECTION: NAD 1983 CGRS UTM Zone 18N



PROJECT: 22-0641
STATUS: DRAFT
DATE: 2022-11-09

It is understood that should Knox Farm be deemed unsuitable; the Project will be paused until Utilities Kingston has an opportunity to confirm the project direction.

This report provides an overview of the methodology and findings of each discipline's respective technical assessment of the suitability of Knox Farm, as well as a summary and recommended next steps for the Project.

1.3 Proposed Site Location

The proposed site location of the Facility is at Knox Farm, a municipally-owned property and greenfield development site located in the City of Kingston (**Figure 1**). The proposed site is north of Highway 401, with frontage to the west side of Perth Road and south of Little Cataraqui Creek Conservation Area and the Cataraqui Region Conservation Authority (CRCA). Knox Farm covers nearly 75 hectares (ha) of land, of which approximately 9.3 ha is a former dewatering facility that previously held an Environmental Compliance Approval (ECA) and is now decommissioned. A portion of the property is currently in use as a snow management facility. The proposed site location is located outside of the City of Kingston's Urban Boundary.

1.3.1 Land Use Designations and Existing Conditions

Knox Farm is identified in **Figure 1** and has a total property area of 75 ha, with the proposed location comprising 9.3 ha of the Property (i.e., "Proposed Site Location").

It is noted that the Knox Farm property (identified as "Property Boundary" in **Figure 1**) is subject to policies at the municipal and provincial levels, including but not limited to the Provincial Policy Statement (PPS) (PPS; Ministry of Municipal Affairs and Housing (MMAH), 2020) and the City of Kingston Official Plan (City of Kingston, 2010; consolidated 2021). An overview of these policies is outlined below.

1.3.1.1 Policy Overview

Provincial Policy Statement (PPS)

The PPS (MMAH, 2020) provides overall policy directions on matters of provincial interest related to land use and development in Ontario and applies to the City of Kingston. The PPS requires planning authorities to plan for, protect and preserve natural resources, public health and safety, employment areas, and the quality of the built

environment for current and future uses. Section 1.6 of the PPS (Infrastructure and Public Service Facilities) includes the policies related to the proposed Facility.

The proposed Facility is, at a minimum, intended to accommodate solid waste from two sources that the City of Kingston manages and to generate a renewable energy source (i.e., biogas). There is a potential that additional sources of organic material could be processed at the Facility. Due to the intended purpose of the proposed Facility, it may be subject to multiple sub-sections under Section 1.6 of the PPS.

Section 1.6.10 of the PPS (Waste Management), includes the following relevant policies:

- *Waste management systems need to be provided that are of an appropriate size and type to accommodate present and future requirements, and facilitate, encourage and promote reduction, reuse and recycling objectives.*
- *Waste management systems shall be located and designed in accordance with provincial legislation and standards (PPS, MMAH).*

Section 1.6.11 of the PPS (Energy Supply), includes the following relevant policies:

- *Planning authorities should provide opportunities for the development of energy supply including electricity generation facilities and transmission and distribution systems, district energy, and renewable energy systems and alternative energy systems, to accommodate current and projected needs (PPS, MMAH).*

City of Kingston Official Plan¹

The City of Kingston Official Plan identifies the City's land use planning goals and policies that "guide physical development, protection of natural and cultural heritage, resource management, and necessary supporting infrastructure" (City of Kingston, 2023a). The Official Plan is intended to guide development in the City until 2036 and provides the framework for the City's zoning bylaw. The Official Plan came into effect in January 2010 and is reviewed every five years in accordance with the requirements of the *Planning Act*. Official Plan Amendment Number 50 (five-year update of the Official Plan) came into effect on August 29, 2017. The Official Plan was consolidated on December 1, 2022,

¹ Note: Review of the City of Kingston Official Plan as of February 2023.

and includes all approvals and modifications made to the Official Plan after it came into effect, up to and including November 30, 2022 (City of Kingston, 2023a).

The Official Plan identifies Open Space areas “designated on Schedule 3 [to] include public parks, private open space areas, natural reserves, and lands adjacent to the Environmental Protection Area designation” (City of Kingston, 2022).

The proposed Facility may not be captured under the Permitted Uses for this land use designation. Section 3.8.10 of the Official Plan indicates that “Conversion of open space to a use other than a permitted open space use requires an amendment to [the] Plan, to be considered in accordance with the relevant policies of [the] Plan” and matters including:

- *The role and function of any adjacent open space area;*
- *The appropriate Plan policies relating to municipal parks and connections with trail systems;*
- *Where the subject lands are adjacent to an Environmental Protection Area, the relationship between the open space and the Environmental Protection Area designation will be assessed in terms of:*
 - *The potential impact of the development on any natural heritage features and areas;*
 - *Any measures proposed to ensure no negative impacts; and,*
 - *The extent to which natural heritage features and areas are retained and enhanced by the proposal upon review of an environmental impact assessment as required under Section 6 of [the] Plan*
- The compatibility of the proposed use relative to the neighbouring uses (City of Kingston, 2022).²

1.3.1.2

Knox Farm Land Uses

Schedule 3-B of the Official Plan identifies the land use designations within the entire Knox Farm property (i.e., “Property Boundary”) to include Rural Lands, Open Space and Environmental Protection Area (EPA). The following sections provide an overview of the

² Note: This is not an exhaustive list of matters listed under Section 3.8.10 of the City of Kingston Official Plan.

land use designations and policies from the Official Plan for specific areas within the Property Boundary.

Proposed Site Location

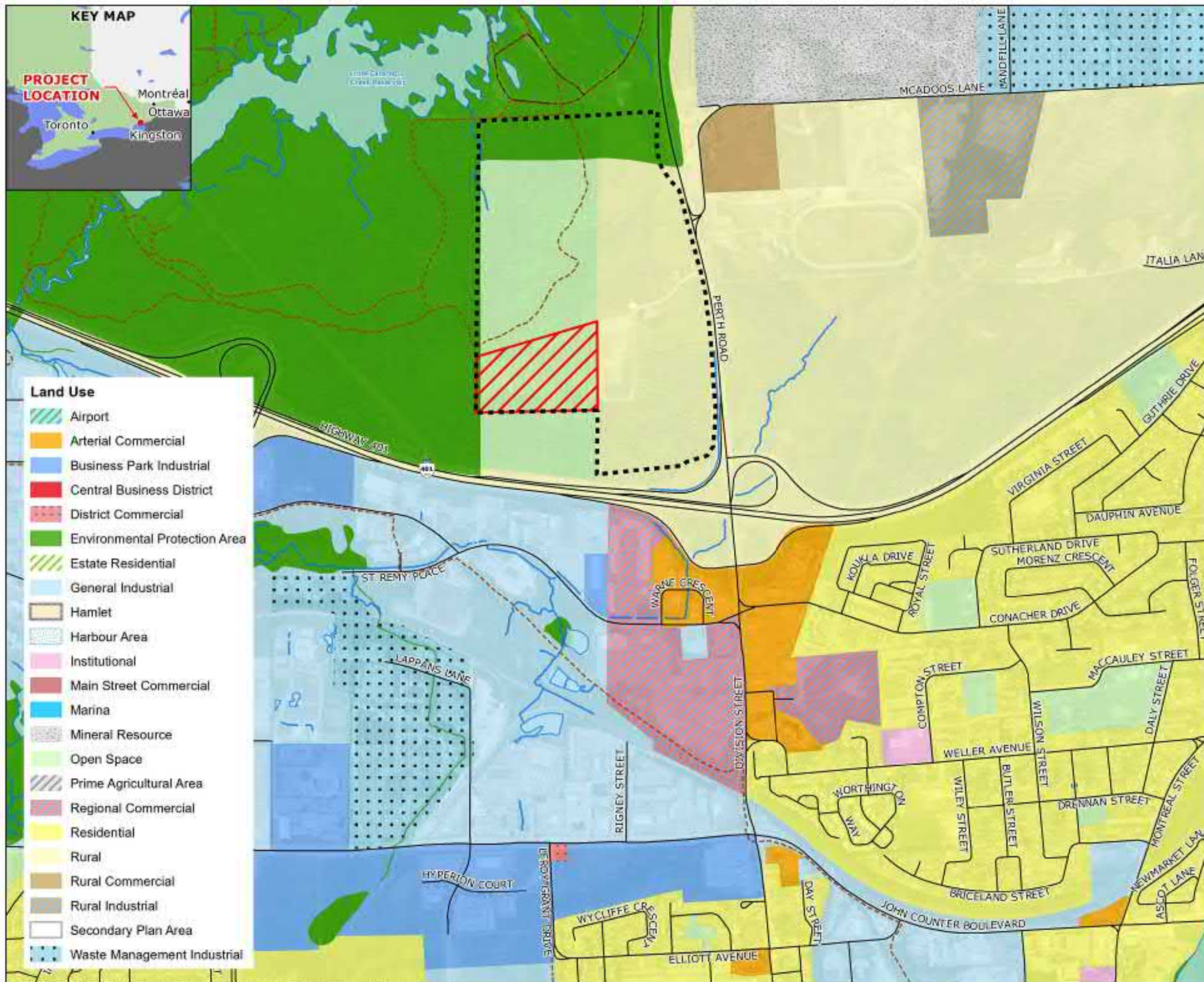
The Proposed Site Location is in the south-western section of the Property Boundary (**Figure 1**) and was part of the former sediment dewatering areas for the City of Kingston's Cataraqui River Dredged Material Storage and Dewatering Facility. The Proposed Site Location is currently vacant.

Schedule 3-B of the City of Kingston Official Plan designates the Proposed Site Location as Open Space, with a slim section along the western boundary designated as EPA, and a slim section along the eastern boundary designated as Rural (**Figure 3**).

The policies under Section 6 of the Official Plan provides guidance "with respect to the protection of environmental quality within the City's natural heritage system" (City of Kingston, 2022). Relevant policies from this section include (but are not limited to) the following:

- Section 6.1.1 notes that the City will direct development away from natural heritage features and areas. The City will also regulate the land use and development within adjacent lands to natural heritage features and areas. Environmental impact assessments may be required to demonstrate that development and land use change will not result in negative impacts (City of Kingston, 2022);
- Section 6.1.8 (Adjacent Lands) includes policies which do not permit development and site alteration on adjacent lands to Natural Heritage "A" and "B" features. Natural Heritage "A" areas are designated as Environmental Protection Areas on Land Use Schedule 3 and the secondary plan Land Use Schedules in the Official Plan. Natural "A" features include Areas of Natural and Scientific Interest (ANSIs), fish habitat, provincially significant wetlands, locally significant wetlands, rivers, streams and riparian corridors.³ Natural Heritage "B" features include significant woodlands, significant wildlife habitat, significant valleylands, linkages and

³ Natural Heritage "A" features are identified under Section 6.1.2 of the City of Kingston Official Plan and are shown in Schedule 7. The Project Study Area is captured in Schedule 7B: https://www.cityofkingston.ca/documents/10180/541790/OfficialPlan_Schedule7B.pdf/33f0baea-8410-4e3d-bf65-7b3c1eee1d42



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LAND USE DESIGNATION

FIGURE 3

- Property Boundary
- Proposed Site Location
- Trail
- Road
- City of Kingston, 2022
- Watercourse
- Waterbody

SCALE 1:12,000

0 300 600 m



MAP DRAWING INFORMATION Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
DATA PROVIDED BY: DILLON CONSULTING LIMITED, MNRF, UTILITIES KINGSTON, CITY OF KINGSTON.

MAP CREATED BY: BK
MAP CHECKED BY: SG
MAP PROJECTION: NAD 1983 CGRS UTM Zone 18N



PROJECT: 22-0641
STATUS: DRAFT
DATE: 2023-02-23

- corridors, and unevaluated wetlands.⁴ The Proposed Site Location is adjacent to these features and requires demonstration that there will be no negative impacts on the natural heritage features and areas or ecological functions. Consultation with the appropriate authorities in accordance with the policies of the Official Plan is also required (Sections 6.1.8 and 6.1.9) (City of Kingston, 2022);
- The policies in Section 6.2 (Energy Conservation and Production) of the Official Plan are supportive of the Kingston Climate Action Plan (adopted in 2014) and the Kingston Community Energy Plan. This section references renewable energy systems, and its general policies promote the design and orientation of development that:
 - *Explores opportunities for renewable energy systems on a site-specific or district-wide basis; and,*
 - *Enhances the feasibility of district energy* (City of Kingston, 2022).⁵

As noted above, a slim section of the Proposed Site Location is designated as EPA (City of Kingston, 2022). EPA is also to the north/northwest of the Proposed Site Location (**Figure 3**). The EPA designation includes the following natural features and areas:

- *Areas of natural and scientific interest (ANSIs)*
- *Fish habitat*
- *Provincially significant wetlands, significant coastal wetlands and locally significant wetlands*
- *Rivers, streams and small inland lake systems* (City of Kingston, 2022a).

Schedule 7-B of the Official Plan identifies the land within the Proposed Site Location as ANSI. Outside of the Proposed Site Location, the land is identified as ANSI and PSW (City of Kingston, 2022a). As per Section 3.10.4, consultation with the Cataraqui Region Conservation Authority (CRCA) or the Ministry of Natural Resources and Forestry (MNRF) (as appropriate) may be required to determine the more specific delineation of the EPA boundary as the boundaries are an approximation (City of Kingston, 2022a) and the EPA could fall further within the Proposed Site Location. The boundaries of the EPA

⁴ Natural Heritage "B" features are identified under Section 6.1.3 of the City of Kingston Official Plan and are shown in Schedule 8. The Project Study Area is captured in Schedule 8B: https://www.cityofkingston.ca/documents/10180/541790/OfficialPlan_Schedule8B.pdf/528af114-c31c-4e44-a7cf-4fcc59833304

⁵ Note: This is not an exhaustive list of policies captured under Section 6.2.1 of the City of Kingston Official Plan.

may be adjusted in review by the City in consultation with MNRF and CRCA as appropriate. To support a minor boundary adjustment, an environmental impact assessment may be required (City of Kingston, 2022a).

Permitted uses in the EPA are limited to uses related to conservation, flood protection or open space and must be approved by the CRCA, MNRF and/or Parks Canada, as appropriate (City of Kingston, 2022a). Other potential permitted uses included new public or private works or utilities (e.g. roads, bridges, pipelines) “where such facilities are not feasible outside of the Environmental Protection Area” (Section 3.10.3; City of Kingston, 2022a).

Section 3.10.9 of the Official Plan notes that any proposal for development or site alteration within an EPA designation will generally be subject Ontario Regulation 148/06: Development, Interference with Wetlands, and Alterations to Shorelines and Watercourses (City of Kingston, 2022a).

Section 10.11 of the Official Plan indicates that applications for development in an EPA and/or adjacent to an EPA is “required to submit an environmental impact assessment in accordance with the policies of Section 6” (City of Kingston, 2022a).

The land immediately east of the Proposed Site Location currently serves as a snow storage facility managed by the City of Kingston. The area remains largely vacant and covered by meadow. This area is designated as Rural Lands and a slim section of the eastern extent of the Proposed Site Location falls within this designation. The Rural Lands are not identified as Prime Agricultural Area. Section 3.12 of the Official Plan notes that:

“Rural Lands designated on Schedule 3 reflects areas of the City outside of the Urban Boundary that generally have Classes 5, 6, and 7 soils with less suitability to sustain viable agriculture and existing non-farm development that may limit the future of intensive farm activity. There are small areas of high capability farmland, existing livestock operations as well as other uses that are designated Rural Lands” (City of Kingston, 2022a).

Section 3.12.2 of the Official Plan indicates that limited non-farm growth is permitted in the Rural Lands if it does not limit or interfere with agricultural-related uses, agricultural

use, on-farm diversified uses or a broader range of rural uses, and if it meets the environmental objectives of the Official Plan (City of Kingston, 2022a).

1.3.1.3

Adjacent Land Uses

The Little Cataraqui Creek Conservation Area surrounds the Property Boundary to the south, west and north. The Little Cataraqui Creek Conservation Area also contains the Little Cataraqui Creek Reservoir, natural wooded areas, the CRCA administrative office, and recreational trails, one of which (Reservoir Trail) crosses through the northern portion of the Property Boundary.

The Macdonald-Cartier Freeway (Highway 401) runs south of the Property Boundary and intersects with Perth Road and Division Street. A Canadian National Railway Line runs south of Highway 401.

Lands south of the Property Boundary are within the City of Kingston's urban boundary and consists of General Industrial, Business Park Industrial, Regional Commercial, Arterial Commercial, Environmental Protection Area, Institutional, Waste Management Industrial, Residential and Open Space (**Figure 3**). The sensitive receptors are predominately located south of the Property Boundary and include:

- A high school (École secondaire catholique Marie-Rivier);
- Residential properties; and,
- Hotels (approximately four).

The high school is located off of Sir. John A. Macdonald Boulevard and is approximately 1.2 kilometres (km) southwest of the Proposed Site Location. Residential properties located off of Division Street are approximately 1.15 km southeast of the Proposed Site Location. The majority of residential properties are apartments (City of Kingston, 2022b). Approximately eight townhomes are located along Conacher Drive. The lot behind these townhomes currently have Building Permits identified for the construction of several other townhouses with multiple units (City of Kingston, 2022c). Several hotels are located south of Highway 401 and are approximately 0.5 km to 0.9 km from the Proposed Site Location.

Other land use designations surrounding the Property Boundary include:

- A Hamlet (Sunnyside) is located to the west;

- Estate Residential and Open Space designated lands are located to the north;
- Mineral Resource, Rural Commercial, Waste Management Area, Rural Lands, and Rural Industrial designated lands are located to the east (e.g., crushed stone supplier, used car dealer, concrete contractor, service companies, waste management service, trucking company/accessory store);
- A waterbody (Little Cataraqui Creek Reservoir) is located to the northwest; and,
- A Trans-Northern Pipeline is located north/northwest of the Property Boundary and carries refined petroleum products (Canada Energy Regulator, 2022).

1.3.1.4 Kingston Zoning Bylaw Number 2022-62

The Kingston Zoning Bylaw 2022-62 was enacted on April 26, 2022, and regulates “the use of lands and the size and location of buildings for almost all properties in the City of Kingston (all properties except those identified as “Not Subject to this By-law”) (City of Kingston, n.d.). The land within the Property Boundary includes EPA Zone and General Rural Area Zone (**Figure 4**).

A portion of the Proposed Site Location is in an EPA Zone under the Zoning Bylaw (City of Kingston, 2022d). A slim section of the eastern portion of the Proposed Site Location appears to fall within a General Rural Area Zone. Section 19 of the Zoning Bylaw indicates that “no use, building or any part of a private sewage system is permitted in the EPA Zone” and identifies the excepted uses, including “new public or private works or utilities such as pipelines, roads, bridges or parking areas, where such facilities are not feasible outside of the Environmental Protection Area” (City of Kingston, 2022e). Section 4.9.1 (Uses Permitted in all Zones) restricts the development of the identified uses (including municipal infrastructure, electricity generation facilities and public utility installations required by any public authority or private utility) for the EPA Zone (City of Kingston, 2022e). A Zoning Bylaw amendment may be required if the Facility is built in the EPA Zone.

The snow management facility is within a General Rural Area Zone, and as mentioned above, a slim section of the eastern portion of the Proposed Site Location also appears to fall within this zone (City of Kingston, 2022d). Based on Section 4.9.1 of the Zoning Bylaw, the proposed Facility may be permitted in the General Rural Area Zone (City of Kingston, 2022e).

1.3.2 Source Water Protection

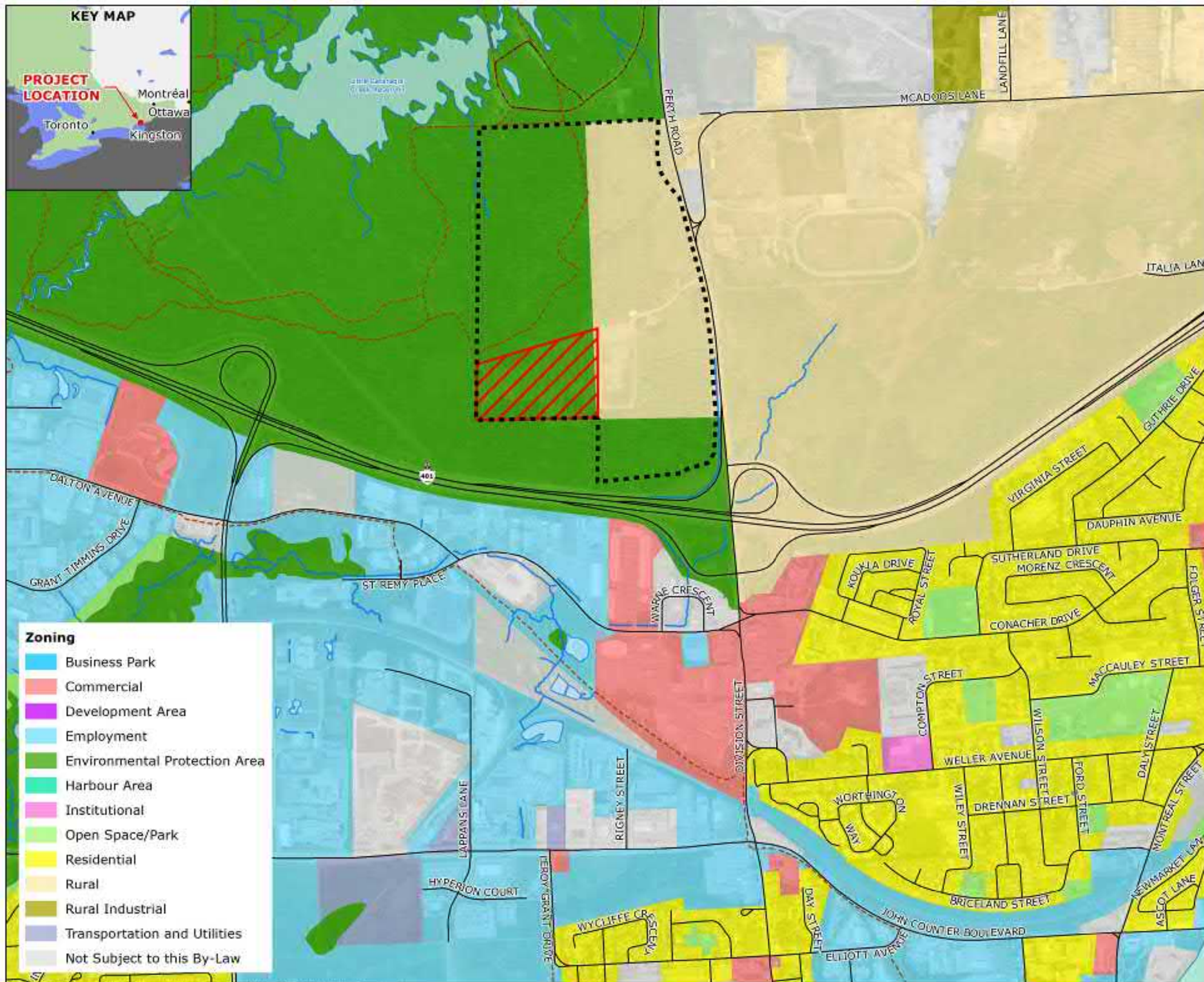
The Study Area falls within the Cataraqui Source Protection Area (SPA) and, as identified in Schedule 11B of the Official Plan (**Figure 5**), is located in a Highly Vulnerable Aquifer (HVA) and Significant Groundwater Recharge Area (SGRA).

