AGRICULTURAL EXISTING CONDITIONS REPORT
FOR
SOUTH LANDFILL PHASE 2 PROJECT, CITY OF NIAGARA FALLS
INTERIM DRAFT

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C22109
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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

1. INTRODUCTION

This report provides an overview of the existing agricultural conditions within the study areas for the South Landfill Phase 2 Environmental Assessment (EA). The Minister of the Environment, Conservation and Parks (Hon. Andrea Khanjin) Approved Terms of Reference (ToR) for the EA included a preliminary description of the existing environmental conditions and made a commitment to expand upon this description during the EA[1].

Walker Environmental Group (Walker) initiated a Comprehensive EA under the Ontario *EA Act* seeking approval to expand the capacity of its existing South Landfill located at the Walker Resource Management Campus (Campus) in Niagara Falls. The South Landfill is an essential component of Walker's Campus since it began operating in 2009 under Environmental Compliance Approval (ECA) No. 008-78RKAM, as amended, and provides safe, reliable, and affordable disposal capacity for solid, non-hazardous waste from residential and industrial, commercial, and institutional (IC&I) sources to its customer base within the City of Niagara Falls, the Regional Municipality of Niagara, and the Province of Ontario. The South Landfill's total approved disposal capacity is 17.7 million m^3 and is expected to reach maximum capacity by 2029 to 2031.

The proposed Phase 2 of the South Landfill would extend its approved capacity by approximately 18 million m^3 over a 20-year period, ensuring Walker can continue to provide essential residual waste disposal services to its existing customer base. Walker is proposing to locate the additional disposal capacity (Phase 2) to the east of the existing South Landfill within the area currently occupied by Walker's Southeast Quarry. The proposal would maintain the existing landfill service area, as well as the annual volume of solid, non-hazardous waste from the sources currently accepted.

The *EA Act* requires that proponents describe the environment that may potentially be affected or may reasonably be expected to be affected, directly or indirectly, by the Alternative Methods of Carrying Out the Undertaking (Alternative Methods) proposed as part of an EA. The description of the existing environmental conditions will provide the baseline for the assessment of potential effects for the proposed Undertaking, which will be conducted during the EA. This report focuses on characterizing the existing conditions within the study areas for the South Landfill Phase 2 EA for agriculture.

2. STUDY AREAS

From an agricultural perspective, the characterization of existing conditions within the following study areas are appropriate to this EA:

- **Site Study Area (SSA)**, including all lands (76.12 ha) owned and operated by Walker that are within the existing approved boundaries of the Southeast Quarry; and

1.A more detailed description of the environment will be provided during preparation of the South Landfill Phase 2 EA reflecting the final study area using available existing information sources and investigative studies.

- **Local Study Area (LSA)**, including all lands within a 1,000 m radius of Walkers Resource Management Campus boundaries.

The SSA was chosen to be consistent with the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) Draft Agricultural Impact Assessment (AIA) Guidance Document (2018) which requires the evaluation of direct impacts on the lands where development is proposed. The LSA was chosen to include all lands that have the potential to be impacted (i.e., indirect impacts) by the proposed development.

The agricultural study areas are illustrated in Figure 1, below.

3. METHODOLOGY

Available secondary sources of information were collected and reviewed to characterize agricultural existing conditions within the study areas. The following sources of secondary information were collected and reviewed:

- Soils of the Regional Municipality of Niagara, Report No. 60 of the Ontario Institute of Pedology (1989);
- OMAFA's digital soil Resource Database to obtain soil series and CLI agricultural capability mapping and data;
- OMAFRA's Artificial Drainage Systems mapping;
- OMAFRA's AgriSuite, AgMaps and Agri-Systems databases; and
- Ortho-rectified, digital aerial photography viewed using Google Earth.

A reconnaissance-level land use survey of the SSA and LSA was completed on June 21, 2023. The land use survey identified the number and type of agricultural operations (both existing and retired), agriculture-related uses, on-farm diversified uses, and the extent and type of non-agricultural land uses in the area. Field crops observed were identified and mapped. Observations of recent tile drainage installation, fencing for livestock, root stocks, and other land improvements were also recorded.

4. CHARACTERIZATION OF THE EXISTING ENVIRONMENT

4.1 Regional Soils

4.1.1 Soil Series

The Soils of the Regional Municipality of Niagara – Report No. 60 of the Ontario Institute of Pedology (Kingsman, M.S., and Presant, E.W., 1989) includes a soil map that shows the distribution of the various soil series mapped in the Region. The digital Provincial Soil Resource database is compiled and administered by OMAFRA and includes most of the soil surveys completed in Ontario. Much of this information is accessible from the Province's Agricultural Information Atlas.