Section 5.A.5 of the Official Plan (under Source Water Protection), indicates that new developments that constitute a drinking water threat within an HVA and SGRA “may be required to incorporate measures to adequately mitigate and manage any risk to source water” to the satisfaction of the City in consultation with the Cataraqui Source Protection Authority (City of Kingston, 2022a). Risk management measures would generally include strategies or works to minimize or mitigate water quality impacts to groundwater. The policies in the Official Plan are consistent with the intent of the policies included in the Cataraqui Source Protection Plan (SPP); however, the SPP must be referenced for clarification and policy detail.

The Study Area is located on an inferred karst formation of unstable bedrock (**Figure 6**) and the SPP policies indicate that developments or certain activities (e.g., waste hauling, snow storage) occurring on surface karst topography formations should have a karst assessment performed to determine if any additional risk management measures are required (CRCA, 2015; CRCA, n.d.).

1.3.3 Land Use Considerations

It is noted that the review of the Official Plan was limited to a high level land use review. As part of the future Class EA for the site, further consideration and review of the City of Kingston’s policies, including the Official Plan, Kingston Climate Action Plan and Kingston Community Energy Plan are recommended for the proposed location of the Facility to help inform the evaluation of alternatives and associated impact assessments. An overview of the recommendations are included in **Table 22**.

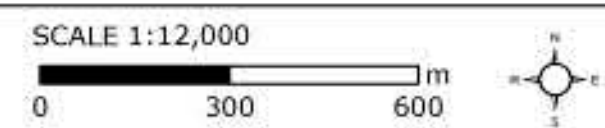


UTILITIES KINGSTON **KINGSTON REGIONAL BIOSOLIDS** **AND BIOGAS FACILITY**

ZONING **FIGURE 4**

- Property Boundary
- Proposed Site Location
- Trail
- Road
- City of Kingston, 2022**
- Watercourse
- Waterbody

- Zoning**
- Business Park
 - Commercial
 - Development Area
 - Employment
 - Environmental Protection Area
 - Harbour Area
 - Institutional
 - Open Space/Park
 - Residential
 - Rural
 - Rural Industrial
 - Transportation and Utilities
 - Not Subject to this By-Law

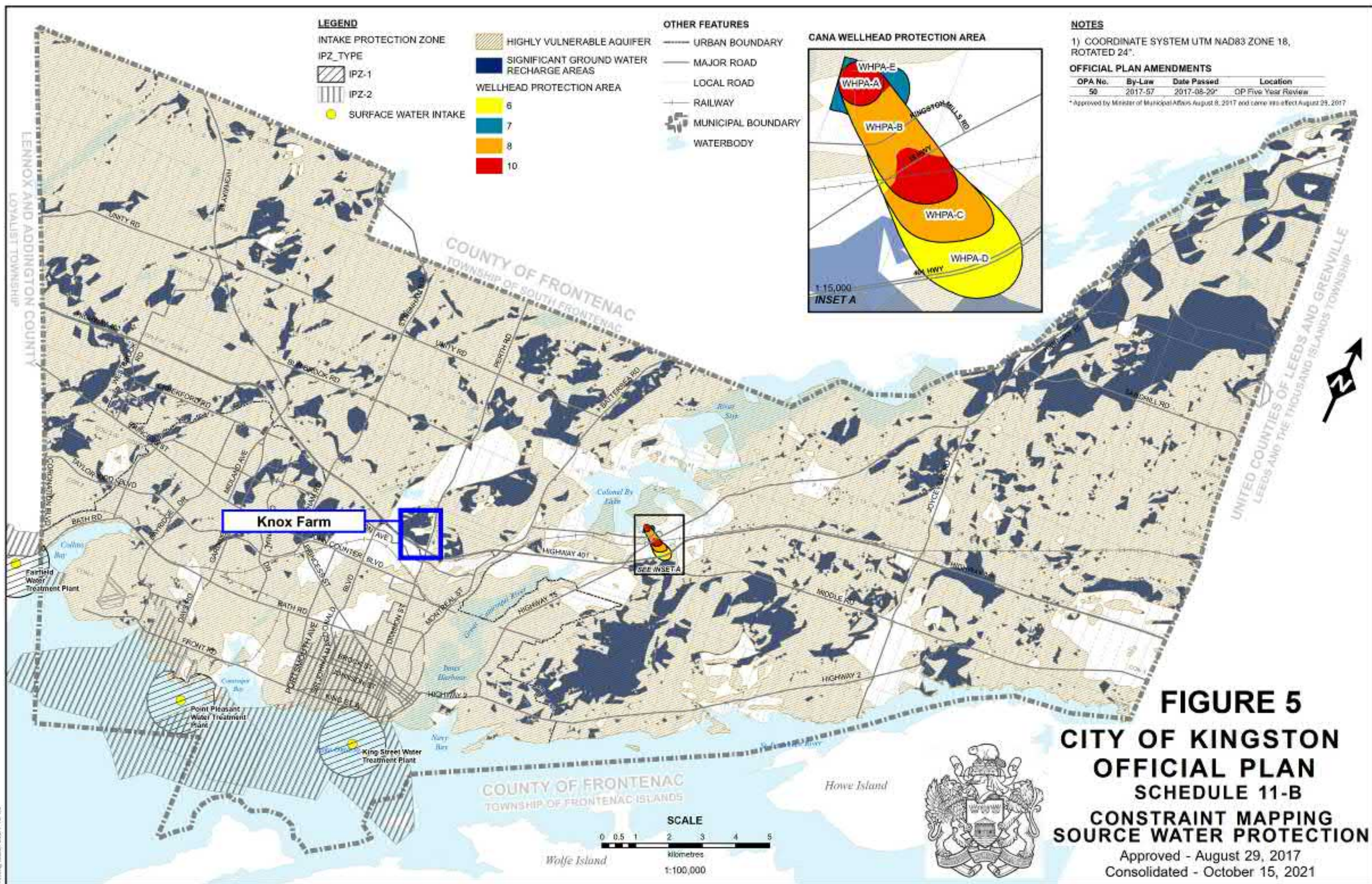


MAP DRAWING INFORMATION: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
 DATA PROVIDED BY: DILLON CONSULTING LIMITED, MNRF, UTILITIES KINGSTON, CITY OF KINGSTON.

MAP CREATED BY: BK
 MAP CHECKED BY: SG
 MAP PROJECTION: NAD 1983 CGRS UTM Zone 18N



PROJECT: 22-0641
 STATUS: DRAFT
 DATE: 2023-03-03



LEGEND

UNSTABLE BEDROCK (KARST TOPOGRAPHY)

- INFERRED
- POTENTIAL

OTHER FEATURES

- URBAN BOUNDARY
- MAJOR ROAD
- LOCAL ROAD OR PRIVATE LANE
- RAILWAY
- MUNICIPAL BOUNDARY
- WATERBODY

NOTES

- 1) COORDINATE SYSTEM UTM NAD83 ZONE 18, ROTATED 24°.
- 2) KARST INFORMATION FROM MINISTRY OF NORTHERN DEVELOPMENT AND MINES.

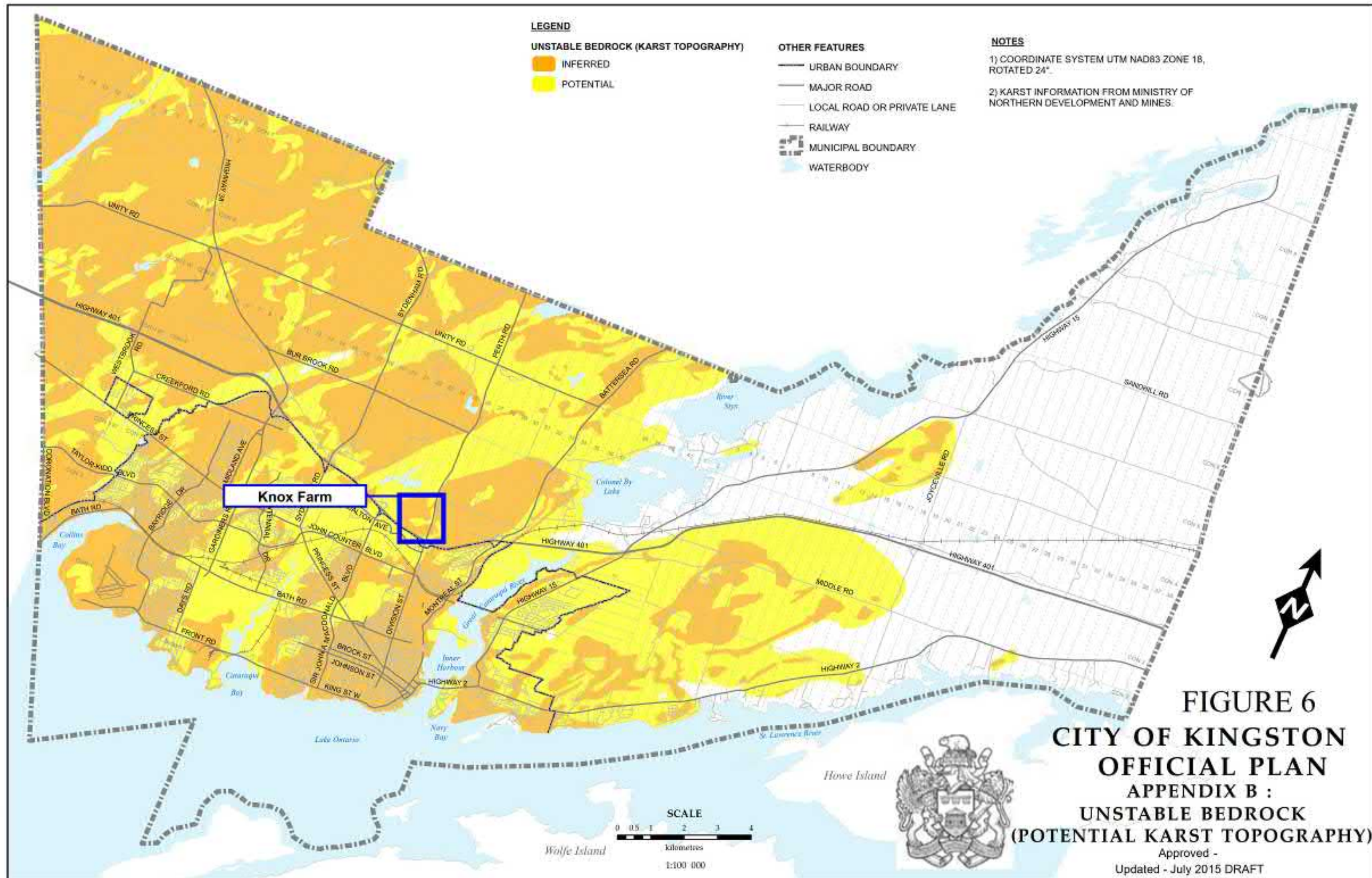


FIGURE 6
CITY OF KINGSTON
OFFICIAL PLAN
APPENDIX B :
UNSTABLE BEDROCK
(POTENTIAL KARST TOPOGRAPHY)

Approved -
 Updated - July 2015 DRAFT

2.0

Knox Farm Suitability Assessment

Technical assessments were completed from various disciplines to understand the suitability of Knox Farm for the proposed Facility. The results are summarized through **Section 2.1 to Section 2.8**.

Table 22 provides a summary of each discipline's results and recommendations. The table also identifies if the recommendations are in the MCEA and in the Project's scope.

2.1

Air Quality

The potential for impact from the proposed Facility on the atmospheric environment in the area of Knox Farm was evaluated. The suitability of the Knox Farm location was assessed through the characterization of background air quality and review of wind speed/direction and nearby sensitive receptor locations. The applicable criteria and background concentrations of the indicator compounds and potential receptors in the Study Area are described in the following sections.

2.1.1

Indicator Compounds

Indicator compounds were selected for this assessment based on the typical emissions from biosolids and biogas facilities. When considering typical emissions from these types of facilities, these compounds are expected to have the highest potential for impacts in regards to the atmospheric environment:

- Nitrogen oxides (expressed as NO₂);
- Carbon monoxide;
- Sulphur dioxide;
- Particulate matter (TSP, PM₁₀, and PM_{2.5});
- Hydrogen sulphide; and,
- Odour.

The environment surrounding the site consists of primarily rural (conservation) land uses to the north and more urban commercial land uses to the south. It is expected that the ambient odours would be characteristic of these land uses and no baseline values (magnitude and characteristics) will be defined for odour.

This suitability assessment reviews the ambient levels of contaminants which are expected to be emitted from the proposed facility for comparison against relevant criteria and/or guidelines. This review will provide an indication of how degraded the airshed is with respect to the indicator compounds.

2.1.2 Air Quality Criteria

The criteria for air quality in Ontario are established in *Ontario Regulation 419/05*⁶ (*O.Reg. 419/05*) and in Ontario's Ambient Air Quality Criteria⁷ (AAQC). *O.Reg. 419/05* provides contaminant concentration standards, guidelines, and limits to assess industrial facility impacts for permitting requirements (i.e., compliance). The AAQCs developed by the Ontario Ministry of Environment, Conservation and Parks (MECP) are commonly used in environmental assessments, special studies using ambient air monitoring data, assessment of general air quality in a community, and annual reporting on air quality across the province.

Federally, the Canadian Council of Ministers of the Environment has a set of Canadian Ambient Air Quality Standards⁸ (CAAQS) that were developed to be outdoor air quality targets for air quality actions across the country.

The applicable Ontario and Canada-wide standards and criteria are provided in **Table 1**.

Table 1: Ontario and Canada-Wide Standards and Criteria

Pollutant	CAS #	Averaging Period	Criterion ($\mu\text{g}/\text{m}^3$)	Regulation/Guideline
NO ₂	10102-44-0	1 hour	112.8	CAAQS (2020)
			79.0	CAAQS (2025)
			400	<i>O. Reg. 419/05</i> , Ontario AAQC
		24 hours	200	<i>O. Reg. 419/05</i> , Ontario AAQC
		Annual	32.0	CAAQS (2020)
			22.6	CAAQS (2025)

⁶ Ministry of the Environment, Conservation and Parks (2019). *Environmental Protection Act, Ontario Regulation 419/05 (O.Reg.419/05): Air Pollution – Local Air Quality*. January 2019.

⁷ Ministry of the Environment, Conservation and Parks (2019). *Ontario's Ambient Air Quality Criteria*. April 2019.

⁸ Environment and Climate Change Canada (2012). *Canadian Ambient Air Quality Standards (CAAQS) for Fine Particulate Matter (PM_{2.5}) and Ozone*. October 2012.

Pollutant	CAS #	Averaging Period	Criterion ($\mu\text{g}/\text{m}^3$)	Regulation/Guideline
PM _{2.5}	-	24 hours	27	CAAQS (2020), Ontario AAQC
		Annual	8.8	CAAQS (2020), Ontario AAQC
PM ₁₀	-	24 hours	50	Ontario AAQC
TSP	-	24 hours	120	O. Reg. 419/05, Ontario AAQC
		Annual	60	Ontario AAQC
SO ₂	7446-09-5	10 minutes	175	Ontario AAQC
		1 hour	183	CAAQS (2020)
			170	CAAQS (2025)
			79	Ontario AAQC
			100	O. Reg. 419/05 ⁽¹⁾
		Annual	13	CAAQS (2020)
			10	CAAQS (2025)
			10	O. Reg. 419/05 ⁽¹⁾ , Ontario AAQC
CO	630-08-0	0.5 hour	6,000	O. Reg. 419/05
		1 hour	36,200	Ontario AAQC
		8 hours	15,700	Ontario AAQC
H ₂ S	7783-06-04	10 minutes	13	O. Reg. 419/05, Ontario AAQC
		24 hours	7	O. Reg. 419/05, Ontario AAQC
Odour	-	10 minutes	1 OU/m ³	MECP Guideline

Notes:

(1) Effective date of this criterion is July 1, 2023.

2.1.3 Background Air Quality

Background air quality was quantified through historic monitoring data proximate to the study areas in addition to a review of on-site air monitoring data. The MECP and Environment and Climate Change Canada (ECCC) NAPS data from nearby stations was reviewed for each indicator compound. The closest monitoring station to the Study Areas with a three-year data set was selected.

A summary of NAPS station IDs and the available data for each indicator compound is summarized in **Table 2** below. It is noted that data was not available for CO and SO₂ in closer proximity to the Study Area than the ECCC NAPS Ottawa station. As the area surrounding Ottawa contains higher population and more industry than Kingston the data obtained from the Ottawa station is anticipated to serve as a conservative surrogate for Kingston air quality considerations for CO and SO₂.

Table 2: Indicator Compound MECP and ECCC NAPS Station ID

Indicator Compound	Station ID	Data Range
TSP	NA	NA
PM ₁₀	NA	NA
PM _{2.5}	ECCC NAPS – Kingston (60304)	2018-2020
Nitrogen Dioxide (NO ₂)	ECCC NAPS – Kingston (60304)	2018-2020
Hydrogen Sulphide (H ₂ S)	NA	NA
Carbon Monoxide (CO)	ECCC NAPS – Ottawa (60104)	2018-2020
Sulphur Dioxide (SO ₂)	ECCC NAPS – Ottawa (60104)	2018-2020
Odour	NA	NA

The background concentrations for the indicator compounds from the MECP and ECCC NAPS stations were calculated for the respective averaging period of the data obtained for the monitoring stations.

Ambient monitoring data for hydrogen sulphide is not readily available for the study areas. ECCC documents an overall average concentration, measured in urban areas presumed to be away from major anthropogenic sources in Canada⁹, which was used as the background concentration for this assessment.

PM_{2.5} is the only particulate species which is monitored by MECP or ECCC. To be consistent with using 3 years of background data where possible, the monitored MECP PM_{2.5} data was adjusted to estimate TSP and PM₁₀ background data. As PM_{2.5} is a size fraction subset of PM₁₀, and PM₁₀ is a size fraction subset of TSP, the PM₁₀ and TSP background concentrations can be estimated based on the PM_{2.5} background

⁹ Environment and Climate Change Canada (2017). Draft Screening Assessment: Hydrogen Sulfide (H₂S), Sodium Sulfide [Na₂SH] and Sodium Sulfide (Na₂S), September 2017.

concentration by applying a $PM_{2.5}/PM_{10}$ ratio of 0.54 and a $PM_{2.5}/PM_{10}$ ratio of 0.3 as shown below¹⁰:

- $PM_{2.5} \text{ concentration} / 0.3 = TSP \text{ concentration}$; and,
- $PM_{2.5} \text{ concentration} / 0.54 = PM_{10} \text{ concentration}$.

2.1.4 Results and Discussion

The background concentrations for each indicator compound for the study areas are summarized in **Table 3** through **Table 7** below.

¹⁰ Lall, R., Kendall, M., Ito, K., and G. Thurston (2004). Estimation of Historical Annual $PM_{2.5}$ Exposures for Health Effects Assessment. *Atmospheric Environment* 38 (2004) 5217-5226.

Table 3: Nitrogen Dioxide Ambient Air Quality Summary

Averaging Period	Ambient Concentration ($\mu\text{g}/\text{m}^3$)			Percentage of Criterion (%)			Criterion ($\mu\text{g}/\text{m}^3$)	Regulation/Guideline
	Max ⁽¹⁾	90 th Percentile	Average	Max ⁽¹⁾	90 th Percentile	Average		
1 hour	61.3	38.2	19.3	54%	34%	17%	112.8	CAAQS (2020)
	61.3	38.2	19.3	78%	48%	24%	79.0	CAAQS (2025)
	94.1	38.2	19.3	24%	10%	5%	400	Reg. 419/AAQC
24 hour	39.3	13.7	7.3	20%	7%	4%	200	Reg. 419/AAQC
Annual	20.5	--	7.3	64%	43%	--	32.0	CAAQS (2020)
	20.5	--	7.3	91%	61%	--	22.6	CAAQS (2025)

Notes:

- (1) Ambient concentrations compared to CAAQS criteria have been refined to match the representative statistics of the respective criteria as noted below:
- a. NO_x 1-hr results represent the three year average of the annual 98th percentile of the daily maximum 1-hr average concentrations
 - b. NO_2 24 hr results represent the maximum 24 hr concentration over the three year data set
 - c. NO_2 Annual results represent the maximum average over a single calendar year of all 1-hr average concentrations over the three-year data set

A review of the three years of ambient monitoring data from the Kingston Station indicated that the ambient concentrations of nitrogen dioxide are below all applicable criteria.

It is noted that the maximum values for 1 hr and annual NO_2 are relatively high when compared to the 2025 CAAQS criteria. However, the CAAQS are stringent, aspirational regional air quality targets, not project-specific air quality criteria, and the ambient NO_2 concentrations are predicted to be below these targets.

Table 4: Particulate Matter Ambient Air Quality Summary

Pollutant	Averaging Period	Ambient Concentration ($\mu\text{g}/\text{m}^3$)			Percentage of Criterion (%)			Criterion ($\mu\text{g}/\text{m}^3$)	Regulation/Guideline
		Max ⁽¹⁾⁽²⁾	90 th Percentile	Average	Max ⁽¹⁾⁽²⁾	90 th Percentile	Average		
PM _{2.5}	24 hour	18.3	10.1	5.5	68%	37%	20%	27	CAAQS (2020)
		26.3	10.1	5.5	97%	37%	20%	27	AAQC
	Annual	5.6	--	5.5	64%	--	63%	8.8	CAAQS (2020)
		5.5	--	5.5	63%	--	63%	8.8	AAQC
PM ₁₀	24 hour	48.7	18.7	10.2	97%	37%	20%	50	AAQC
TSP	24 hour	87.6	33.6	18.4	73%	28%	15%	120	O. Reg. 419/AAQC
	Annual	18.4	--	18.4	31%	--	31%	60	Ontario AAQC

Notes:

- (1) Ambient concentrations compared to CAAQS criteria have been refined to match the representative statistics of the respective criteria as noted below:
- PM_{2.5} 24-hr results represent the three year average of the annual 98th percentile of the daily 24 hour average concentrations
 - PM_{2.5} Annual results represent the three year average of the annual average of the daily 24 hour average concentrations
- (2) Annual ambient concentrations compared to the AAQC criteria are taken as the average 24 hour concentrations for the dataset.

A review of the three years of ambient monitoring data from the Kingston Station indicated that the ambient concentrations of each relevant particulate matter species are below all applicable criteria.

It is noted that the maximum values for PM_{2.5} and PM₁₀ represent a relatively high percentage when compared to the AAQC criteria. However, the 90th percentile and average concentration values for these contaminants are well below their respective criteria indicating concentrations approach but do not exceed the maximum on an infrequent basis.

Table 5: Sulphur Dioxide Ambient Air Quality Summary

Averaging Period	Ambient Concentration ($\mu\text{g}/\text{m}^3$)			Percentage of Criterion (%)			Criterion ($\mu\text{g}/\text{m}^3$)	Regulation/Guideline
	Max ⁽¹⁾⁽²⁾	90 th Percentile	Average	Max ⁽¹⁾⁽²⁾	90 th Percentile	Average		
10 minutes	10.5	2.1	1.0	6%	1%	1%	175	AAQC
1 hour	10.5	2.1	1.0	13%	3%	1%	79	AAQC
	10.5	2.1	1.0	10%	2%	1%	100	<i>O. Reg.419</i>
	5.4	2.1	1.0	3%	1%	1%	183	CAAQS (2020)
	5.4	2.1	1.0	3%	1%	1%	170	CAAQS (2025)
	1.1	--	0.4	8%	--	3%	13	CAAQS (2020)
Annual	1.1	--	0.4	10%	--	4%	10	CAAQS (2025)
	0.4	--	0.4	4%	--	4%	10	<i>O. Reg.419/AAQC</i>

Notes:

- (1) Ambient concentrations compared to CAAQS criteria have been refined to match the representative statistics of the respective criteria as noted below:
- SO₂ 1-hr results represent the three year average of the annual 99th percentile of the maximum 1 hour average concentrations*
 - SO₂ Annual results represent the three year data sets maximum average over a single calendar year of all 1 hour average concentrations*
- (2) Annual ambient concentrations compared to the *O. Reg. 419/18* and AAQC criteria are taken as the average 24 hour concentrations for the dataset.

A review of the three years of ambient monitoring data from the Ottawa Station indicated that the ambient concentrations of sulphur dioxide are well below all applicable criteria.

Table 6: Carbon Monoxide Ambient Air Quality Summary

Averaging Period	Ambient Concentration ($\mu\text{g}/\text{m}^3$)			Percentage of Criterion (%)			Criterion ($\mu\text{g}/\text{m}^3$)	Regulation/Guideline
	Max(1)	90th Percentile	Average	Max(1)	90th Percentile	Average		
0.5 hour	1.1	0.5	0.2	0.02%	0.01%	0.004%	6,000	AAQC
1 hour	1.1	0.5	0.2	0.003%	0.001%	0.001%	36,200	AAQC
8 hour	0.7	0.3	0.2	0.005%	0.002%	0.001%	15,700	AAQC

A review of the three years of ambient monitoring data from the Ottawa Station indicated that the ambient concentrations of carbon dioxide are well below all applicable criteria.

Table 7: Hydrogen Sulphide Ambient Air Quality Summary

Averaging Period	Ambient Concentration ($\mu\text{g}/\text{m}^3$) ⁽¹⁾	Percentage of Criterion (%)	Criterion ($\mu\text{g}/\text{m}^3$)	Regulation/Guideline
10 minutes	1.4	11%	13	AAQC
24 hour	1.4	20%	7	AAQC

Notes:

- (1) Ambient concentrations taken from Environment and Climate Change Canada (2017), Draft Screening Assessment: Hydrogen Sulfide (H_2S), Sodium Sulfide (NaSH) and Sodium Sulfide (Na_2S), September 2017.

As ambient monitoring data was unavailable for hydrogen sulphide, a review of the ECCC documents provided the background concentration for this assessment. The ambient concentration of hydrogen sulphide is well below the applicable criteria.

2.1.5 Location of Sensitive Receptors within the Study Area

Potential air quality impacts are determined through the assessment at sensitive receptors located within the Study Area. Environmental assessments consider sensitive receptors in locations generally where human activities may regularly occur. Typical land uses that are defined as sensitive receptors for evaluating potential air quality impacts include, but are not limited to: residences, schools, daycares, hospitals, and sports fields.

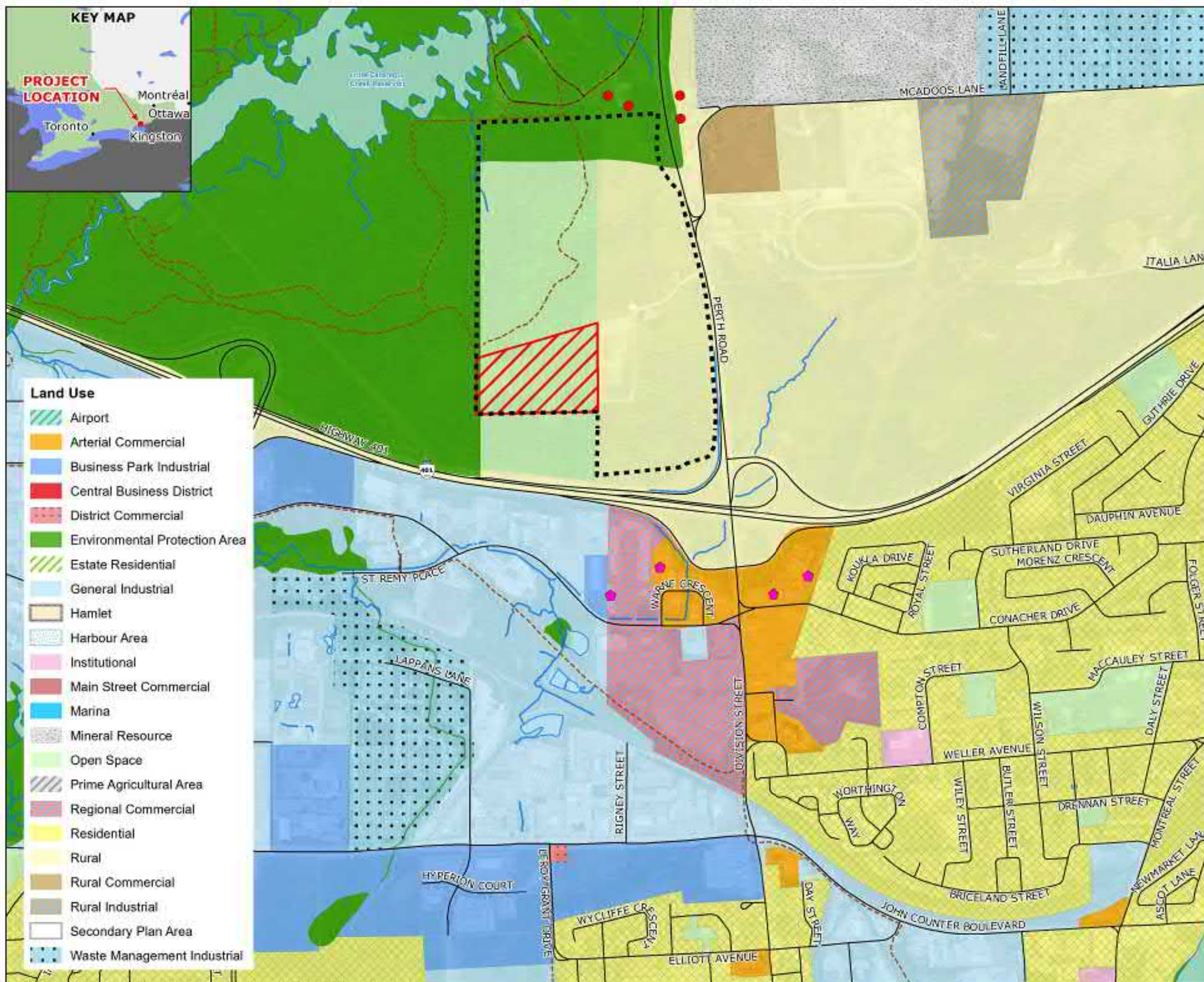
A review of the surrounding land uses to the south of Knox Farm and Highway 401 show General Industrial, Business Park Industrial, Arterial Commercial, Regional Commercial and Residential land uses. Located in the Arterial Commercial and Regional Commercial areas are four hotels located along the southern perimeter of Highway 401 approximately 250 m to 600 m from the southeast boundary of the proposed site location. Residential dwellings are located approximately 900 m from the southeast boundary of the Proposed Site Location. A zoning and receptor location map is provided in **Figure 7**, which also illustrates the boundaries of the Proposed Site Location. It is noted that there is a Little Cataraqui Creek Conservation Authority trail (Reservoir Trail) that currently runs through the northwestern part of the Property.

The land use to the north of the Knox Farm boundary is comprised of Rural, Open Space, and Environmental Protection Areas. The Little Cataraqui Creek Conservation Area (CA) trails are located in the Environmental Protection Area to the northwest of the boundary of the Proposed Site Location within the Knox Farm boundary may be considered a sensitive receptor for the consideration of potential air quality impacts.

2.1.6 Wind Speed and Direction

Prevailing wind speed and direction play a critical role in the dispersion of contaminants through the atmosphere and the potential downwind impacts. The most recent annual wind speed and direction data was reviewed from the nearby Kingston Airport NAVCAN weather station. A wind rose summarizing the 2021 hourly wind data is provided in **Figure 8**.

The predominant wind direction is shown to be from the southwest with moderate westerly and northerly components.



UTILITIES KINGSTON

KINGSTON REGIONAL BIOSOLIDS AND BIOGAS FACILITY

PROPOSED SITE LOCATION WITHIN KNOX FARM LAND USES MAP AND RECEPTOR LOCATIONS
FIGURE 7

- Property Boundary
- Proposed Site Location
- Trail
- Road
- Hotels
- Residential Receptors
- Residential Land Use Receptors
- City of Kingston, 2022
- Watercourse
- Waterbody

SCALE 1:12,000

0 300 600 m



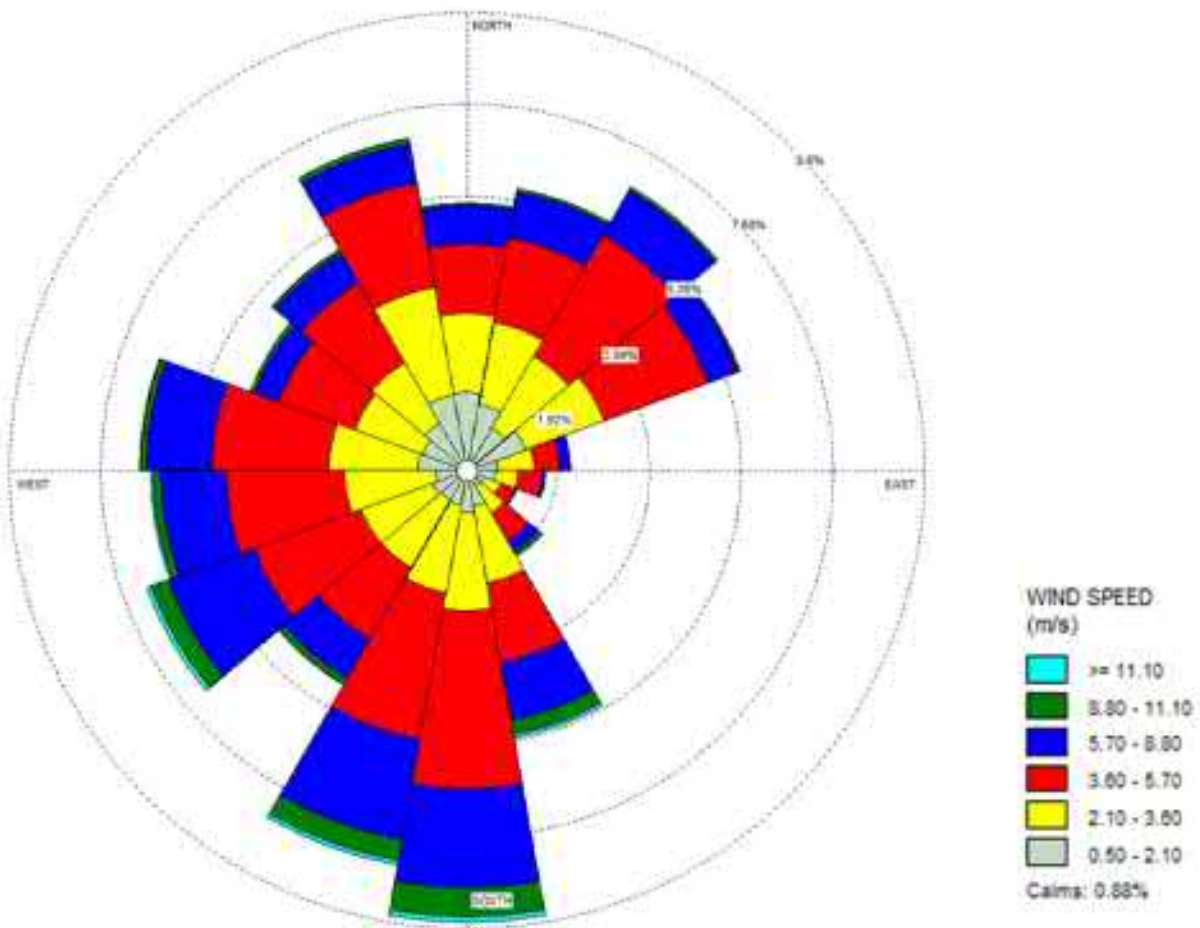
MAP DRAWING INFORMATION: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
DATA PROVIDED BY: DILLON CONSULTING LIMITED, MNRF, UTILITIES KINGSTON, CITY OF KINGSTON.

MAP CREATED BY: BK
MAP CHECKED BY: SG
MAP PROJECTION: NAD 1983 CRS UTM Zone 18N



PROJECT: 22-0641
STATUS: DRAFT
DATE: 2023-02-23

Figure 8: Kingston Airport 2021 Windrose



2.1.7 Summary and Recommendations

2.1.7.1 Study Area Results

Based on a review of ambient monitoring data, all contaminants were below their respective criteria in the region where Knox Farm is located. Although some maximum ambient concentrations of NO_2 , $\text{PM}_{2.5}$, and PM_{10} were approaching their respective criteria, the 90th percentile and average ambient concentrations were well below these criteria. Typically, environmental assessments use the 90th percentile ambient concentrations when considering cumulative impacts from facility operations at off-site sensitive receptors.

A review of the sensitive receptor locations within the study area was completed. Potential sensitive receptors, shown in **Figure 7**, in the immediate vicinity of Knox Farm include:

- Hotels located south of Highway 401;
- Residential dwellings located southeast of Highway 401 and north of the property along McAdoo's Lane and Little Cataraqui Creek CA Trails; and,
- The Little Cataraqui Creek CA Trail to the northwest of the proposed site location boundary.

The predominant wind direction is shown to be from the southwest with moderate westerly and northerly components.

2.1.7.2 Recommendations

The assessment of background air quality and review of wind speed/direction and nearby sensitive receptor locations do not indicate any compliance concerns with the current location of the proposed Facility.

Consideration is to be given to the configuration of the sources of air and odour emissions at the proposed Facility at Knox Farm. Source configuration may have the potential to result in a significant reduction of air quality and odour impacts at the sensitive receptors. With a property boundary footprint of approximately 300 m by 380 m, source locations may be optimized to reduce potential impact.

Once process and location details of the proposed Facility are available, an air emissions and dispersion modelling report will be required to determine the potential off-site impacts from air and odour emissions. Potential impacts from odour will be evaluated during the completion of the air emissions and dispersion modelling report and odour best management practices will be reviewed.

2.2 Archaeology and Cultural Heritage

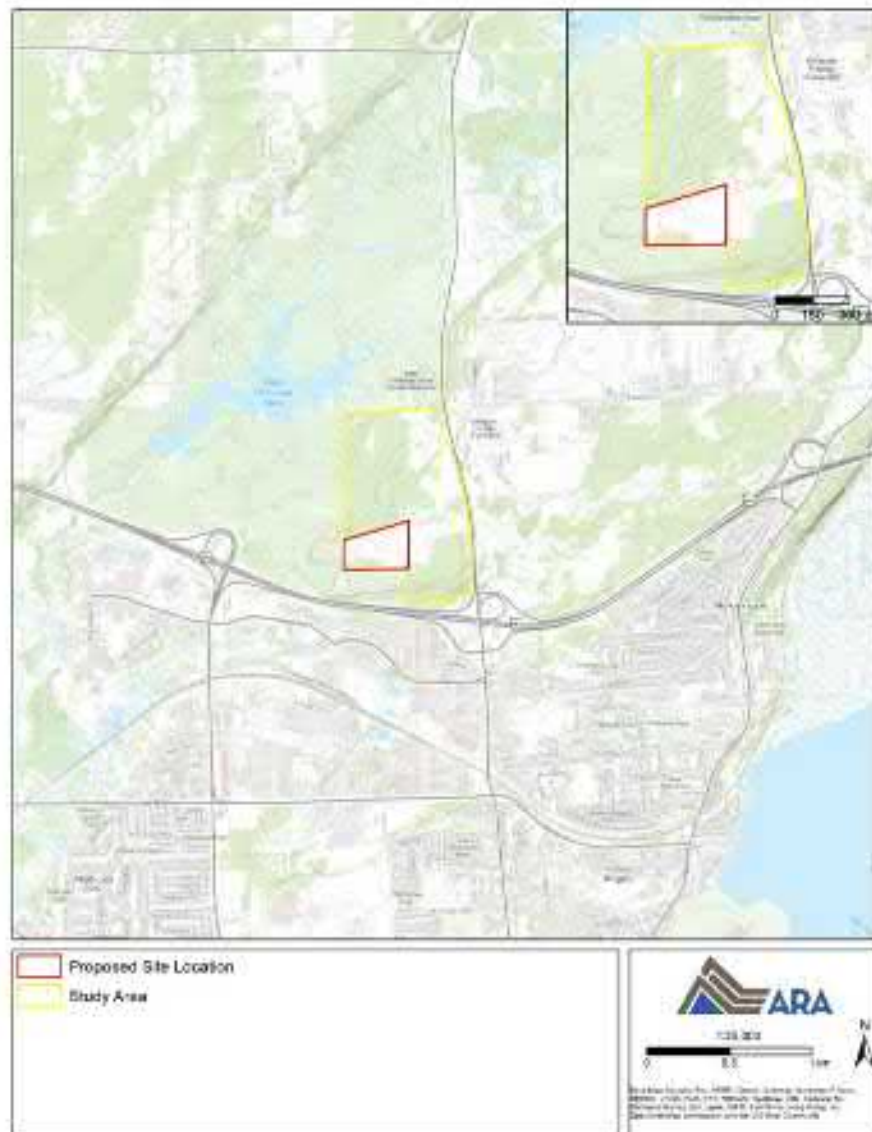
The final draft results for the Stage 1 Archaeological Assessment and Cultural Heritage Assessment Report (CHAR) are summarized below.

2.2.1 Stage 1 Archaeological Assessment

2.2.1.1 Methodology

Archaeological Research Associates Ltd. (ARA) conducted a Stage 1 Archaeological Assessment of lands with the potential to be impacted by the Facility. The Stage 1 assessment was conducted in October 2022 and encompassed the entire Study Area (**Figure 9 – Map 1**). At the time of the assessment, the Study Area consisted of access roads, a former dredge material storage site/dewatering facility, a snow management facility, several former agricultural fields and various overgrown and wooded areas.

Figure 9: Map 1 - Location of Study



The Stage 1 assessment was conducted in October 2022 under Project Information Form (PIF) #P007-1420-2022. The investigation encompassed the entire study area. Legal permission to enter and conduct all necessary fieldwork activities within the assessed lands was granted by the property owner (the City of Kingston). In compliance with the objectives set out in Section 1.0 of the 2011 Standards and Guidelines for Consultant Archaeologists (S&Gs), this investigation was carried out to:

- Provide information concerning the geography, history and current land condition of the Study Area;
- Determine the presence of known archaeological sites in the Study Area;
- Present strategies to mitigate project impacts to such sites, if they are located;
- Evaluate in detail the archaeological potential of the Study Area; and,
- Recommend appropriate strategies for Stage 2 Archaeological Assessment, if some or all of the study area has archaeological potential.

2.2.1.2

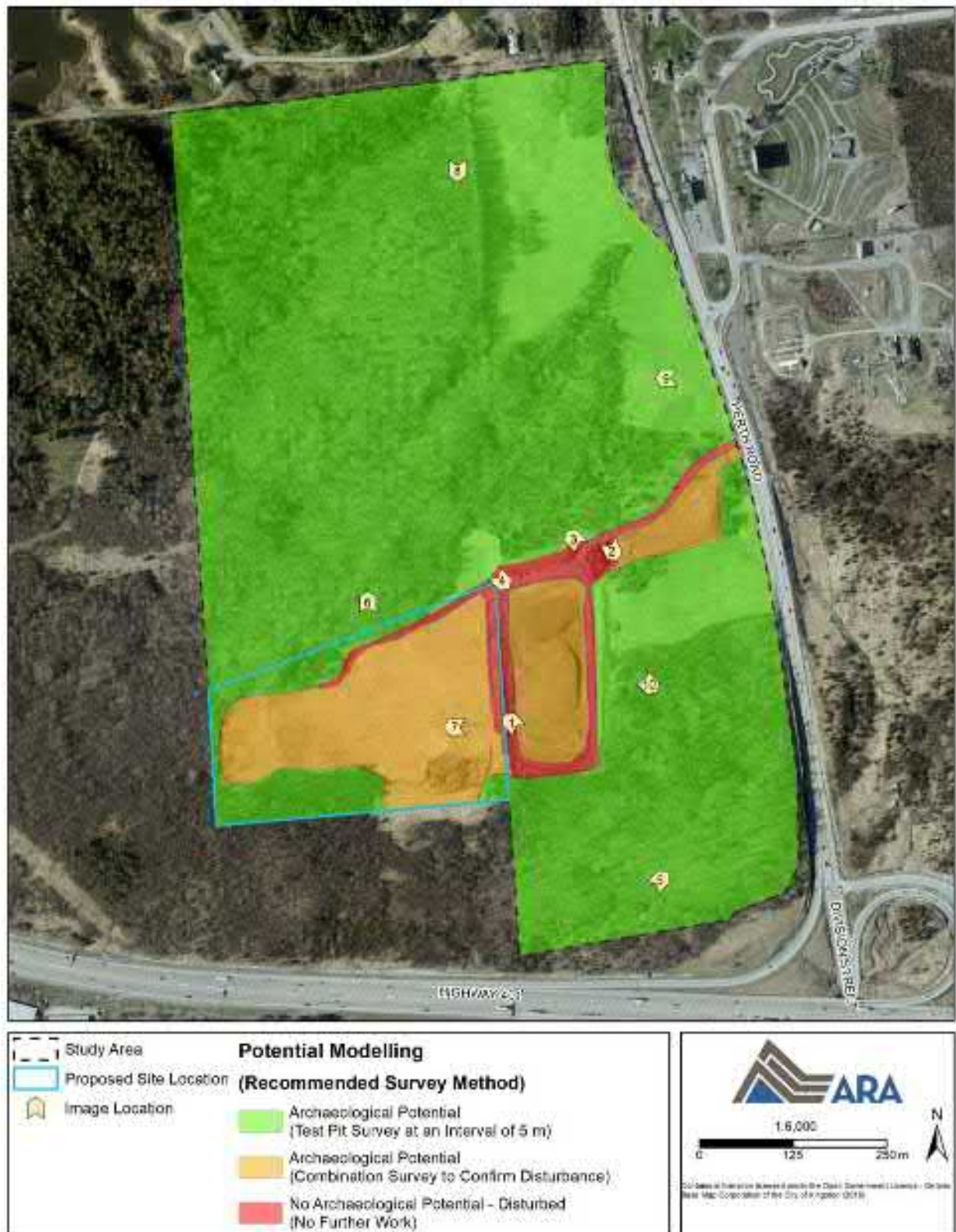
Results

The Stage 1 assessment determined that the Study Area comprises a mixture of areas of archaeological potential and areas of no archaeological potential (**Figure 10 – Map 9**). It is recommended that all areas of archaeological potential that could be impacted by the project be subject to a Stage 2 property assessment in accordance with Section 2.1 of the 2011 Standards and Guidelines for Consultant Archaeologists. **Figure 10 – Map 9** shows the Proposed Site Location of the Facility as an area of Archaeological Potential.

The identified areas of no archaeological potential do not require any additional assessment. Given that there are still outstanding archaeological concerns within the Study Area, no ground alterations or development may occur until the required investigation is complete, a recommendation that the lands require no further Archaeological Assessment is made and the associated report is entered into the Ontario Public Register of Archaeological Reports.

The final draft Stage 1 Archaeological Assessment report is captured under separate cover.

Figure 10: Map 9 - Potential Modelling (Recommended Survey Method)



2.2.2 Cultural Heritage

2.2.2.1 Methodology

As part of the Regional Biosolids and Biogas Facility Municipal Class EA for Utilities Kingston, ARA completed a Cultural Heritage Assessment Report (CHAR). A CHAR outlines the existing identified cultural heritage resources including properties recognized under the Ontario Heritage Act, those located adjacent to a Canadian Heritage River, National Historic Sites, properties with an Ontario Heritage Trust easement or plaques and any known cemeteries in the entire study area. Any properties that have been identified through other reports for projects within the Study Area are also to be examined in this CHAR.

The process for completing a CHAR includes consultation with local municipal staff to obtain information related to any known Built Heritage Resources (BHRs) or Cultural Heritage Landscapes (CHLs), broadly known as cultural heritage resources. A CHAR also involves an on-site survey to identify any potential BHRs or CHLs within or adjacent to the Study Area. The goal of the CHAR is to document and map all cultural heritage resources within and adjacent to the Study Area with the potential to be impacted by the project.

The Cultural Heritage Assessment Report approach included:

- Summary of the history of the Study Area including historical mapping, aerial photographs;
- Consultation with City of Kingston regarding heritage matters in the Study Area in November 2022;
- Identification of any designated or recognized properties within and adjacent to the Study Area;
- On-site inspection in October 2022 and creation of an inventory of all properties with potential Built Heritage Resources and Cultural Heritage Landscapes within and adjacent to the Study Area;
- A description of any affected resources and their potential heritage interest or value;
- Description of potential project impacts; and,
- Recommendations.

2.2.2.2 Results

After conducting historical research, consultation and field survey, no cultural heritage resources were identified within the assessed area. To date, there are no concerns with respect to built heritage resources and cultural heritage landscapes related to the proposed Kingston Biosolids and Biogas Facility construction on the Knox Farm Property.

2.3 Hydrogeology

The approximate location of the proposed Biosolids and Biogas Facility (within the Knox Farm property) will herein be referred to as the “Proposed Site Location”, and the area including and within a 500 metre radius of the Knox Farm property will herein be referred to as the “Study Area”; as shown on **Appendix A1 – Figure 1**. Of interest, the area to the north of the Proposed Site Location is the Little Cataraqui Creek Conservation Area, which is managed by the CRCA, to the east is the City of Kingston’s snow management facility and to the west and south is a wooded area.

The hydrogeological suitability assessment of the Knox Farm included:

- A review of background records relevant to hydrogeology; and,
- Borehole drilling, monitoring well installation, groundwater sample collection and hydrogeological testing.

This section documents baseline hydrogeological conditions and provides information to help determine if the Proposed Site Location is suitable for the development of the proposed Facility from hydrogeological and environmental perspectives.

2.3.1 Methodology

To gain a further understanding of the hydrogeology of the Study Area and the Proposed Site Location, the following information was collected and assessed:

- Existing groundwater information;
- Topographic information;
- Soils/geological information;
- Drilling of boreholes to assess existing soil stratigraphy;
- Installation of monitoring wells to assess existing groundwater conditions;

- Collection of groundwater samples for analysis of Metals and Inorganics, Petroleum Hydrocarbons (PHCs), Volatile Organic Compounds (VOCs) and Polycyclic Aromatic Hydrocarbons (PAHs);
- Hydraulic conductivity testing by means of a rising head test; and,
- Infiltration testing of the shallow soils using a Guelph Permeameter.

A review of the following background information sources was completed:

- City of Kingston Official Plan, Appendix B: Unstable Bedrock (Potential Karst Topography) map (City of Kingston, Draft Updated July 2015);
- Niblett Environmental Associates Inc., Snow Disposal Site Part Lot 23, Con. 3 City of Kingston, Natural Environment Existing Conditions Report. (Niblett, 2003);
- Inspec-Sol Inc., Geotechnical Assessment - Field Investigation – Proposed Dewatering Facility, Knox Farm, Perth Road, Kingston, Ontario (Inspec-Sol, February 2004);
- Inspec-Sol Inc., Monitoring Well Installations – Knox Farm Dewatering Facility, Perth Road, Kingston, Ontario (Inspec-Sol, March 2004);
- XCG Consultants Ltd, Phase I ESA – Knox Farm Dredge Material Storage Site – Kingston, Ontario (XCG, 2007);
- XCG Consultants Ltd, Phase II ESA – Knox Farm Dredge Material Storage Site – Kingston, Ontario (XCG, 2008);
- XCG Consultants Ltd, Risk Assessment and Risk Management Plan – Knox Farm Dredge Material Storage Site – Kingston, Ontario (XCG, 2010);
- XCG Consultants Ltd, Dredge Material Storage Site Closure Report – Kingston, Ontario (XCG, 2015);
- Ministry of the Environment, Conservations and Parks (MECP). 2018. Water Well Information System (Well location and Summary). Last updated October 18, 2021;
- Ontario Geological Survey (OGS). 1997. Quaternary geology, seamless coverage of the province of Ontario: Ontario Geological Survey, Data Set 14; and,
- Ontario Geological Survey (OGS). 2011. 1:250 000 scale bedrock geology of Ontario; Ontario Geological Survey, Miscellaneous Release – Data 126-Revision 1. ISBN 978-1-4435-5704-7 (CD) ISBN 978-1-4435-5705-4 [zip file].

2.3.2 Background Information

2.3.2.1 Location and Physiography

The Knox Farm property is located within the physiographic region known as the Napanee Plain, characterized by the flat to undulating plain of limestone of the Gull River and Bobcaygeon Formations. The Napanee Plain is known to be relatively thin as the most recent glaciation had stripped most of the overburden in region, with exception in stream valleys and depressions (Putnam, 1984).

According to the Source Protection Atlas by the MECP, the Knox Farm Property is located within the Cataraqui Source Protection Area (SPA) and is identified to be within a Significant Groundwater Recharge Area and a Highly Vulnerable Area; of which the majority of the Cataraqui SPA is identified.

Potential Karst Topography mapping noted in the City of Kingston Official Plan indicated the Knox Farm Property is on potential/inferred karst topography. Karst formations are formed when rock is dissolved by water, creating features that can act as underground drainage systems; creating a pathway for contaminants on the surface to reach groundwater.

2.3.3 Regional Geological Setting

2.3.3.1 Bedrock Geology

The Knox Farm property is underlain by Upper Ordovician limestone (OGS, 2009). A previous geotechnical investigation by Inspec-Sol in 2004 and a Phase II Environmental Site Assessment by XCG in 2008 found bedrock to occur from 0 to 2.5 metres below ground surface (mbgs) at the Proposed Site Location; described as grey limestone.

2.3.3.2 Quaternary Geology and Surficial Geology

Mapping by OGS (2000) indicates that the Quaternary geology and surficial geology of the Knox Farm property consists of Pleistocene aged glaciomarine deposits composed of silt, clay, minor sand basin and quiet water deposits. Previous investigations by Inspec-Sol (2004) and XCG (2008) found the overburden overlying the bedrock to be up to 2.5 metres (m) thick, consisting of silty clay to clay soils.

Inspec-Sol's (2004) results of field percolation testing indicate that the stratified in-situ soils at the Proposed Site Location have a permeability range in the order of 10^{-2} to 10^{-6} cm/s. The permeability of the soil is anticipated to be greater in the horizontal direction, with lower permeability in the vertical direction.

2.3.4 Hydrogeology of the Proposed Site Location

Based on the Proposed Site Location's geology, a simple hydrogeological system can be interpreted. Surficial geology mapping and the previous investigations completed by Inspec-Sol (2004) and XCG (2008) indicate deposits of silty clay to clay soils overlying limestone bedrock underlie the Proposed Site Location. Silt and clay deposits and limestone typically have hydraulic conductivity (k) in the order of 10^{-6} to 10^{-9} m/s (Freeze and Cherry, 1979).

2.3.4.1 Groundwater Flow

A Risk Assessment previously completed by XCG (2010), identified that the Proposed Site Location's hydrogeological system is as follows; the shallow groundwater system is present at the silty clay and shallow bedrock (limestone) interface, the shallow aquifer (limestone) is present within 1.2 m and 2.1 mbgs and a deep aquifer at depths greater than 3 m within the limestone. The groundwater flow direction of the shallow aquifer is to the west and southwest towards the Little Cataraqui Creek (1.2 kilometers west), while the groundwater flow direction of the deep aquifer is towards the north.

The Risk Assessment completed by XCG (2010) at the Proposed Site Location indicates the estimated seepage rate of the shallow aquifer to be 0.95 m/yr directed to the west-southwest. The seepage rate is based on a maximum hydraulic conductivity of 5.9×10^{-5} cm/s (or 5.9×10^{-7} m/s) calculated for the site and an average horizontal hydraulic gradient of 0.02 to 0.05.

2.3.4.2 Study Area: Groundwater Use and Water Records Well Search

Water wells from the MECP Water Well Record database within the Study Area are summarized in **Table 8**, shown in **Appendix A1 – Figure 1** and found in **Appendix A2**. There are 39 wells records within the Study Area with depths ranging from 3 m to 54.2 m. All water supply wells were completed within limestone at bottom depths ranging between 18.3 m and 54.2 m. Recommended pumping rates noted on supply

water well records range between 18.9 and 75.7 litres per minute (l.p.m). Note that the locations of the wells are based on the MECP water well record database, which often contains inaccurate location coordinates. Actual well locations and potential unregistered wells should be verified in the field as needed.

Table 8: Summary of Well Information

Well ID	Ground Elevation (masl)	Latitude	Longitude	Static Level (m)	Well Depth (m)	Rec Pumping Rate (L.P.M)	Well Use
2217153	108.89	44.27400	-76.50327	-	22.5	-	Monitor
2217152	104.88	44.27376	-76.50190	-	15.5	-	Monitor
7104242	105.82	44.27329	-76.50800	-	17	-	Monitor
2217151	104.87	44.27123	-76.50266	22.2	23.5	-	Monitor
2217150	104.18	44.27150	-76.50109	21.9	23.5	-	Monitor
2207680	115.69	44.27850	-76.50090	16.7	30.1	22.7	Supply
2207028	117.33	44.27899	-76.50116	12.8	37.1	45.4	Supply
2207162	83.83	44.28096	-76.50853	5.5	37.5	18.9	Supply
2200574	88.01	44.27092	-76.49908	3.6	4.2	-	Monitor
2206449	86.15	44.28159	-76.50410	5.8	28.9	37.8	Supply
2209101	116.44	44.28227	-76.50101	28.3	40.8	75.7	Supply
2200874	121.40	44.27830	-76.49878	21.3	30.5	37.8	Supply
2206734	119.40	44.28187	-76.49981	7.6	54.2	11.3	Supply
7235606	96.40	44.27176	-76.49645	11.2	24.3	18.9	Commercial
2218953	82.85	44.26753	-76.50551	-	5.2	-	Decommissioned
2219063	82.85	44.26753	-76.50551	-	5.2	-	Decommissioned
7235605	98.87	44.27176	-76.49597	-	36.5	-	Decommissioned
7041475	126.28	44.28125	-76.49863	-	32.6	-	Monitor
7175442	82.64	44.28330	-76.50817	-	32	-	Decommissioned
7175440	82.64	44.28332	-76.50814	32.9	36.5	37.8	Municipal
2215436	110.94	44.28340	-76.50085	-	59.4	-	Monitor
7228950	100.10	44.27313	-76.49590	12.8	30.7	56.7	Supply
2200605	87.11	44.26801	-76.49752	3.65	44.8	56.7	Supply
7344187	124.86	44.28151	-76.49714	-	5.1	-	Test hole
7332608	83.79	44.26663	-76.50078	-	5	-	Decommissioned
7223484	84.88	44.26691	-76.49814	2.4	6.1	-	Monitor
2219263	90.90	44.28485	-76.50223	0.6	18.3	18.9	Supply
7290189	83.79	44.26638	-76.50078	-	4.2	-	Monitor
2200597	84.82	44.26643	-76.49908	1.8	37.1	37.8	Supply
7332607	83.92	44.26622	-76.50026	-	3	-	Decommissioned
7223485	84.88	44.26659	-76.49819	2.3	6.1	-	Monitor
7164132	84.88	44.26663	-76.49806	0.6	5.5	-	Monitor
7236633	84.88	44.266529	-76.4983	-	-	-	-
7223486	84.88	44.26653	-76.49823	1.2	4.6	-	Monitor
7332609	83.90	44.26607	-76.50026	-	5	-	Decommissioned
7244734	84.88	44.26652	-76.49807	-	-	-	-

Well ID	Ground Elevation (masl)	Latitude	Longitude	Static Level (m)	Well Depth (m)	Rec Pumping Rate (L.P.M)	Well Use
7204278	84.77	44.26617	-76.49937	-	7.6	-	Monitor
7150083	84.89	44.266478	-76.49815	0.4	6.1	-	Monitor
7202230	84.86	44.26655	-76.49790	-	-	-	-

Notes:

MASL – Metres Above Sea Level

L.P.M – Litres per Minute

Wells assumed to be active as no decommission records found.

As mapped in the MECP Water Well Record database, the Proposed Site Location contains one water well records and the adjacent snow management facility area part of the Knox Farm property contains four records. All of the mentioned well records are of monitoring wells and installed within limestone.

2.3.5 Site Investigation and Results

2.3.5.1 Geology

Drilling was completed at the Proposed Site Location on October 20, 2022, under supervision of Dillon personnel. Three boreholes were drilled using a truck-mounted drill rig, equipped with auger and air hammer drilling equipment, borehole locations are shown on **Appendix A1 – Figure 2**. The boreholes were drilled to depths between approximately 4.7 and 4.9 metres below ground surface (mbgs). Solid stem auger drilling was used to drill through the silty clay to clay overburden and air hammer drilling was used to drill into the bedrock (limestone). Bedrock was encountered at each borehole location at depths ranging between 2.0 to 3.1 mbgs or 103.0 to 104.8 metres above sea level (masl).

A grain size sample was collected at borehole location P1 at approximately 1.2 metres within the overburden. The grain size analysis indicates that 93% of the particles are finer than 0.075 mm; characteristic of fine silty clay to clayey soils. Borehole logs can be found in **Appendix A3** and grain size analysis results are presented in **Table 9** and Certificates of Analysis in **Appendix A5**.

Table 9: Grain Size Analysis Results

Sample ID	Sieve	Results (%)
GS-1	#4 (>4.75 mm)	<0.20
	#10 (>2.00 mm)	<0.20
	#40 (>0.425 mm)	1.9
	#200 (>0.075 mm)	5.2
	Pan	93

2.3.5.2 Groundwater: Monitoring Well Installation

Groundwater monitoring wells were installed in each of the boreholes by G.E.T Drilling on October 20, 2022. The monitoring wells are identified as P1, P2 and P3, as shown on **Appendix A1 – Figure 2**.

A truck-mounted drill rig, equipped with auger and air hammer equipment was used for the installation of the monitoring wells upon completion of borehole drilling. The monitoring wells were screened at the interface between the silty clay to clay overburden and the limestone bedrock; targeting the shallow groundwater system and aquifer. The wells were constructed using 38-mm diameter Schedule 40 PVC and a 3.0 m well screen (slot) 10. A sand pack was placed within the borehole annulus around the well screens from the bottom of the well to approximately 0.3 m above the well screen. Bentonite holeplug seal was placed above the sand pack to 0.3 mbgs. The wells were completed with protective steel casing.

Each monitoring well was equipped with dedicated 13 mm HDPE tubing and Waterra D-25 inertial pump to facilitate well development.

2.3.5.3 Groundwater: Elevations and Flow Direction

Static water levels were measured on two occasions, prior to well development and groundwater sampling. Well development occurred on October 26, 2022, measured water levels ranged between 0.95 and 1.93 mbgs. Groundwater sampling occurred on November 7, 2022, groundwater levels ranged between 1.06 and 2.13 mbgs.

The monitoring wells were surveyed using ArrowGold GNSS high accuracy receiver. Groundwater flow direction of the shallow aquifer system at the Proposed Site Location is interpreted to be to the west/northwest, results are shown on **Appendix A1 – Figure 2** and summarized on **Table 10**.

Table 10: Groundwater Level Summary

Monitoring Well	Date	Water Level (mbgs)	Water Level (masl)
P1	October 26, 2022	1.08	106.38
	November 7, 2022	1.06	106.40
P2	October 26, 2022	1.93	105.50
	November 7, 2022	2.13	105.3
P3	October 26, 2022	0.95	104.03
	November 7, 2022	1.14	103.84

2.3.5.4 Hydraulic Conductivity Testing

Hydraulic conductivity testing was completed at each of the three monitoring wells on October 26, 2022. In order to assess the hydraulic conductivity of the shallow aquifer, a rising head test was performed at each well. The wells were pumped dry to record the well recovery by; measuring water levels manually and installing transducers programmed to record water column pressure at intervals of 1 to 5 seconds. Upon completion of the hydraulic conductivity testing, AquiferTest was used to calculate the hydraulic conductivity (k) using the Bower and Rice analysis method. Results are shown on **Table 11** and presented in **Appendix A3**.

Table 11: Hydraulic Conductivity Summary

Monitoring Well	Hydraulic Conductivity (m/s)
P1	2.2×10^{-7}
P2	3.8×10^{-8}
P3	1.3×10^{-8}

Hydraulic conductivity values ranged between 1.3×10^{-8} and 2.2×10^{-7} m/s. The shallow aquifer system at the Proposed Site Location is interpreted to be the top of the limestone bedrock. Literature values indicate that the hydraulic conductivity limestone can range between 10^{-6} and 10^{-9} m/s (Freeze and Cherry, 1979).

2.3.5.5 Soil Percolation Testing

Soil percolation testing was completed on November 7, 2022, using a Guelph Permeameter. The location of test pit GP1 is shown on **Appendix A1 – Figure 2**, and the soil type within GP1 was observed to be dark gray silty clay. The change in water level within the Guelph Permeameter water reservoir could not be observed during the test due to the nature of the fine soils (silty clay to clay). It was determined that the use of a Guelph Permeameter is not suitable to measure the infiltration rate of the shallow soils at the Proposed Site Location due to the characteristics of the fine soils and the limited capabilities of the equipment in the fine soil type.

Inspec-Sol's (2004) results of field percolation testing indicate that the stratified in-situ soils at the Site have a permeability range in the order of 10^{-2} to 10^{-6} cm/s. The permeability of the soil is anticipated to be greater in the horizontal direction, with lower permeability in the vertical direction. Laboratory falling head permeability testing

completed by Inspec-Sol of the same soil tested during the field percolation testing, indicates permeability values of 1.9 to 6.8×10^{-8} cm/s.

Based on the characteristics of the surficial soil and previous findings, the percolation time is likely greater than 50 min/cm.

2.3.5.6 Groundwater: Sampling

Groundwater samples were collected from all monitoring wells (P1, P2 and P3) on November 7, 2022. Samples were collected by low flow method with newly installed 6-mm LDPE tubing, a peristaltic pump and a Horiba U-52 to assess pH, dissolved oxygen, temperature and turbidity throughout the sampling process. New 0.45-micron disposable filters were used for samples being analyzed for metal parameters.

Disposable nitrile gloves were used during sample collection and changed between each sample to minimize the potential for cross-contamination. Groundwater samples were collected directly into laboratory-supplied bottle and stored in a cooler containing ice. The groundwater samples were submitted to the analytical laboratory under the standard chain of custody procedures.

Four groundwater samples, including one field duplicate sample, were submitted for laboratory analysis, as summarized in **Table 12**.

Table 12: Summary of Groundwater Samples Submitted for Laboratory Analysis

Sample ID	Laboratory Analysis	Additional Information
P1	Metals & Inorganics, PAHs, PHCs, VOCs	
P2	Metals & Inorganics, PAHs, PHCs, VOCs	
P3	Metals & Inorganics, PAHs, PHCs, VOCs	
Dup 1	Metals & Inorganics, PAHs, PHCs, VOCs	Field duplicate of P1

Groundwater samples were submitted to Bureau Veritas (BV) Laboratories in Mississauga, Ontario, for chemical analysis for the above listed parameters. BV Laboratories is accredited by the Canadian Association for Laboratory Accreditation (CALA) for the analytical testing completed as part of this investigation.

Groundwater: Analytical Results

The groundwater analytical results were compared to MECP Table 6: Generic Site Condition Standards for Shallow Soils in a Potable Ground Water Condition (MECP Table 6). This is the same criteria used in the dredge dewatering facility closure plan completed by XCG in 2015 and used to compare groundwater quality then to now for consistency. All samples met the reference MECP Table 6 criteria which would be applicable for the proposed development.

The analytical results are presented in **Appendix A4** and the Laboratory Certificates of Analysis are provided in **Appendix A5**.

2.3.6 Site Suitability

2.3.6.1 Hydrogeological Conditions

The Proposed Site Location is located within the Cataraqui SPA and is identified to be within a SGRA and an HVA. Potential Karst Topography mapping noted in the City of Kingston Official Plan (2021), indicates the Proposed Site Location is on potential/inferred karst topography. The Cataraqui SPP outlines that if there is any evidence of surface karst on a property, a karst assessment must be completed by a karst specialist. Further studies are needed to determine if surface karst formations exist within the Proposed Site Location.

Previous investigations by Inspec-Sol (2004) indicate that the stratified in-situ soils at the Proposed Site Location have a permeability range in the order of 10^{-2} to 10^{-6} cm/s. Laboratory falling head permeability testing of the same soil tested during the field percolation testing, indicates permeability values of 1.9 to 6.8×10^{-8} cm/s.

Despite the limited response of the Guelph permeameter testing, observations made during the drilling program and the results of the grain size distribution testing, suggest the existing shallow soil (silty clay) permeability is consistent with Inspec-Sol's findings. The percolation time for the surficial soil is likely greater than 50 min/cm.

The groundwater within the shallow aquifer at the Proposed Site Location is interpreted to flow to the west/northwest (approximately 1.2 km) towards Little Cataraqui Creek, the shallow aquifer's hydraulic conductivity was observed to range in magnitudes of 10^{-8} and 10^{-7} m/s.

Despite the relatively low hydraulic characteristics of the shallow aquifer at the Proposed Site Location, Best Management Practices and operations guidelines should be considered for the proposed Facility in order minimize the risk to the groundwater as the Proposed Site Location is located on a SGRA and a HVA as identified in the Cataraqui SPA.

Best Management Practices include but are not limited to:

- Bulk storage of chemicals or fuel must be placed in certified containers and follow applicable regulations and best practices (i.e., labelling, developing spill contingency plans, etc.);
- Secondary containment for bulk storage containers of oils and chemicals to prevent spills to the ground surface; and,
- Suitable site drainage to avoid areas of ponding near operations and proper containment of any material handling areas or transfer points where spills or drips may occur to prevent process water runoff and contamination of local watercourses.

It is understood that there is no existing water servicing infrastructure in the vicinity of the Proposed Site Location as it is located outside of the City of Kingston's urban boundary. As a result, the proposed Facility will need to rely on groundwater supply wells for potable and process water, if alternative methods are not suitable (i.e., trucking in water). Within the Study Area, numerous supply wells were identified as shown on **Table 8** and **Appendix A1 – Figure 1**; all water supply wells were completed within a regional limestone at bottom depths ranging between 18.3 and 54.2 metres and pumping rates ranging between 18.9 and 75.7 litres per minute.

The water demands for the Facility will be largely determined through vendor discussions. Dillon's recent *Phase 1 and 2 Reconfirmation: Problem/Opportunity Statement and Screening Process and Results* memo outlined a fresh water demand of approximately 16 m³/d, which will be highly dependent on the water content of raw feedstock arriving at the Facility, required solids content of material in the digestion process and desired product consistency.

A review of the supply wells installed within the deep regional limestone aquifer located within the Study Area, suggests the deep aquifer can likely service a Facility with an assumed fresh water demand of approximately 16 m³/day (or 11 L/min). However,

further studies will be required to confirm the suitability of groundwater supply at the Proposed Site Location. It is also noted that actual water demands for the Facility will be largely determined through vendor discussion and could ultimately exceed the assumed fresh water demand. It should be noted that, groundwater takings at or above 34.8L/min for a 24-hour period will require a Permit-To-Take-Water as water takings would exceed 50,000L per day.

2.3.6.2 Environmental Conditions: Soil

The Proposed Site Location has historically been used as dredge dewatering facility and operated under Provisional Certificate of Approval (C of A) Number 2039-5SJM8X. The dredge material was generated during the construction of sewer and water mains across the Great Cataraqui River and was placed within three containment cells at the Proposed Site Location. Containment Cell A, constructed with a geotextile polyethylene liner, was used to store and dewater material considered to be potentially contaminated. Containment Cells B and C, constructed using the native clay as a liner, was used to store and dewater material presumed to be non-contaminated.

Throughout the operations of the dredge dewatering facility, the dredge material was sampled on several occasions between 2004 and 2009; analytical results were compared to MECP (formerly MOECC) Table 6 soil quality standards for Industrial/Commercial/Community (ICC). Analytical results of the dredge material within Cell A was found to exceed arsenic and boron concentrations of the applicable criteria. Analytical results of the dredge material within Cells B and C were found to meet the applicable criteria.

The dredge material contained within Cell A (approximately 5,139 m³) was completely removed and hauled to Kingston East Landfill. Upon further characterization (according to condition 25(b) of ECA Notice No. 2) of the dredge material in Cells B and C; exceedances of arsenic were found in a sample taken from Cell C. Subsequently, the contaminated dredge material was delineated and approximately 907.2 m³ was removed from the Proposed Site Location (XCG, 2015).

Based on the past use and soil remediation activities as described in the Closure Plan by XCG in 2015, it is anticipated that soil quality at the Proposed Site Location will not impact the development of the proposed Facility. That said, further soil sampling may be required depending on project activities and needs.

2.3.6.3 Environmental Conditions: Groundwater

Throughout the operations of the former dredge dewatering facility, the groundwater quality of the shallow and deep aquifers (as referred to in previous reports) at the Proposed Site Location has been monitored and compared to MECP Table 6. On occasion (2011) minor exceedances of chloride were identified in the shallow aquifer; however, the exceedance of chloride is believed to be a result of the snow management facility located up gradient, directly to the east of the Proposed Site Location. Minor exceedances of selenium and petroleum hydrocarbons (PHC) F3/F4 have been found in the deep aquifer; however, the elevated concentrations are not believed to be related to the dredge dewatering facility as exceedances were not detected in the shallow aquifer (XCG, 2015).

The analytical groundwater samples collected as part of this suitability study, indicate groundwater quality of the shallow aquifer at the Proposed Site Location meets MECP Table 6 as discussed in **Section 2.3.5.6 "Groundwater: Analytical Results"**.

Based on the historic and recent groundwater quality monitoring completed at the Proposed Site Location, it is anticipated that the shallow groundwater quality will not impact the development of the proposed Facility from a contaminated sites perspective.

Further studies during the Class Environmental Assessment (EA) are required to determine if groundwater quality, particularly of the deep limestone aquifer, is appropriate for process water and/or potable consumption. It is understood the City is proceeding with developing a well for testing on the site in spring 2023.

2.4 Natural Environment

The purpose of the Natural Environment assessment was to identify potential natural environment constraints that may be present within Knox Farm in order to inform on the suitability of the proposed development of Knox Farm into the future site of the Facility.

This section summarizes the results of the existing conditions review and suitability assessment which included a background review of the existing conditions of the natural environment (e.g., woodlands, wetlands, potential habitat for species at risk (SAR), and wildlife habitat) of Knox Farm and a field investigation focused within the southwest

quadrant to assist in desktop review including the identification of ecological communities and potential natural heritage features that may occur.

For the purposes of the Natural Environment assessment, Knox Farm has been separated into two areas: the “Proposed Site Location” which encompasses previously disturbed portions of the Property, and the entire Knox Farm Property herein referred to as the “Desktop Study Area”. Field investigation was primarily focused on the Proposed Site Location which represents candidate areas for development of the Project while the Desktop Study Area was assessed primarily by desktop review to screen for potential future opportunities and constraints. The two Study Areas are shown in **Appendix B1 – Figure 1**.

2.4.1 Approach

A desktop review of mapping, aerial imagery and relevant background information was conducted to screen the potential for natural heritage features, SAR and SAR habitat and any other sensitive natural environment features within the immediate vicinity of the Desktop Study Area (**Appendix B1 – Figure 2**). Following the background review, Dillon undertook a field investigation on September 26, 2022, within the Proposed Site Location (**Appendix B1 – Figure 1**) to verify desktop findings and search for any additional natural heritage or sensitive natural environment features that may occur within and adjacent to the Proposed Site Location for the purposes of the immediate proposed Project.

2.4.1.1 Background Review Methods

A desktop review of mapping, aerial imagery and relevant background information as well as applicable provincial and municipal policies and guidelines was conducted to identify potential environmental constraints within and adjacent to the Desktop Study Area to inform on the suitability of the Property for future development. A background information review of the following sources was undertaken:

- Aerial and roadside photography and satellite imagery (GoogleEarth, GoogleMaps Street View);
- Provincial Policy Statement (PPS; 2020);
- Ministry of Natural Resources and Forestry (MNRF) Land Information Ontario (LIO) database;

- MNRF Natural Heritage Information Centre (NHIC) (1 km squares #18UQ7904, 18UQ8004, 18UQ7903, 18UQ8003);
- Ministry of the Environment, Conservation and Parks (MECP), *Ontario Regulation 242/08* (General) and *Ontario Regulation 230/08* (the Species at Risk in Ontario [SARO] List) of the *Endangered Species Act (ESA)* (2007);
- Various wildlife atlases, including:
 - Ontario Breeding Bird Atlas (10 km grid squares #18TUQ70, 18TUQ80);
 - Ontario Herpetofaunal Atlas;
 - Ontario Butterfly Atlas (10 km grid squares #18UQ70, #18UQ80);
 - Ontario Reptile and Amphibian Atlas (Ontario Nature, 2019);
 - Ontario Odonata Atlas (NHIC, 2005); and,
 - Atlas of the Mammals of Ontario (Patterson *et. al.*, 2007).
- City of Kingston Official Plan (2021 consolidation);
- CRCA Regulations Map (**attempted to access; however, currently unavailable*);
- CRCA – Little Cataraqui Creek Conservation Area Master Plan, 2012;
- Central Cataraqui Region Natural Heritage Study (2006); and,
- University of Toronto Map and Data Library, 1954 Air Photos of Southern Ontario.

For the purposes of this review, we have considered such items as Conservation Authority Regulation Limits, existing and potential natural heritage features, habitat contiguity and physical landforms. We have also highlighted potential restrictions and buffers or setbacks that would be anticipated based on the applicable policies.

2.4.1.2 Field Investigation Methods

A field investigation was conducted by two Dillon biologists on September 26, 2022, which consisted of site reconnaissance and SAR and general wildlife habitat assessments, Ecological Land Classification (ELC), and a single-season (late-summer) botanical survey focused within the Proposed Site Location. Incidental wildlife observations made during the surveys were also documented. Fieldwork conducted for the Natural Environment assessment occurred in 2022, when weather conditions and timing were deemed suitable based on the survey protocols being implemented. The remaining areas outside of the Study Area within Knox Farm (the Desktop Study Area) were assessed primarily via desktop review and will need to be reassessed via field investigations for future development proposals. The following sub-sections outline the specific field survey methodologies.

Site Reconnaissance and Wildlife Habitat Assessment

Wandering transects of the Proposed Site Location were conducted to identify the potential for natural heritage features including woodlands, wetlands, significant wildlife habitat (SWH) and SAR and SAR habitat. Examples of potential natural features of interests for potential SAR habitat and candidate SWH may include but not limited to unique vegetation communities, presence of potential nesting or overwintering areas for SWH for turtle or for Blanding's Turtle (*Emydoidea blandingii*), presence of mature trees with peeling or loose bark that could be suitable SAR bat habitat, potential habitat for SAR birds, for potential SWH for amphibian breeding habitat (woodland or wetland) in the form of vernal pools, wetland pockets, etc. and other incidental wildlife observations.

Identification of SWH followed criteria outlined in the Ecoregion 6E Criterion Schedule (MNRF, 2015) of the Significant Wildlife Habitat Technical Guide (MNRF, 2000); while assessment for potential SAR habitat followed other guidelines and standards set by the MECP such as the General Habitat Description for Blanding's Turtle (*Emydoidea blandingii*) (2013), General Habitat Description for Eastern Meadowlark (*Sturnella magna*) (2016), General Habitat Description for Bobolink (*Dolichonyx oryzivorus*) (2016), and Bats and Bat Habitats Guidelines for Wind Power Projects (2011).

Ecological Land Classification

Vegetation communities were assessed using the ELC system for Southern Ontario, second approximation (Lee *et al.*, 1998; Lee, 2008) to serve as a baseline for identifying and assessing potential for natural heritage features within and adjacent to the Proposed Site Location. During the field investigations, vegetation was characterized using ELC in order to classify and map ecological communities to the vegetation level. Soil texture and site moisture characteristics were determined through the examination of hand auger soil profiles to further refine the ELC classification. Vegetation communities within Knox Farm outside of the Proposed Site Location were assessed via desktop review only and were supplemented by field observations from the boundaries of the Proposed Site Location and along the access road when entering the Proposed Site Location.

Botanical Survey

A single-season (late-summer) botanical survey was conducted in tandem with the ELC, and consisted of wandering transects and/or area searches to determine the presence, richness and abundance of floral species within the Study Area as well as presence/absence of botanical SAR. Species nomenclature recorded is based on the Ontario Plant List (Newmaster et al, 1998).

Incidental Wildlife Observations

Incidental observations of wildlife and potential wildlife habitat encountered in the field were noted including visual and auditory wildlife observations, roadkill and indirect wildlife evidence such as dens, tracks, and scat. For each observation, notes, and when possible, photos were taken. These observations helped to determine potential ecological functions, linkages, etc., within the Proposed Site Location.

2.4.2 Results

Based on background review of applicable policies and guidance documents from the City of Kingston, the Desktop Study Area occurs outside the Urban Boundary and is identified as being within Rural Lands, Open Space and Environmental Protection Area (EPA) designation on Schedule 2 and Schedule 3-B of the City of Kingston Official Plan (OP), 2021. The Proposed Site Location specifically contains a slim area section of EPA within and along the western boundary and the remainder of the area is designated as Open Space. A review of available aerial imagery reveals that a little over half the Desktop Study Area contains wooded areas as mapped by the City of Kingston and MNRF LIO and the other half contains meadow open areas. **Appendix B1 – Figure 2** illustrates the environmental features identified through background review within and adjacent to the Proposed Site Location and Desktop Study Area at a landscape level.

The results of the background review and the site visit as they relate to natural heritage features are presented in the sections below. The areas outside of the focused site visit includes the remaining areas within the Desktop Study Area outside of the Proposed Site Location and will need to be reassessed for future development proposals.

2.4.2.1 Ecological Land Classification

In total, 10 ELC communities were identified within the Desktop Study Area, eight of which are considered natural, the remaining two are considered cultural. Approximately half of the communities within the Desktop Study Area are wooded, including forest, swamp and thicket while the other half was identified as meadow. The Proposed Site Location is primarily meadow with woodland and thicket along the boundary. None of the ELC communities observed are considered rare in Ontario. The boundaries and locations of ELC communities are shown in **Appendix B1 – Figure 3**. A full list of ELC community types, descriptions within the Desktop Study Area are provided in **Table 13** below. Representative photos of vegetation communities identified can be found in **Appendix B3**.

Table 13: Ecological Land Classification

ELC code	Classification	Total Area within Study Area (ha)	Vegetation	Photo Appendix C
NATURAL				
FOD	Deciduous Forest	10.71	Community dominated by deciduous trees. ELC community is based on desktop (aerial) interpretation only.	---
FODM6-2	Fresh-Moist Sugar Maple-Black Maple Deciduous Forest	9.76	This forest community is dominated by deciduous trees and shrubs. The canopy has greater than 60% cover and it is dominated by Sugar Maple (<i>Acer saccharum</i>) Black Maple (<i>Acer nigrum</i>), Eastern Hop-hornbeam (<i>Ostrya virginiana</i>) and White Ash (<i>Fraxinus americana</i>). The sub-canopy has a similar species composition as the canopy while the understory consisted of Sugar Maple, Eastern Hop-hornbeam and Common Buckthorn (<i>Rhamnus cathartica</i>). The ground layer is made up of seedling Sugar Maple, Panicked Aster (<i>Symphyotrichum lanceolatum</i> ssp. <i>lanceolatum</i>) and Herb-Robert (<i>Geranium robertianum</i>).	1
THD	Deciduous Thicket	13.06	Communities dominated by shrubs with little or no canopy. ELC community is based on desktop (aerial) interpretation only.	---
THDM2-6	Buckthorn Deciduous Shrub Thicket	16.90	Community composition varies slightly. However, each region remains dominated by Common Buckthorn. The northern section of this community has an open canopy (10% or less) that consists of Sugar Maple and White Ash. Sub-canopy and understory is comprised mostly of Common Buckthorn with some Tartarian Honeysuckle (<i>Lonicera tatarica</i>) in areas. White Ash occurs in areas of the sub-canopy and Riverbank Grape (<i>Vitis riparia</i>) occurs in	2

ELC code	Classification	Total Area within Study Area (ha)	Vegetation	Photo Appendix C
			<p>the understory as well. The ground layer is dominated by European Swallow-wort (<i>Cynanchum rossicum</i>) with Common Crown-vetch (<i>Securigera varia</i>), Awnless Brome (<i>Bromus inermis</i>) and Common Dandelion (<i>Taraxacum officinale</i>) occurring as well.</p> <p>The western portion of the community has an open canopy of between 10-25% and consists of Sugar Maple and Black Maple. Common Buckthorn was the dominant species in both the sub-canopy and understory. Hardwoods such as White Ash and Shagbark Hickory (<i>Carya ovata</i>) occur in both these communities. Black Maple and Sugar Maple seedlings are present in the ground layer with Virginia Creeper (<i>Parthenocissus quinquefolia</i>) and Riverbank Grape being found as well.</p> <p>The southern portion of this community has a canopy cover of between 10-25% with White Ash, Wild Black Cherry (<i>Prunus serotina</i>) and Sugar Maple occurring. In the sub-canopy, understory and ground layer, Common Buckthorn is the most dominant. White Ash occurs in both the sub canopy-and the understory. Riverbank Grape is present in the understory and European Swallow-wort and Garlic Mustard (<i>Alliaria petiolata</i>) is present in the ground layer.</p>	
FODM8-3	Moist Cottonwood Deciduous Forest	0.30	<p>This forest community is dominated by deciduous trees and shrubs. However, meadow species such as Canada Goldenrod (<i>Solidago canadensis</i> var. <i>canadensis</i>) and European Common Reed (<i>Phragmites australis</i> ssp. <i>australis</i>) are common on the outer edges of the community. The canopy cover is between 10-25% and is dominated by</p>	3

ELC code	Classification	Total Area within Study Area (ha)	Vegetation	Photo Appendix C
ME	Meadow	11.61	<p>Eastern Cottonwood (<i>Populus deltoides</i> ssp. <i>deltoides</i>); however, White Willow (<i>Salix alba</i>) is common in sections as well. The sub-canopy cover is greater than 60% and consists of Eastern Cottonwood. The understory consists of Common Buckthorn and European Common Reed; however, Hemp Dogbane (<i>Apocynum cannabinum</i>) is common in some areas as well. The ground layer is comprised of Canada Goldenrod and Common Buckthorn with White Heath Aster (<i>Symphyotrichum ericoides</i> var. <i>ericoides</i>), Panicked Aster and Riverbank Grape being common too.</p> <p>Community with no canopy dominated by graminoids and/or forbs. ELC community is based on desktop (aerial) interpretation only.</p>	---
MEGM3-8	Reed Canary Grass Graminoid Meadow	7.52	<p>Reed Canary Grass (<i>Phalaris arundinacea</i>) dominates the ground layer with occasional Grass-leaved Goldenrod (<i>Euthamia graminifolia</i>) and Canada Goldenrod are found in both layers with Common crown-vetch, New England Aster (<i>Symphyotrichum novae-angliae</i>), White Heath Aster and Panicked Aster being found in the ground layer.</p> <p>There is a noticeable change in the centre of the community which contained abundant European Common Reed and Reed Canary Grass with occasional Bittersweet Nightshade (<i>Solanum dulcamara</i>), Grass-leaved Goldenrod and Canada Goldenrod. The soil profile indicated that this area could be interpreted as a wetland due to the shallow layers of clay; however, based on multiple years of disturbance noted during the background review, the small size of the community and lack of functional wetland habitat, this area remained as one community.</p>	4, 5

ELC code	Classification	Total Area within Study Area (ha)	Vegetation	Photo Appendix C
SWD	Deciduous Swamp	13.1	Community dominated by deciduous trees, but has been mapped as unevaluated wetland by MNRF. ELC community is based on desktop (aerial) interpretation only.	---
CULTURAL				
TAGM5	Fencerow	0.27	Dominated by deciduous trees such as Sugar Maple, Bur Oak (<i>Quercus macrocarpa</i>), American Basswood (<i>Tilia americana</i>), Eastern Cottonwood and American Elm (<i>Ulmus americana</i>). Understory included Gray Dogwood (<i>Cornus racemosa</i>), Common Buckthorn and Chokecherry (<i>Prunus virginiana</i>).	6
CVI_2	Disposal and Recycle	3.24	Composed of a road and two parking lots. Based on aerial imagery and background review the area is used by the City of Kingston area as a snow disposal area.	7

2.4.2.2 Botanical Survey

A total of 63 vascular plant species were documented within the Proposed Site Location during the September 2022 site visit. Of the 63 species, approximately 60% are listed as native species considered to be common (S4) to very common (S5) in the province of Ontario; and approximately 40% are listed as non-native species; therefore, a status ranking is not applicable as the species is not a suitable target for conservation activities (SE or SNA rank). One plant was only identified to the genus level (Willow [*Salix sp.*]) and could not be identified to the species level; therefore, no status ranking is assigned. None of the plant species observed are designated as SAR under the Ontario *Endangered Species Act* (ESA) or the Federal *Species at Risk Act* (SARA).

The Co-efficient of Conservatism (CC) provides additional information on the nature of the vegetation communities with the Proposed Site Location. The CC values range from 0 to 10 and represent an estimated probability that a plant is likely to occur in a landscape that is relatively unaltered or is in a pre-settlement condition. For example, a CC of 0 is given to plants such as Manitoba Maple that demonstrate little fidelity to any remnant natural community, i.e., may be found almost anywhere. Similarly, a CC of 10 is applied to plants like Shrubby Cinquefoil (*Potentilla fruticosa*) that are almost always restricted to a pre-settlement remnant, i.e., a high-quality natural area. Introduced plants were not part of the pre-settlement flora, so no CC values have been applied to these species.

The average CC value for the site was 3.4 out of a possible 10 indicating a relatively altered landscape as compared to naturally occurring environments. The plant species with the highest CC value observed was Black Maple (*Acer Nigrum*) with a value of 7. A full list of the vegetation species observed within the Proposed Site Location has been included in **Appendix B2**.

2.4.2.3 Wetlands

Provincially Significant Wetlands (PSW) are wetland areas that receive special protection by the province based on calculated value as determined by the scientifically based Ontario Wetland Evaluation System (OWES). Several unevaluated wetlands occur through the Desktop Study Area and one PSW (Little Cataraqui Creek Complex) occurs approximately 40 m northwest of the Desktop Study Area. The location of Little

Cataraqui Creek Complex PSW and the unevaluated wetlands within the Desktop Study Area are shown in **Appendix B1 – Figure 2**.

No wetlands were identified within the Proposed Site Location as the result of the ELC and site visit. Desktop ELC completed for the remaining portions of Knox Farm identified several unevaluated wetlands in the form of deciduous swamp concentrated within the northwest and southeast quadrants of the Study Area. Wetlands identified by MNRF background mapping outside of the Proposed Site Location were assumed to be present for the purpose of this report. Wetlands identified within the Desktop Study Area are shown in **Appendix B1 – Figure 3**.

2.4.2.4

Woodlands

Section 1 of the City of Kingston OP identifies significant woodlands as those woodlands identified by the Central Cataraqui Region Natural Heritage Study (2006) or identified using criteria established by the MNRF using evaluation procedures established by the Province. A review of Schedule 8-B of the City of Kingston OP reveals that significant woodlands occur within the Desktop Study Area. The extent of significant woodlands identified within the Desktop Study Area by the City of Kingston was generally consistent with woodlands shown in **Appendix B1 – Figure 2** from MNRF data.

Only small portions of or small woodlands were observed within the boundaries of the Proposed Site Location as the result of the ELC and the site visit and occur as deciduous forest. ELC based on desktop review for the remaining portions of the property identified additional woodlands to occur in the form of deciduous swamp and deciduous forest concentrated within the northwest and southeast quadrants of the Desktop Study Area. The majority of woodlands identified by desktop review outside of the Proposed Site Location were assumed to be present for the purpose of this report with the exception to the area that could be confidently analyzed through aerial interpretation as thicket. Woodlands identified within the Study Area and Desktop Study Area as a result of the ELC are shown in **Appendix B1 – Figure 3** and have been assumed significant as they overlap with significant woodland as per Schedule 8-B of the City of Kingston OP. Many portions of woodlands identified by MNRF and Schedule 8-B of the City of Kingston OP to be woodland were actually identified as deciduous thicket based on the site visit and desktop review and have been excluded from consideration as significant woodland.

2.4.2.5

Valleylands

Section 1 of the City of Kingston OP also identifies significant valleylands, which are identified as those identified by the Central Cataraqui Region Natural Heritage Study (2006) or through criteria established by the MNRF. Schedule 8-B of the City of Kingston OP identifies one significant valleyland associated with Little Cataraqui Creek to be located within the northwest corner of the Desktop Study Area.

2.4.2.6

Areas of Natural and Scientific Interest

Areas of Natural and Scientific Interest (ANSI) are designated by the MNRF based on the presence of unique natural landscapes or existing features that meet specific criteria as having life or earth science values related to protection, scientific study or education. A review of the MNRF LIO geographic database indicates that the Cataraqui Clay Creek Ridges Earth Science Regionally Significant ANSI occurs within and adjacent to the west and north boundaries of the Desktop Study Area and aligns with the EPA designation as described above (**Appendix B1 – Figure 2**).

2.4.2.7

Significant Wildlife Habitat

The Significant Wildlife Habitat Technical Guide (MNRF, 2000) defines Species of Conservation Concern (SCC) as globally, nationally, provincially, regionally, or locally rare (S-Rank of S1, S2 or S3) as well as species listed as Endangered or Threatened federally; but does not include provincial SAR (species listed as Threatened or Endangered under the ESA). SCC include the following:

- Species that are assigned a conservation rank of S1-S3 by the NHIC;
- Species that are listed as Special Concern on the SARO list;
- Species that are listed as Special Concern, Threatened, or Endangered on Schedule 1 of SARA; and/or,
- Species that are classified as Special Concern, Threatened, or Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) but have not yet been added to Schedule 1 of SARA.

Based on the results of the background review, a total of 11 SCC listed in **Table 14** below were identified as having the potential to occur within the general vicinity of the Desktop Study Area and have been considered in determining the potential for SWH within the Study Area.

Table 14: SAR and SCC with the Potential to Occur within the Vicinity of the Desktop Study Area

Scientific Name ¹	Common Name	SARA ¹	ESA ²	S-Rank ³	Info Source ⁴
BOTANICAL					
<i>Fraxinus nigra</i>	Black Ash	---	END	S4	TOC
<i>Juglans cinerea</i>	Butternut	END	END	S3?	NHIC, TOC
BIRDS					
* <i>Ammodramus savannarum</i>	Grasshopper Sparrow	SC	SC	S4B	OBBA
<i>Chaetura pelagica</i>	Chimney Swift	THR	THR	S4B, S4N	OBBA
* <i>Contopus virens</i>	Eastern Wood-pewee	SC	SC	S4B	OBBA
<i>Dolichonyx oryzivorus</i>	Bobolink	THR	THR	S4B	NHIC, OBBA
<i>Sturnella magna</i>	Eastern Meadowlark	THR	THR	S4B	CBC, NHIC, OBBA
<i>Hirundo rustica</i>	Barn Swallow	THR	THR	S4B	OBBA
<i>Riparia riparia</i>	Bank Swallow	THR	THR	S4B	OBBA
<i>Lanius ludovicianus migrans</i>	Loggerhead Shrike	END	END	S2B	NHIC
<i>Colinus virginianus</i>	Northern Bobwhite	END	END	S1	NHIC
* <i>Chordeiles minor</i>	Common Nighthawk	THR	SC	S4B	OBBA
<i>Ixobrychus exilis</i>	Least Bittern	THR	THR	S4B	NHIC, OBBA
* <i>Melanerpes eruthrocephalus</i>	Red-headed Woodpecker	THR	SC	S4B	CBC
* <i>Hylocichla mustelina</i>	Wood Thrush	THR	SC	S4B	NHIC, OBBA
MAMMALS					
<i>Myotis leibii</i>	Eastern Small-footed Myotis	---	END	S2S3	MWH
<i>Myotis lucifugus</i>	Little Brown Myotis	END	END	S4	MWH
<i>Myotis septentrionalis</i>	Northern Myotis	END	END	S3	MWH
<i>Pipistrellus subflavus</i>	Tri-colored Bat	END	END	S3?	MWH

Scientific Name [*]	Common Name	SARA ¹	ESA ²	S-Rank ³	Info Source ⁴
HERPTILES					
<i>*Pseudacris triseriata</i> pop. 1	Western Chorus Frog (Great Lakes /St. Lawrence – Canadian Shield Population)	THR	---	S3	ON
<i>Emydoidea blandingii</i>	Blanding's Turtle	THR	THR	S3	ON
<i>Pantherophis spiloides</i>	Gray Ratsnake (Frontenac Axis population)	THR	THR	S3	ON, NHIC
<i>*Graptemys geographica</i>	Northern Map Turtle	SC	SC	S3	ON
<i>*Sternotherus odoratus</i>	Eastern Musk Turtle	SC	SC	S3	ON
<i>*Thamnophis sauritus</i>	Eastern Ribbonsnake (Great Lakes population)	SC	SC	S3	ON
<i>*Chrysemys picta marginata</i>	Midland Painted Turtle	SC	---	S4	NHIC
LEPIDOPTERA					
<i>*Danaus plexippus</i>	Monarch	SC	SC	S2N, S4B	OBA

¹ Federal Species at Risk Act, 2002.

² Provincial Endangered Species Act, 2007.

³ S-Rank is an indicator of commonness in the Province of Ontario. A scale between 1 and 5, with 5 being very common and 1 being the least common. These provincial ranks may further be modified; ? - A question mark following the rank indicates that there is some uncertainty with the classification due to insufficient information; S2S3 - Indicates that an element is rare, but insufficient information exists to accurately assign a single rank.

⁴ Information sources: CBC = Christmas Bird Count, MECP = Ministry of Environment, Conservation and Parks, MWH = Digital Distribution Maps of the Mammals of the Western Hemisphere, NHIC = MNRF Natural Heritage Information Centre, OBA = Ontario Butterfly Atlas; OBBA = Ontario Breeding Bird Atlas, version 3.0, ON = Ontario Nature Reptile and Amphibian Atlas, TOC = Trees of Canada.

*An asterisk indicates the species is identified as a SCC.

Criteria for determining the significance of wildlife habitat follow the guidelines outlined in the NHRM (MNRF, 2010) and the Significant Wildlife Habitat Technical Guide Ecoregion 6E Criterion Schedules (MNRF 2015), where applicable. The Desktop Study Area, particularly the woodland areas (forest and swamp) throughout the Desktop Study Area, have the potential to contain features that may support SWH such as bat maternity colonies, amphibian breeding habitat (woodland and wetland) and habitat for special concern or rare wildlife species (Wood Thrush and Eastern Wood-Pewee).

Further studies such as breeding bird surveys and amphibian surveys are recommended to confirm the presence or absence of SWH within the Proposed Site Location and Desktop Study Area.

2.4.2.8 Species at Risk and Species at Risk Habitat

The Desktop Study Area and adjacent natural environments were considered during background review (**Appendix B1 – Figure 2**). 16 SAR were identified through background review with the potential to occur within the vicinity of the Desktop Study Area, and are included in **Table 14** above.

Of the 16 SAR identified, and considering their range distributions, known occurrences, the vegetation communities and habitat features observed in the Proposed Site Location and ELC communities identified throughout the Desktop Study Area the following species have been brought forth for further consideration:

- Black Ash;
- Butternut;
- Blanding's Turtle;
- Bobolink;
- Eastern Meadowlark; and,
- SAR bats.

Although not observed within the Proposed Site Location, Black Ash and Butternut have the potential to occur throughout the existing portions of the Desktop Study Area. It should be noted that the MECP temporarily suspended protections for Black Ash starting in January 2022 when the species was added to the SARO list until January 2024 and during this time, proponents will not need to seek authorizations for activities that impact Black Ash and its habitat.

Both Eastern Meadowlark and Bobolink require large grassland habitat to complete their life processes. This may include (but is not limited to): hayfields, pastures, and old or abandoned fields. Bobolink are highly area sensitive and require areas of habitat that are much larger than Eastern Meadowlark which is a less area sensitive species. Based on the 2022 site visit and desktop review, Knox Farm may contain suitable habitat associated with meadow communities. However, based on size requirements for Bobolink (≥ 10 ha) the habitat would only be considered suitable for Eastern

Meadowlark. Meadows along Perth Road may provide suitable breeding habitat for Eastern Meadowlark; however, meadow community within the Proposed Site Location was observed as disturbed and has been considered to have a low probability of providing suitable habitat for Eastern Meadowlark. Absence of Eastern Meadowlark habitat should be confirmed via breeding bird surveys.

Based on the site visit, Blanding's Turtle nesting and overwintering habitat was not observed within the Proposed Site Location; however, this species was considered as potentially occurring within the Proposed Site Location and Desktop Study Area based on nearby potential aquatic habitat associated with Little Cataraqui Creek PSW complex located approximately 40 m northwest of the Study Area (**Appendix B1 – Figure 4**) as this species is known to travel considerable distances from their habitat of origin during nesting and overwintering migrations (MECP, 2019). Bats utilize mature trees and snags with peeling bark, cracks, crevices, cavities and dense leaf clusters as well as human made structures for maternity roosting (MECP, 2022). With the exception to the Cottonwood Deciduous Forest (FODM8-3) which was observed to not contain suitable SAR bat habitat, the woodland communities (i.e., forest and swamp) throughout the Proposed Site Location and Desktop Study Area have the potential to contain snags and trees that could support roosting habitat for SAR bats.

Further studies such as breeding bird surveys and amphibian surveys are recommended to confirm the presence or absence of potential SAR and SAR habitat within the Proposed Site Location and Desktop Study Area.

2.4.2.9 Incidental Wildlife Observations

One species, Blue Jay (*Cyanocitta cristata*) was observed during the site visit and is considered widespread and common in Ontario (Srank of S5). No other incidental wildlife were observed during the site visit.

2.4.3 Potential Constraints and Suitability Assessment

Based on a review of applicable policies and guidelines under the City of Kingston OP and the PPS and the results of the existing conditions review and suitability assessment,

we have outlined three different levels of constraint with respect to development, as follows:

- **High Constraint Areas:** areas which contain natural features which local or provincial agencies consider having high ecological function and development is generally not permitted in these areas. Areas of high constraint often require buffers to protect and maintain their form and function;
- **Medium Constraint Areas:** areas of lower quality habitat or areas that abut high quality habitat that have moderate tolerance to site alteration. Typically, mitigation, compensation and/or permitting is required to offset works undertaken in areas of Medium Constraint; and,
- **Low Constraint Areas:** are those which contain no valuable or significant environmental features. Development is usually permitted in these areas so long as other planning and engineering criteria are met.

2.4.3.1 High Constraint Areas

Based on a review of the guiding policies of the City of Kingston OP and the PPS no areas within the Desktop Study Area have been identified as representing areas of high constraint. Although the ANSI and associated EPA designation occur within the Proposed Site Location and Desktop Study Area, the area is not considered a high constraint because development within the EPA may be allowed as per Section 3.10.3.a of the City of Kingston OP which states that if the proposed project is a new public or private works or utilities and if no other suitable areas for the facility exist the development may be allowed – criteria which could be met by the Project.

As a result, we have identified approximately 0 ha of High Constraint lands (Appendix B1 – Figure 4).

2.4.3.2 Medium Constraint Areas

Based on a review of the guiding policies of the City of Kingston OP and the PPS the following areas that are detailed in the above sections that were identified as occurring or have the potential to occur within the Desktop Study Area have been identified as representing areas of medium constrain which are subject to permits or approvals from

applicable authorities (i.e., City of Kingston, Fisheries and Oceans Canada, MNRF, MECP, CRCA):

- Significant woodlands;
- Significant valleylands;
- SAR and SWH Habitat;
- SWH;
- Unevaluated wetlands;
- Fish habitat; and,
- EPAs.

It should be noted that as per Section 6.1.8 of the City of Kingston OP, which aligns with provincial guidance on natural heritage features, many of the features identified above, and depending on the location and adjacency of the proposed development footprint, generally would trigger the requirement of an environmental impact assessment to be completed prior to commencement of development.

As a result, we have identified 46.2 ha of Medium Constraint lands (Appendix B1 – Figure 4).

2.4.3.3 Low Constraint Areas

We have considered areas of high disturbance, previously disturbed lands, cultural use and areas of low ecosystem value (invasive species communities) as a low constraint (Appendix B1 – Figure 4). This includes meadows and thicket which were observed as disturbed and/or containing high concentrations of invasive species such as Common Buckthorn.

We have identified 27.6 ha of as Low Constraint lands (Appendix B1 – Figure 4).

2.4.4 Summary and Recommendations

This Natural Environment assessment was prepared to identify potential SAR or SAR habitat and sensitive natural environment features that may occur within the Desktop Study Area. The results of Dillon's background review and site visit revealed that the majority of the Proposed Site Location contained areas of low constraint based on the disturbed meadow which dominates the centre of the Proposed Site Location and is known as the former site of the Cataraqui River Dredged Material Storage and Dewatering Facility. However, several confirmed and potential sensitive natural heritage

features were identified as occurring within or adjacent to the Desktop Study Area such as ANSIs, PSWs, significant woodlands and unevaluated wetlands; therefore, the majority of the Desktop Study Area was identified as containing areas of medium constraint.

Further, based on the background review and field visit several SAR have the potential to occur within the Proposed Site Location and Desktop Study Area. As a result, it is recommended that additional studies be conducted in 2023 to determine presence/absence of SAR and significant wildlife habitat within the Proposed Site Location such as breeding bird surveys and amphibian breeding surveys conducted during the appropriate seasons of 2023. The findings from the additional studies may highlight that the absence or presence of certain SAR habitat or Significant Wildlife Habitat which may influence the recommended buffers, mitigation measures and/or compensation recommendations regarding development in proximity to the habitat.

2.5 Noise

The potential for impact of the Facility on the acoustic environment in the area of Knox Farm was evaluated. The suitability of the Knox Farm location was assessed through the characterization of background noise environment. The applicable noise criteria and the background noise level for the Study Areas are described in the following sections.

2.5.1 D-6 Compatibility Assessment

The feasibility of a proposed land use development is assessed using the MECP D-series Guidelines and the D-6 "Compatibility Between Industrial Facilities" guideline in particular. This guideline categorizes industrial facilities and specifies the potential influence area and the required separation distance from the facility. The industrial classification and the minimum separation distance are tabulated in **Table 15**.

Table 15: Industrial Categorization and Recommended Separation Distances

Category	Categorization Criterion	Minimum Separation Distance [m]	Area of Influence [m]
Class I	Small scale and self-contained plant with no outside storage; Daytime operation only.	20	70
Class II	Medium level plant with open process and outside storage permitted; frequent movement of products and/or heavy trucks movements mostly during the daytime; shift operation permitted.	70	300
Class III	Large production level; with open process and outside storage of raw and finished products; continuous movement of products and employees.	300	100

Based on the definitions, the proposed Facility is best classified as a Class 2 Industry due to the assumed use of heavy trucks and primarily daytime operations. With this classification the minimum separation distance of 70 m and area of influence of 300 m apply. **Appendix C1 – Figure 1** shows these approximate distances based on a potential location of the Facility, as well as the closest noise sensitive Points-of-Reception (PORs) and Vacant Lots (VL) within 1 km of Knox Farm. As shown, the proposed Facility is expected to comply with the 70 m minimum separation distance and should also have no noise sensitive uses within its 300 m area of influence.

It is worth noting that the CRCA walking trail is not considered a noise sensitive land use for the purposes of the guideline since in Ontario, noise limits are primarily focused on locations where people sleep and noise sensitive institutional spaces (e.g., school classrooms). However, it is included on **Appendix C1 – Figure 1** for future reference. In particular future analysis should be aware of this walking trail when planning equipment locations and truck routes to minimize the potential noise impacts to the trail users.

2.5.2 Background Noise Assessment

In addition to the compatibility D-6 guidelines, the MECP publication NPC-300 establishes sound level limits that are applied to stationary noise sources such as

industrial facilities. The noise impact assessment descriptor is the One-Hour Equivalent Sound Level (L_{eq}). As per NPC-300, sound level limits at a point of reception is the higher of the applicable exclusion limit value, or the minimum background sound level. The ambient (background) noise environment in this area can be characterized as having qualities of a Class 1 area where the background noise is dominated by human activity. The exclusionary limits of Class 1 area are presented in **Table 16**.

Table 16: Class 1 Area Sound Level Limits

	Daytime (07:00 to 19:00)	Evening (19:00 to 23:00)	Nighttime (23:00 to 07:00)
Plane of Window [dBA]	50	50	45
Outdoor Point of Reception [dBA]	50	50	--

To confirm the Class 1 Area classification, the hourly sound levels from Perth Road were measured from September 15, 2022, to September 19, 2022. The ambient noise monitoring was carried out in accordance with applicable guidelines and methodologies, including noise measurement methodology stipulated in MECP noise publication NPC-103. The background noise monitoring program was completed using a Rion NL-52 Type I noise level meter. The unit was equipped with an environmental enclosure, an external battery and a wind screen to protect the microphone from wind and precipitation. The instrument was laboratory calibrated and field calibrated before and after the measurements period. The Monitoring Location is shown in **Appendix C2**.

The measured data was supplemented with weather data from Environment Canada's Kingston A weather station. The results of this background noise study are presented in **Appendix C2 – Table A1** with the minimum hourly measurements highlighted for each assessment period. These minimum hourly sound levels were further adjusted to estimate the background noise levels at the closest PORs. The results of this calculation are provided in **Appendix C3 – Table A2** and include corrections based on distance, exposure angles, and intervening structures.

On the south side of Highway 401, there are a number of hotels which have been identified as POR4 to POR7. Hotels are not considered noise sensitive under NPC-300 if the windows are sealed; however, for the purposes of suitability all identified hotels have been included in this assessment. The background noise levels at these PORs have

been estimated using the MECP's approved STAMSON calculation method and the Ontario Ministry of Transportation's published 2016 Average Annual Daily Traffic (AADT) for this section of Highway 401. These traffic volumes have been adjusted using the standard traffic distributions as shown in **Table 17**.

Table 17: Highway 401 Traffic Volumes (Division Street to Montreal Street)

AADT	Medium Trucks	Heavy Trucks	Day/Night Split
44,500	5%	8%	66% / 33%

The results of this assessment are summarized in **Appendix C3 – Table A2**.

2.5.3 Discussion

2.5.3.1 Results

The results of the D-6 Compatibility Assessment, as shown on **Appendix C1 – Figure 1**, confirm the proposed Facility is compatible with the surrounding land uses.

The results of the Background Noise Assessment, as shown in **Appendix C3 – Table A2**, confirm that the ambient (background) noise environment in the area is best characterized as having qualities of a Class 1 area where the background noise is dominated by human activity. Elevated noise limits were identified at some receptor locations, particularly the hotels on the south side of Highway 401.

The Knox Farm location is therefore considered likely suitable from a noise perspective.

2.5.3.2 Recommendations

To ensure the final design meets the applicable noise criteria, the following best practices are recommended:

- Ensure the final Facility location is more than 70 m from any of the identified noise sensitive locations. As a result, the area within approximately 60 m of the north property line and 50 m of the east property line are not considered suitable locations;
- To the extent possible, locate the Facility more than 300 m from any of the identified noise sensitive locations. The area within approximately 290 m of the

north property line and 280 m of the east property line are not considered suitable locations;

- To minimize the potential noise impacts to the CRCA trail users, locate the Facility more than 70 from the CRCA walking trail and orient noise sources away from the trail to the extent possible; and,
- Prepare a Noise Impact Study at the appropriate design stages to inform equipment selection and any identify any additional noise mitigation requirements.

2.6 Site Servicing

The purpose of this section is to provide sufficient information to determine if the proposed site is feasible from a Site Servicing perspective.

2.6.1 Site Grading

Existing contour and elevation data were obtained through the City of Kingston GIS information. The existing site topography has a maximum grade differential of approximately 24 m from a high point of 114 m east side/central, to the southeast boundary of the site. Refer to **Appendix D – Figure 1**. The existing topography is not expected to negatively impact development options for the new facility.

2.6.2 Storm Sewer Servicing

There is no existing storm sewer infrastructure in the vicinity of the site as it is located outside of the City's urban boundary. Refer to **Appendix D – Figure 2**. The proposed facility will impact existing drainage patterns and on-site stormwater management facilities will be required to provide stormwater quality and quantity to satisfy CRCA and City of Kingston guidelines. Stormwater considerations are addressed under **Section 2.7**.

2.6.3 Sanitary Servicing

There is no existing sanitary sewer infrastructure in the vicinity of the site as it is located outside of the City's urban boundary. Refer to **Appendix D – Figure 2**. The Facility will be required to be serviced through an onsite wastewater treatment system, or through the temporary on-site storage and off-site transportation of wastewater for treatment or beneficial re-use.

As part of the hydrogeological work, findings have indicated that the overburden, which is silt/clay at the site, has variable thickness ranging from 0 to 3 metres with limestone bedrock underlying the overburden where present. Given the thickness and variability of the overburden, it has been assumed that components associated with an onsite wastewater treatment system will need to be above ground. This above ground system would be suitable for daily sewage flow of up to 10,000 litres, which is subject to the Ontario Building Code, permit obtained through the City of Kingston. It has been assumed that such an above ground system could accommodate sewage generated from the operations of the Facility, such as washrooms, but not from the volumes and higher concentrations presumed to be generated as process wastewater. The presence of limestone bedrock does not preclude the installation of a septic system to treat Facility operations (staff use), it will however, add additional capital costs as the systems will be raised/above ground.

The process wastewater demands for the proposed facility will be largely determined through vendor discussions. Based on loading rates prepared in the Tetra Tech Report, *Consulting Engineering Services Detailed Assessment Report Kingston Biosolids and Biogas Master Plan (July 2019)*, 32,000 litres of wastewater per day are expected to require treatment. Dillon's recent memo titled *Phase 1 and 2 Reconfirmation: Problem/Opportunity Statement and Screening Process and Results* identified a potential wastewater process wastewater generation of 30,000 litres per day through a mass-balance reconfirmation exercise. It was noted at the same time that this wastewater, produced from the liquid fraction of digested biosolids, may have value for agricultural land application, which could remove the need to provide treatment for this material.

If treatment of liquid material generated from the treatment process is required, an assessment of treatment alternatives would need to be evaluated and practicality associated with either:

- Removal and disposal of the wastewater off-site; or,
- Development of a suitable onsite treatment system.

Once expected demands become more refined, an appropriate means of treatment or disposal can be determined. Onsite wastewater treatment systems which support a daily sewage flow exceeding 10,000 litres will require an ECA through MECP. The required treatment facility would be required to accommodate high organic and

dissolved nutrient concentrations. Subsurface discharge of treated wastewater would need to consider “reasonable use” limits on offsite nitrate impacts, which would likely require a complex, potentially tertiary system, providing total nitrogen removal to be installed.

2.6.4 Water Servicing

There is no existing watermain infrastructure in the vicinity of the site as it is located outside of the City’s urban boundary. Refer to **Appendix D – Figure 2** for domestic water demands the proposed facility could be serviced with a drilled well or reservoir. Consideration will need to be taken with regards to the onsite wastewater treatment system. The minimum separation distance of 15 m [Ontario Regulation 332/12 (Building Code)] will need to be met or exceeded from a well to the wastewater treatment system to minimize the potential for contaminants entering the potable water system.

Fire flow protection requirements for the proposed facility will be determined in accordance with the Fire Underwriters Survey, Utilities Kingston and City of Kingston standards, and the Ontario Building Code. Due to the rural nature of the site, a combination of cistern/reservoir and dry hydrants could be used.

As part of the hydrogeological work, a desktop investigation determined water well yields in the vicinity of the Knox Farm range between 18.9 to 75.7 litres per minute. The aquifer in which those water supply wells are installed in is expected to be present at the site. However, it is possible that the water well yields may not be representative of an actual water well installed at Knox Farm.

The water demands for the Facility will be largely determined through vendor discussions. Dillon’s recent *Phase 1 and 2 Reconfirmation: Problem/Opportunity Statement and Screening Process and Results* memo outlined a fresh water demand of approximately 16 m³/d, which will be highly dependent on the water content of raw feedstock arriving at the Facility, required solids content of material in the digestion process and desired product consistency. Once raw water requirements are better defined, the viability of an adequate on-site supply should be reassessed through further hydrogeological investigations to confirm the yields at the site’s most favourable aquifer zone(s).

2.6.5 Utility Considerations

The natural gas, electrical, and telecommunication for the Facility will be designed and installed in accordance with the distributors' specifications. Once required demands to service the Facility are known, respective companies can be contacted to confirm serviceability. Perth Road in the vicinity of the site currently contains gas, aerial electrical and telecommunication within the right-of-way; servicing is not expected to be an issue. Refer to **Appendix D – Figure 2**.

2.6.6 Summary

Due to the location of the site outside of the City's urban boundary, servicing opportunities other than municipal infrastructure will be required. Options for this site do exist to address servicing for water, sanitary, gas, electrical and telecommunication. Once expected demand loads for the proposed facility are known, more refined options can be provided. Communication with utility companies will be required to determine the best servicing option.

While there are no reasons to suggest that servicing opportunities do not exist, financial considerations associated with design, permits/approvals, and capital costs to implement the required infrastructure to support the proposed facility were not considered. As noted above, a raw water demand of approximately 16 m³/d has been estimated, subject to future decisions regarding feedstock, digestion process and product consistency. A wastewater stream of 30 m³/d was also identified, although this stream may be stored onsite for beneficial use rather than directed to treatment. The quantities of wastewater potentially generated at the facility, while potentially significant in terms of developing and operating onsite servicing are believed to be manageable through trucking if required.

While likely more complex from the perspective of land use adjacency and other issues, an alternate site within the municipally serviced area of the City could support the proposed facility with less effort and uncertainty related to the design, permitting, and capital costs of on-site servicing.

2.7 Stormwater Management

The purpose of this section is to document baseline conditions and provide sufficient information to help determine if the site is likely to be suitable for the development of the proposed Facility from a stormwater management perspective.

2.7.1 Study Area

The study area for the Knox Farm suitability assessment generally includes the Proposed Site Location for the Facility and surrounding lands, as shown in **Appendix E1 – Figure 1**. Of interest, the area to the north and east of the site is the Little Cataraqui Creek Conservation Area, which is managed by CRCA.

2.7.2 Scope of Assessment

The suitability assessment of the Knox Farm site, as related specifically to stormwater management, involved a preliminary examination of existing topographic and hydrologic characteristics of the subject lands. It is noted that the physical characteristics for the proposed Facility (i.e., location, size, layout, etc.) have not yet been determined and, accordingly, the objective of the suitability assessment is limited to identifying significant issues or constraints that should be considered in determining the feasibility of developing the Facility at this location.

The assessment included a review of available relevant background information together with field reconnaissance (on October 4, 2022) to collect site observations with respect to overall site grading and drainage. An inventory of photographs taken during the field reconnaissance is included in **Appendix E2**.

Sources of background information that were reviewed include:

- City of Kingston GIS data (contours, watercourses/waterbodies, drainage features, and roads and trails);
- Soils mapping – Ontario Ministry of Agriculture, Food, and Rural Affairs (OMAFRA);
- Various documents and files related to the snow management facility and former dredgate material dewatering facility including the Closure Report and final contour plan (XCG, March 2, 2015);

- Memorandum regarding Knox Farm Dredgate Material Storage Site Closure Report (F. Crossley, Ministry of Environment and Climate Change, April 17, 2015);
- City of Kingston Official Plan, Appendix B: Unstable Bedrock (Potential Karst Topography) map (City of Kingston, Draft Updated July 2015); and,
- Cataraqui Source Protection Area – Regional Areas of Sensitive Groundwater map (Cataraqui Region Conservation Authority, January 2012).

2.7.3 Existing Site Conditions

A description of existing site conditions related to topography, land use, soils, and drainage is provided below.

2.7.3.1 Topography

Available contour mapping obtained from the City of Kingston indicates that the Knox Farm property is located within an area of low to moderate topographic relief. The gradient of the property generally slopes from higher elevations within the eastern portion of the site to the west and north towards the Conservation Area lands (**Appendix E1 – Figure 1**). A small area within the southeast corner of the property is graded south towards Highway 401.

Appendix E1 – Figure 2 presents the topography for the proposed site location, including the contours derived from LiDAR data (obtained from the City of Kingston open database) and the as-built final topography plan for the former dredgate material storage site (XCG, January 2015). As illustrated, the two sets of contour data are relatively constant – with both showing that the existing topography within the proposed site location area generally slopes from higher elevations near the snow management facility (approximately 110 m) to the west and south where site elevations are in the range of approximately 101–102 m. The average slope between the northeast and southeast corners of the proposed site location is roughly 2%.

2.7.3.2 Land Use

Under existing conditions, much of the Knox Farm property consists of undeveloped woodlands along with some cleared areas. It is understood that the City utilizes a portion of the southern part of the property as a snow management facility during the winter months.

A trail associated with the Conservation Area is located within the northern portion of the property, which is used for recreational activities.

Available background documents indicate that the proposed site location was previously used as a storage facility for dredgate material from the Cataraqui River related to utility upgrades, which consisted of multiple containment cells and holding ponds. The dredgate material storage facility has since been decommissioned, remediated, re-graded and hydroseeded.

2.7.3.3 Soils & Geology

Available mapping obtained from OMAFRA (**Appendix E1 – Figure 3**) indicates that surficial soils generally consist primarily of Farmington Loam for much of the property, with the northwest corner of the property classified as Gananoque Clay. These soil types correspond with hydrologic soil groups B and C/D, respectively.

The geologic conditions for the property are reported to consist of inferred unstable bedrock (potential karst topography) as noted in the City of Kingston Official Plan (City of Kingston, 2015).

2.7.3.4 Drainage

There is very limited formal drainage infrastructure within the Knox Farm property. Surface runoff generally occurs in the form of overland (sheet) flow that follows the topographic gradient towards the west and north. During the field reconnaissance performed by Dillon, ditching was observed along the access road and at the perimeter of the snow management facility. Based on the available contour mapping, it is understood that the ditches and associated culvert structures capture and convey runoff around the snow management facility towards the southern portion of the property.

Surface runoff from the majority of the Knox Farm property travels in a northwesterly direction towards the Little Cataraqui Creek Reservoir. The City's GIS mapping shows that a watercourse extends from the reservoir into the northwest corner of the property (**Appendix E1 – Figure 1**).

No distinguishable drainage features were identified within the proposed site area through the review of available background information or field reconnaissance

observations. Surface runoff appears to travel overland from the higher elevations near the snow management facility towards the western and southern site boundaries.

It is noted that available mapping (CRCA, 2012) indicates the Knox Farm property is located within an area that is classified as Highly Vulnerable Aquifers and Significant Groundwater Recharge Areas.

2.7.4 Stormwater Management Servicing

The proposed development of the Facility at the Knox Farm property will require the preparation of an appropriate stormwater management (SWM) servicing strategy to satisfy applicable federal, provincial, and municipal requirements – including the *Ontario Water Resources Act*, *Environmental Protection Act*, *Conservation Authorities Act*, *Fisheries Act*, Provincial Policy Statement, and Kingston Official Plan.

Specifically related to SWM planning, Section 1.6.6.7 of the Provincial Policy Statement prescribes the need to:

- a) Minimize, or, where possible, prevent increases in contaminant loads;
- b) Minimize changes in water balance and erosion;
- c) Not increase risks to human health and safety and property damage;
- d) Maximize the extent and function of vegetative and pervious surfaces; and,
- e) Promote stormwater management best practices, including stormwater attenuation and re-use, and low impact development.

Under Section 53 of the *Ontario Water Resources Act*, an ECA is required prior to using, operating, establishing, altering, extending or replacing new or existing sewage works – including drainage and stormwater management works. Consultation with MECP and CRCA will be required to confirm the SWM objectives and design criteria for the proposed Facility.

The proposed development of the Facility at the Knox Farm property will result in an increase in impervious surfaces, changes to drainage characteristics, and potential impacts to surface water quality. Accordingly, a site-specific SWM strategy will be necessary to minimize or mitigate impacts to surface water resources and satisfy applicable regulations.

The SWM servicing strategy for the proposed Facility could involve one or more measures to provide the necessary level of water quality and quantity controls. This could consist of various conveyance and/or end-of pipe controls including stormwater management pond(s). A 'treatment train' approach is recommended to ensure that the SWM objectives are achieved (MOE, 2003).

There may be an opportunity or obligation to implement low impact development (LID) best practices such as bioretention techniques, green roofs, and/or rainwater harvesting. Given the absence of municipal potable water servicing at the site location, rainwater harvesting could provide a source of water that can be used for operational purposes. Further assessment of the feasibility for rainwater harvesting will be required during the design phase of the project. Guidance and recommendations for the design and implementation of LID practices is provided in the *Low Impact Development Stormwater Management Guidance Manual* (MECP, 2022).

Given that the Knox Farm property is located within lands that are classified as a highly vulnerable aquifer and significant groundwater recharge area (CRCA, 2012), any LID measures that are proposed as part of the SWM servicing strategy should consider the potential for impacts to groundwater quality resulting from the infiltration of contaminated surface runoff.

Ultimately, the specific SWM requirements and servicing strategy will depend upon the size and layout of the Facility and the applicable SWM control criteria, which must be confirmed in consultation with the Conservation Authority. For planning purposes, it is anticipated that an 'Enhanced' level of water quality protection will be required together with measures necessary to detain and/or retain stormwater onsite in order to protect the receiving environment.

If the proposed development of the Facility results in changes to surface water quality or quantity released towards Highway 401, it may be necessary to obtain approval from the Ontario Ministry of Transportation.

2.7.5 Summary and Recommendations

A review of available background information and field reconnaissance was conducted to assess the suitability of the Knox Farm property for the construction of an integrated biosolids and source separated organics processing facility. Specifically, the objective of

the assessment was to identify potential issues or constraints related to stormwater management servicing that should be considered in determining the feasibility of this location for the proposed Facility.

Available information indicates that the proposed development area on the Knox Farm property has undergone significant alteration in the past – initially for agricultural purposes and, more recently, as a dredgate management facility together with the continued use of the adjacent lands at the City's snow management facility.

Development of the proposed Facility will involve changes in the current land use and hydrologic characteristics within the proposed development area, including an increase in impervious surface area, alterations to onsite drainage conditions, and possible water quality effects. Consequently, there is a significant potential for impacts to surface water quality and quantity (rate and volume) on the site and within the receiving drainage system.

A hydrology assessment will be necessary to identify potential impacts corresponding to the proposed development, followed by the preparation of a practical, site-specific SWM servicing strategy to mitigate these impacts through the application of best practices. At a minimum, it is anticipated that this will include a combination of measures required to protect water quality and maintain water quantity conditions. It is recommended that the SWM servicing strategy should include LID practices to further minimize impacts to surface water resources through infiltration, rainwater harvesting, and water quality enhancement. In addition, it is recommended that the impacts of climate change are considered in the planning and design of the SWM system for the proposed Facility.

Overall, the assessment did not identify significant issues or constraints within the proposed development area at the Knox Farm property that would substantially affect the suitability of this site for the proposed Facility – provided that appropriate steps are taken to mitigate potential impacts on surface water resources. Through the preparation and implementation of an appropriate SWM servicing strategy, it is anticipated that controls can be put in place to mitigate the potential impacts to surface water quality and quantity.

2.8 Traffic

This section evaluates the feasibility of the site to accommodate the proposed site traffic impacts and identifies potential transportation constraints within the Study Area (Figure 1).

The Study Area limits of this analysis is bound by the Highway 401 South Ramp Terminal and McAdoo's Lane to the north. The following intersections are included within the Study Area:

- Highway 401 South Ramp Terminal and Division Street;
- Highway 401 North Ramp Terminal and Perth Road;
- Perth Road and the site driveway; and,
- Perth Road and McAdoo's Lane.

Utilities Kingston is proposing to use the Knox Farm site to develop an integrated biosolids and source separated organics processing facility. Biosolids would be transported from the wastewater treatment plants and the City's Green Bin material, or source separated organics, would be hauled to the site for processing.

2.8.1 Existing Conditions

2.8.1.1 Existing Road Network

The following describes the roadways within the Study Area.

Perth Road/County Road 10 runs from Highway 401 in the south to the Village of Westport in the north. The majority of the roadway is a two-lane rural cross section; however, a four lane rural cross section is provided from Division Street to approximately 200 m north of the north ramp terminal. To the south of Highway 401, the roadway continues as Division Street. The elevation changes by approximately 27 m from the Highway 401 north ramp terminal to McAdoo's Lane. The posted speed limit is 60 km/h within the Study Area. Perth Road is a designated an emergency detour route (EDR) when Highway 401 is closed between Sydenham Road and Montreal Street/Battersea Road.

Division Street is a four-lane arterial road that becomes Perth Road north of Highway 401. It terminates in the south at Union Street, in downtown Kingston. The posted speed limit is 50 km/h within the Study Area.

Highway 401 is a six-lane freeway under the jurisdiction of the Ministry of Transportation of Ontario (MTO). The posted speed limit is 100 km/h within the Study Area.

McAdoo's Lane is a two-lane local road that begins at Perth Road and terminates at Battersea Road (County Road 11). It is designated an EDR when Highway 401 is closed between Division Street/Perth Road and Montreal Street/Battersea Road. The posted speed limit is 60 km/h from Perth Road to 500 m east of Perth Road, where it increases to 70 km/h.

By-law 2003-229 confirms that there are no weight restrictions or seasonal load limits on McAdoo's Lane or Perth Road.

There are no existing sidewalks, dedicated bicycle facilities or transit stops within the Study Area. The City's 2018 Active Transportation Master Plan does not identify future active transportation facilities in the Study Area.

2.8.1.2 Existing Traffic Volumes

Weekday AM and PM peak hour intersection turning movement counts were undertaken at the Study Area intersections by Ontario Traffic Inc. (OTI) on the following dates:

- Tuesday, September 20, 2022; and,
- Thursday, September 22, 2022.

Traffic volume data is contained in **Appendix F1**. Traffic signal timing plans are contained in **Appendix F2**. At the intersection of McAdoo's Lane and Perth Road, the 2022 traffic volume data was compared to historical traffic volumes from 2018; the 2022 traffic volumes appear generally in line with expectations and represent some traffic growth in the corridor. **Figure 11** presents the existing traffic volumes in the Study Area. **Figure 12** illustrates the existing lane geometry and traffic control within the Study Area.

Figure 11: Existing Traffic Volumes

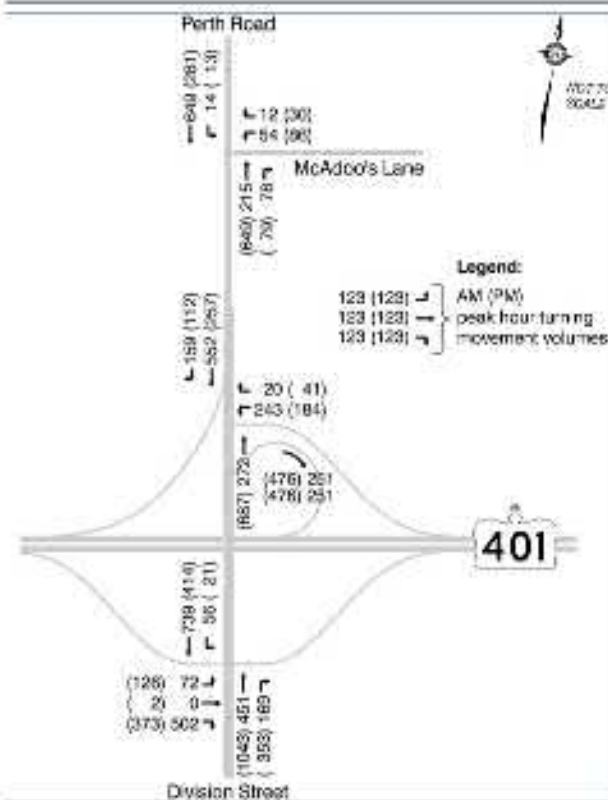
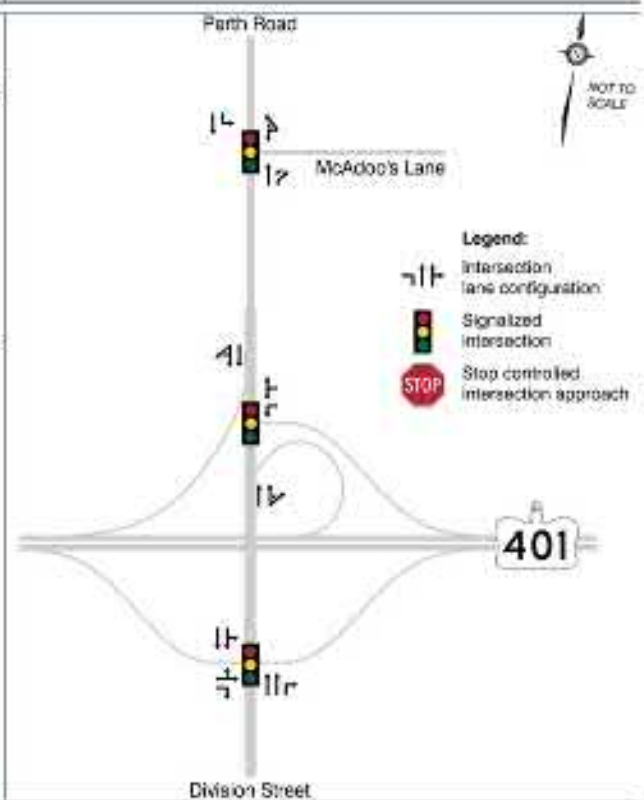


Figure 12: Existing Lane Geometry and Traffic Control



2.8.1.3 Existing Pedestrian and Cycling Activity

The volume of pedestrians and cyclists were counted at the Study Area intersections. There were no pedestrians observed at the Study Area intersections during the weekday AM and PM peak hours.

Table 18 presents the number of cyclists observed at each intersection approach during the weekday AM and PM peak hours. There were no cyclists observed during the weekday AM peak hour, and two northbound and southbound cyclists observed during the weekday PM peak hour.

Table 18: Existing Cycling Activity

Intersection	AM peak hour					PM peak hour				
	WB	EB	SB	NB	Total	WB	EB	SB	NB	Total
Division Street and Highway 401 South Ramp Terminal	0	0	0	0	0	0	0	2	2	4
Division Street and Highway 401 North Ramp Terminal	0	0	0	0	0	0	0	2	2	4
Perth Road and McAdoo's Lane	0	0	0	0	0	0	0	2	2	4

2.8.1.4 Existing Intersection Operations

Vehicle Delay Based Analysis Methodology (Highway Capacity Manual)

Traffic analyses for signalized and unsignalized intersections are typically conducted according to the methodology developed by the Transportation Research Board (TRB) as published in the *Highway Capacity Manual* (HCM). Most of the analyses concern estimates of vehicle delay under various traffic volumes, roadway configurations and traffic control strategies. The delay estimates are used as the basis for determining intersection performance. According to the HCM, the relative performance of an intersection depends on a number of different factors, including:

- **Level of Service** – measures the average delay per vehicle during a 15-minute analysis period. Levels of service range from A to F (minimal delay to unacceptable delay) and may be measured on an intersection, approach, or per movement basis;
- **Degree of Saturation** – measured in terms of a ratio of demand flow rate (v) to maximum capacity (c); intersections with volume to capacity (v/c) ratios < 1.0 are at full capacity and likely experience severe congestion; and,
- **Vehicle Delay** – average vehicle delay on an intersection, approach or per movement basis. Measured in seconds per vehicle or total hours of delay during the peak hour under analysis.

Table 19 and **Table 20** summarize the Level of Service (LOS) for signalized and un-signalized intersections, respectively, as listed in the HCM.

Table 19: Signalized Intersections – HCM Level of Service Characteristics

HCM Level of Service	Average Signal Delay per Vehicle (sec/veh)	Characteristics
A	≤ 10	Free flow, low volumes and high speeds, most drivers can select own speed
B	> 10 and ≤ 20	Stable flow, speed restricted slightly by traffic
C	> 20 and ≤ 35	Stable flow, speed controlled by traffic
D	> 35 and ≤ 55	Approaching unstable flow, low speed
E	> 55 and ≤ 80	Unstable flow and speeds, volumes at/near capacity
F	> 80	Forced flow, low speed, volume above capacity

Table 20: Un-Signalized Two-Way and All-Way Stop Control Intersections – HCM Level of Service Characteristics

HCM Level of Service	Total Delay (sec/veh)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

Intersection Traffic Operations

At each intersection, critical movements are indicated in red font. Critical movements are defined as:

- Any individual movement at a signalized intersection operating at a v/c ratio of 0.85 or greater;
- Any individual movement at an unsignalized intersection operating at LOS F; and,
- Any turning movement where the calculated 95th percentile queue exceeds the available storage length.

Table 21 summarizes the existing operations at the Study Area intersections. Synchro analysis worksheets reports are provided in **Appendix F3**.

Table 21: Existing Intersection Traffic Operations

Movement	AM peak hour				PM peak hour			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Division Street at Highway 401 South Ramp Terminal								
EB left	0.18	C	30.9	26	0.65	E	62.5	52
EB right	0.95	D	54.7	163	0.74	B	14.0	33
NB through	0.27	B	12.6	41	0.44	A	6.2	72
NB right	0.20	A	2.2	10	0.32	A	2.9	24
SB left	0.50	B	15.8	84	0.22	A	4.8	26
Overall	—	C	24.3	—	—	A	9.8	—
Division Street at Highway 401 North Ramp Terminal								
WB left	0.53	C	33.2	36	0.48	C	32.0	32
WB right	0.43	B	17.8	24	0.38	B	15.8	20
NB through	0.15	A	5.9	15	0.34	A	6.6	35
NB right	0.19	A	0.3	0	0.33	A	0.6	0
SB through	0.28	A	6.6	29	0.13	A	5.5	13
SB right	0.12	A	0.2	0	0.09	A	0.1	0

Movement	AM peak hour				PM peak hour			
	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)	v/c	LOS	Delay (s/veh)	95 th %ile queue (m)
Overall	—	A	8.1	—	—	A	6.6	—
Perth Road at McAdoo's Lane								
WB left	0.30	C	31.9	17	0.37	C	31.5	24
WB approach	0.07	B	14.2	4	0.13	B	10.8	7
NB through	0.17	A	5.4	30	0.52	A	9.7	114
NB right	0.08	A	2.3	6	0.09	A	3.2	8
SB left	0.02	A	3.1	2	0.03	A	3.4	2
SB through	0.46	A	5.7	72	0.23	A	4.8	26
Overall	—	A	6.8	—	—	A	9.6	—

Division Street and Highway 401 South Ramp Terminal

The intersection currently operates at an acceptable LOS C during the weekday AM peak hour and a very good LOS A during the weekday PM peak hour. The eastbound right turn movement is deemed critical with a v/c ratio of 0.95 and the queue exceeds the available storage of approximately 80 m. The eastbound right turn movement is not anticipated to be utilized by the site traffic, and therefore, should not be impacted by additional site traffic.

Perth Road and Highway 401 North Ramp Terminal

The intersection currently operates at a very good LOS A during the weekday AM and PM peak hours. There are no critical movements at the intersection.

Perth Road and McAdoo's Lane

The intersection currently operates at a very good LOS A during the weekday AM and PM peak hours. No critical movements are identified.

The Study Area intersections are operating at a LOS A to LOS C. The intersections are capable of accommodating additional traffic. At this time, the number and classification of vehicles accessing the site has not been determined; however, it is anticipated that tanker trucks and waste collection vehicles would be accessing the site throughout the day. It is very likely that the Study Area intersections are capable of accommodating the additional traffic related to the proposed site use, assuming waste managed by the City, which will be confirmed during the future conditions analysis.

2.8.2 Site Access

Two potential site access options have been identified through preliminary discussions, these include but may not be limited to:

- The addition of a west leg to the intersection of Perth Road and McAdoo's Lane; and,
- The existing midblock access approximately 170 m south of the Perth Road and McAdoo's Lane intersection.

Driveway Access from Perth Road and McAdoo's Lane Intersection

Most road authorities require left turn lanes at traffic controlled intersections. The existing intersection has been designed with a southbound left turn lane. The receiving lane south of the intersection is wide and may be repurposed/repainted to accommodate a northbound left turn lane, subject to future traffic demands and a review of geometric requirements. Traffic signal modifications would be required to relocate traffic signal poles and traffic signal head locations. **Figure 13** is a photo of Perth Road at McAdoo's Lane intersection looking southbound. The westbound secondary traffic signal pole would require relocation, as a minimum, to accommodate the driveway access as a fourth leg at the intersection.

Figure 13: Perth Road at McAdoo's Lane Intersection Looking Southbound



Midblock Access Driveway

A review of the existing conditions indicates that a northbound left turn lane may be warranted to accommodate left turns to the site due to the high peak hour traffic volumes on Perth Road. The future conditions analysis will confirm the need for a northbound left turn lane at the midblock location. If a northbound left turn lane is warranted, a geometric review would be required to identify the impact to the existing roadway cross-section, which could include rock excavation and fill sections. **Figure 14** shows Perth Road at the existing driveway location, looking southbound.

A northbound left turn lane to the site may not be required if the turning volume is very low.

Figure 14: Perth Road at Existing Driveway Location



2.8.3 Summary

The total forecast traffic volumes accessing the site have not yet been confirmed; however, the road network is capable of accommodating additional traffic volumes. The Study Area intersections are currently operating under capacity at acceptable levels of service.

A future conditions analyses, including the site traffic volume forecasts are required to confirm that the Study Area intersections will continue to operate at acceptable levels of service. This will be confirmed as part of the design basis for the proposed Facility in the next phase of the project.

The location of the site access will be finalized in future stages of the project. The need for turn lanes at the site driveway(s) will be determined based on the volume of traffic accessing the site. If the traffic volumes accessing the site are very low, a left turn lane may not be warranted. A left turn lane warrant analyses will be undertaken to determine if a northbound left turn lane is required on Perth Road.

If the driveway is to be located at the McAdoo's Lane intersection, (forming the fourth leg of the signalized intersection), an intersection modification would be required which would impact the westbound secondary traffic signal pole, as a minimum. A northbound left-turn lane on Perth Road at McAdoo's Lane would likely be required at the traffic signal-controlled intersection to safely accommodate traffic demands on Perth Road.

3.0 Summary and Recommended Next Steps

3.1 Summary of Knox Farm Assessment

Eight disciplines conducted an assessment of Knox Farm and through their reviews, no major barriers were identified for Knox Farm as a potential location for the proposed Facility. **Table 22** provides a summary of each discipline's results and recommendations.

A disadvantage identified through the assessments is that Knox Farm is not presently serviced by municipal water and sewer infrastructure. Treatment infrastructure must be developed onsite or servicing provided through trucking. As noted in Dillon's recent *Phase 1 and 2 Reconfirmation: Problem/Opportunity Statement and Screening Process and Results* memo updated servicing estimates were developed using the original Master Plan assumptions for daily facility feedstock processing tonnage, and municipal sludge feedstock water content. Using these assumptions, a raw water demand of approximately 16 m³/d has been estimated, subject to future decisions regarding feedstock dewatering, digestion process requirements and product consistency. A process liquid waste stream of 30 m³/d was also identified, although this stream may be stored onsite for beneficial use rather than directed to treatment. The quantities of raw water and wastewater potentially generated at the Facility, while potentially significant in terms of developing and operating onsite servicing, is believed to be manageable through trucking if required.

3.2 Recommended Next Steps

The following next steps are recommended:

- Additional studies as outlined by each of the disciplines in **Table 22**;
- Additional on-site assessment of potable water supply and sewage systems;
- Consult with the public on the use of Knox Farm as the Proposed Site Location for the Facility; and,
- Engage with vendors through the RFI process.

Subject to discussions with Utilities Kingston, the Project may proceed with the Municipal Class EA or the Project will be paused until further review and direction is received from Utilities Kingston (**Figure 2**).

Table 22: Knox Farm Suitability Assessment Results and Recommendations

Discipline	Results	Knox Farm Suitability Determination	Recommendations
Land Use	<ul style="list-style-type: none"> The Proposed Site Location lands are currently designated as “Open Space”, “Rural” and “Environmental Protection Area (EPA)” in the Official Plan Schedule 3: Land Use. Adjacent land use designations include “Rural” and “EPA”. Based on the Zoning Bylaw, the Proposed Site Location is within the EPA Zone and a slim section of the General Rural Area Zone. Knox Farm is located within a Highly Vulnerable Aquifer and Significant Ground Water Recharge Area. Knox Farm is located on an inferred karst formation of unstable bedrock (see Hydrogeology for Recommendations). 	<ul style="list-style-type: none"> The review of land use and zoning designations indicate that the Proposed Site Location may require amendments to the Official Plan and/or Zoning Bylaw. 	<ul style="list-style-type: none"> As part of the future EA for the site, further consideration and review of the City of Kingston’s policies, including the Official Plan, Kingston Climate Action Plan and Kingston Community Energy Plan are recommended for the proposed location of the Facility to help inform the evaluation of alternatives and associated impact assessments (Class EA – Dillon Scope; Socio-Economic and Land Use Memo). As the Proposed Site Location falls within the EPA Zone, a Zoning Bylaw amendment may be required (Outside of Class EA & Dillon Scope – Future Commitment). Confirm whether such a facility is not feasible outside of the EPA (Class EA - Dillon Scope; Socio-Economic and Land Use Memo). Likely require the submission of an environmental impact assessment in accordance with the policies of Section 6 of the Official Plan (refer to Natural Environment recommendation below).
Air Quality	<ul style="list-style-type: none"> Based on a review of ambient monitoring data, all contaminants were below their respective criteria in the region where Knox Farm is located. Potential sensitive receptors in the immediate vicinity of Knox Farm include: <ul style="list-style-type: none"> Hotels located south of Highway 401 Residential dwellings located southeast of Highway 401 The Little Cataraqui Creek CA Trails to the northwest of the proposed site location boundary but within the Knox Farm property boundary. The predominant wind direction is shown to be from the southwest with moderate westerly and northerly components. 	<ul style="list-style-type: none"> The review of background air quality, predominant wind direction, and nearby sensitive receptor locations indicate there are no specific concerns regarding the suitability of the proposed location on Knox Farm. 	<ul style="list-style-type: none"> Consideration is to be given to the configuration of the sources of air and odour emissions at the proposed Facility at Knox Farm. Source configuration may have the potential to result in a significant reduction of air quality and odour impacts at the sensitive receptors. With a property boundary footprint of approximately 300 m by 380 m, source locations may be optimized to reduce potential impact (Class EA – Dillon Scope; Atmospheric Impact Assessment). An air emissions and dispersion modelling report will be required to determine the potential off-site impacts from air and odour emissions from the proposed Facility (Class EA – Dillon Scope; Atmospheric Impact Assessment).

Discipline	Results	Knox Farm Suitability Determination	Recommendations
Archaeology	<ul style="list-style-type: none"> The Stage 1 Archaeological Assessment determined that the Study Area comprises of areas of archaeological potential and areas of no archaeological potential (Figure 8 – Map 9). 	<ul style="list-style-type: none"> The Proposed Site Location of the Facility is currently identified in a location with Archaeological Potential. The suitability of Knox Farm is subject to a Stage 2 property assessment in accordance with Section 2.1 of the 2011 <i>Standards and Guidelines for Consultant Archaeologists</i>. 	<ul style="list-style-type: none"> It is recommended that all areas of archaeological potential that could be impacted by the project be subject to a Stage 2 property assessment in accordance with Section 2.1 of the 2011 <i>Standards and Guidelines for Consultant Archaeologists</i> (S&Gs). The former agricultural fields, overgrown and wooded areas must be assessed using the test pit survey method. A survey interval of 5 m will be required due to the proximity of the lands to the identified features of archaeological potential. Given the likelihood that the former dewatering facility, the snow management facility and other lands south of the access road were previously impacted, a combination of visual inspection and test pit survey should be utilized to confirm the extent of disturbance in accordance with Section 2.1.8 of the 2011 S&Gs. This will allow for the empirical evaluation of the integrity of the soils and the depth of any impacts. If these areas are determined to have archaeological potential, then a test pit survey interval of 5 m must be maintained. Each test pit must be excavated into at least the first 5 cm of subsoil, and the resultant pits must be examined for stratigraphy, potential features and/or evidence of fill. The soil from each test pit must be screened through mesh with an aperture of no greater than 6 mm and examined for archaeological materials. If archaeological materials are encountered, all positive test pits must be documented, and intensification may be required (Class EA – Outside of Scope). The identified areas of no archaeological potential do not require any additional assessment. Given that there are still outstanding archaeological concerns within the study area, no ground alterations or development may occur until the required investigation is complete, a recommendation that the lands require no further archaeological assessment is made and the associated report is entered into the Ontario Public Register of Archaeological Reports (Class EA – Outside of Scope).

Discipline	Results	Knox Farm Suitability Determination	Recommendations
Cultural Heritage	<ul style="list-style-type: none"> After conducting historical research, consultation and field survey, no cultural heritage resources were identified within the assessed area. To date, there are no concerns with respect to built heritage resources and cultural heritage landscapes related to proposed facility on the Knox Farm Property. 	<ul style="list-style-type: none"> No cultural heritage resources identified within the assessed area. 	<ul style="list-style-type: none"> N/A
Hydrogeology	<ul style="list-style-type: none"> The Proposed Site Location is on potential/inferred karst topography. The Cataraqui SPP outlines that if there is any evidence of surface karst on a property, a karst assessment must be completed by a karst specialist. Observations made during the drilling program and the results of the grain size analysis, suggest the existing shallow soil permeability is consistent with Inspec-Sol's findings based on composition of the soil. The percolation time for the surficial soil is likely greater than 50 min/cm. The groundwater within the shallow aquifer at the Proposed Site Location is interpreted to flow to the west/northwest (approximately 1.2 km) towards Little Cataraqui Creek, the shallow aquifer's hydraulic conductivity was observed to range in magnitudes of 10^{-8} and 10^{-7} m/s. A review of the supply wells installed within the deep regional limestone aquifer located within the Proposed Site Location, suggests the deep aquifer can service a Facility with an assumed fresh water demand between 18L/min and 56L/m. The analytical groundwater samples collected as part of this suitability study, indicate groundwater quality of the shallow aquifer at the Proposed Site Location meets MECP Table 6. 	<ul style="list-style-type: none"> Bases on the historic and recent groundwater quality monitoring completed at the Subject Site, it is anticipated that the shallow groundwater quality will not impact the development of the proposed Facility. Based on the past use and soil remediation activities as described in the Closure Plan by XCG in 2015, it is anticipated that soil quality at the Subject Site will not impact the development of the proposed Facility. 	<ul style="list-style-type: none"> Best Management Practices and operations guidelines should be considered for the proposed Facility in order minimize the risk to the groundwater as the Proposed Site Location is located on a Significant Groundwater Recharge Area and a Highly Vulnerable Aquifer as identified in the Cataraqui SPA (Detailed Design). Further studies are needed to determine if surface karst formations exist within the Proposed Site Location (Class EA – Outside of Scope). When water supply demands of the proposed facility are determined, a desktop review of water well yields is required (Class EA - Dillon Scope). The installation and testing of a supply well will be required to determine the actual water well yields at the Proposed Site Location (Detailed Design). When water quality demands are established for the Proposed Facility, a desktop review is required (Class EA - Dillon). Once a supply well has been installed at the Proposed Site Location, water quality testing is required to determine actual water quality of the supply well at the Proposed Site Location (Detailed Design).

Discipline	Results	Knox Farm Suitability Determination	Recommendations
Natural Environment	<ul style="list-style-type: none"> The majority of the Proposed Site Location contained areas of low constraint based on the disturbed meadow which dominates the centre of the Proposed Site Location and is known as the former site of the Cataraqui River Dredged Material Storage and Dewatering Facility. However, several confirmed and potential sensitive natural heritage features were identified as occurring within the Property Boundary such as ANSIs, PSWs, significant woodlands and unevaluated wetlands; therefore, the majority of the Desktop Study Area was identified as containing areas of medium constraint. Areas of medium constraint occur within the boundaries of and are to adjacent Proposed Site Location. Further, based on the background review and field visit several SAR and SAR habitat as well as potential SWH (natural heritage features) have the potential to occur within the Proposed Site Location and Desktop Study Area. 	<ul style="list-style-type: none"> Based on the results of the natural environment background review and preliminary site visit the majority of the Proposed Site Location (proposed development location) was identified as containing areas of low constraint, generally indicating a suitable location. However, due to the location of potential and confirmed natural heritage features (areas of medium constraint) within the Proposed Site Location and Desktop Study Area depending on the location and adjacency of the proposed development footprint to these areas, as per Section 6.1.8 of the City of Kingston OP, which aligns with provincial guidance on natural heritage features, the completion of an environmental impact assessment may be required prior to the commencement of development. 	<ul style="list-style-type: none"> It is recommended that additional studies be conducted in 2023 to determine presence/absence of SAR, SAR habitat and SWH within and adjacent to the Proposed Site Location such as, breeding bird surveys and amphibian breeding surveys (Class EA – Dillon Scope). Depending on the location and adjacency of the proposed development footprint to potential and confirmed natural heritage features within the Desktop Study Area and Proposed Site Location, an environmental impact assessment may be required in support of the proposed development. Studies proposed for 2023 can be used as part of the environmental impact assessment, if required. The Natural Heritage Report as part of the Class EA may be used in place of the EIS if applicable EIS guidelines are met (Class EA – Dillon Scope).

Discipline	Results	Knox Farm Suitability Determination	Recommendations
Noise	<ul style="list-style-type: none"> The results of the D-6 Compatibility Assessment confirm the proposed Facility is compatible with the surrounding land uses. The results of the Background Noise Assessment confirm that the ambient (background) noise environment in the area is best characterized as having qualities of a Class 1 area where the background noise is dominated by human activity. Elevated noise limits were identified at some receptor locations, particularly the hotels on the south side of Highway 401. 	<ul style="list-style-type: none"> The Knox Farm location is considered suitable from a noise perspective. 	<ul style="list-style-type: none"> To ensure the final design meets the applicable noise criteria, the following best practices are recommended: <ul style="list-style-type: none"> Ensure the final Facility location is more than 70 m from any of the identified noise sensitive locations. As a result, the area within approximately 60 m of the north property line and 50 m of the east property line are not considered suitable locations (Class EA – Dillon Scope; Noise Impact Assessment). To the extent possible, locate the Facility more than 300 m from any of the identified noise sensitive locations. As a result, it is recommended that the Facility be located more than 290 m of the north property line and 280 m of the east property line (Class EA – Dillon Scope; Noise Impact Assessment). The area within approximately 290 m of the north property line and 280 m of the east property line are not considered suitable locations (Class EA – Dillon Scope; Noise Impact Assessment). To minimize the potential noise impacts to the CRCA trail users, locate the Facility more than 70 from the CRCA walking trail and orient noise sources away from the trail to the extent possible (Class EA – Dillon Scope; Noise Impact Assessment). Prepare a Noise Impact Study at the appropriate design stages to inform equipment selection and identify any additional noise mitigation requirements (Class EA – Dillon Scope; Noise Impact Assessment).
Site Servicing	<ul style="list-style-type: none"> Due to the location of the site outside of the City's urban boundary, servicing opportunities other than municipal infrastructure will be required. Options for this site do exist to address servicing for water, sanitary, gas, electrical and telecommunication. While there are no reasons to suggest that servicing opportunities do not exist, financial considerations associated with design, permits/approvals, and capital costs to implement the required infrastructure to support the proposed facility were not considered. 	<ul style="list-style-type: none"> Provision of water and wastewater servicing through trucking may be feasible depending on the volumes ultimately required for the facility. 	<ul style="list-style-type: none"> Once expected demand loads for the proposed facility are known, more refined options can be provided (Class EA – Dillon Scope). Communication with third party utility companies will be required to determine the best servicing option (Detailed Design).

Discipline	Results	Knox Farm Suitability Determination	Recommendations
Stormwater Management	<ul style="list-style-type: none"> Development of the proposed Facility will involve changes in the current land use and hydrologic characteristics within the proposed development area, including an increase in impervious surface area, alterations to onsite drainage conditions, and possible water quality effects. The Knox Farm property is located within an area that is classified as Highly Vulnerable Aquifers & Significant Groundwater Recharge Areas based on available mapping (CRCA, 2012). Consequently, there is a significant potential for impacts to surface water quality and quantity (rate and volume) on the site and within the receiving drainage system. 	<ul style="list-style-type: none"> Overall, the assessment did not identify significant issues or constraints within the proposed development area at the Knox Farm property that would substantially affect the suitability of this site for the proposed Facility – provided that appropriate steps are taken to mitigate potential impacts on surface water resources. Through the preparation and implementation of an appropriate SWM servicing strategy, it is anticipated that controls can be put in place to mitigate the potential impacts to surface water quality and quantity. 	<ul style="list-style-type: none"> A hydrology assessment will be necessary to identify potential impacts corresponding to the proposed development, followed by the preparation of a practical, site-specific SWM servicing strategy to mitigate these impacts through the application of best practices (Class EA – Dillon Scope). At a minimum, it is anticipated that this will include a combination of measures required to protect water quality and maintain water quantity conditions. It is recommended that the SWM servicing strategy should include LID practices to further minimize impacts to surface water resources through infiltration, rainwater harvesting, and water quality enhancement (Detailed Design). Given that the Knox Farm property is located within lands that are classified as a highly vulnerable aquifer and significant groundwater recharge area (CRCA, 2012), any LID measures that are proposed as part of the SWM servicing strategy should consider the potential for impacts to groundwater quality resulting from the infiltration of contaminated surface runoff (Class EA – Dillon Scope). In addition, it is recommended that the impacts of climate change are considered in the planning and design of the SWM system for the proposed Facility (Class EA – Dillon Scope).
Traffic	<ul style="list-style-type: none"> The total forecast traffic volumes accessing the site have not yet been confirmed; however, the road network is capable of accommodating additional traffic volumes. 	<ul style="list-style-type: none"> The Study Area intersections are currently operating under capacity at acceptable levels of service. 	<ul style="list-style-type: none"> A future conditions analyses, including the site traffic volume forecasts are required to confirm that the Study Area intersections will continue to operate at acceptable levels of service (Class EA – Dillon Scope). The location of the site access will be finalized in future stages of the project. The need for turn lanes at the site driveway(s) will be determined based on the volume of traffic accessing the site. If the traffic volumes accessing the site are very low, a left turn lane may not be warranted. A left turn lane warrant analyses will be undertaken to determine if a northbound left turn lane is required on Perth Road (Class EA – Dillon Scope).

Discipline	Results	Knox Farm Suitability Determination	Recommendations
			<ul style="list-style-type: none">If the driveway is to be located at the McAdoo's Lane intersection, (forming the fourth leg of the signalized intersection), an intersection modification would be required which would impact the westbound secondary traffic signal pole, as a minimum. A northbound left-turn lane on Perth Road at McAdoo's Lane would likely be required at the traffic signal-controlled intersection to safely accommodate traffic demands on Perth Road (Class EA – Dillon Scope).

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