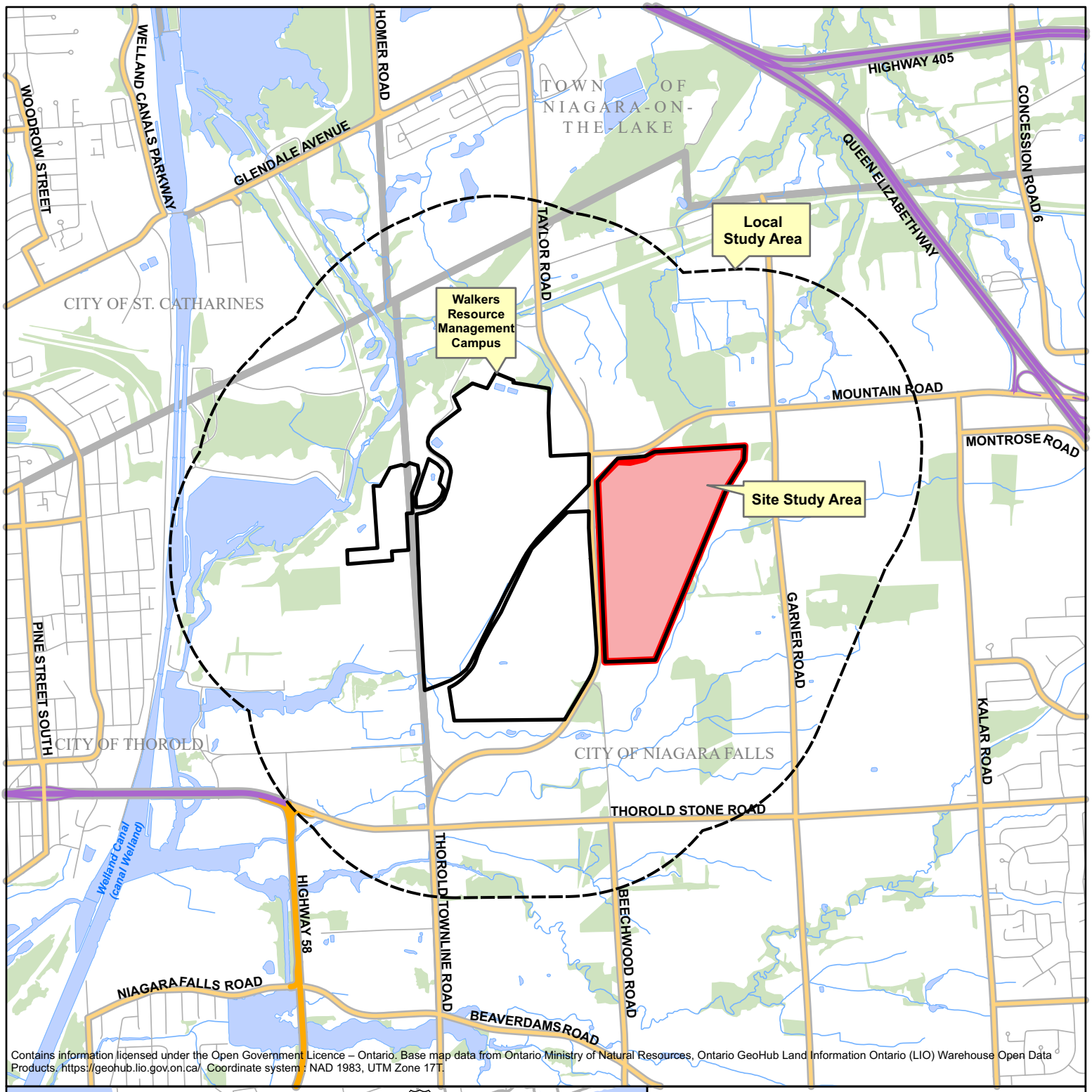

Figure 1
Location

Agricultural Existing Conditions Report
South Landfill Phase II, Walker's Niagara Campus

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The Soils of the Regional Municipality of Niagara mapping shows that the soils within the SSA are comprised primarily of Peel – Red Phase soils (53.58%), with smaller areas mapped as Beverly (21.53%), Alluvium, (11.32%), Malton – Red Phase (9.37%), and Toledo (4.20%) soils. Regional scale soil mapping is shown in Figure 2.

The regional scale soil mapping is not reflective of the current soils present within the SSA, as these lands have been disturbed due to the extraction of aggregate resources. Under the current conditions, the soils on the SSA would be more accurately described as Disturbed Lands. Descriptions of each soil series mapped on the SSA, as well as a description of Disturbed soils, can be found in Appendix A.

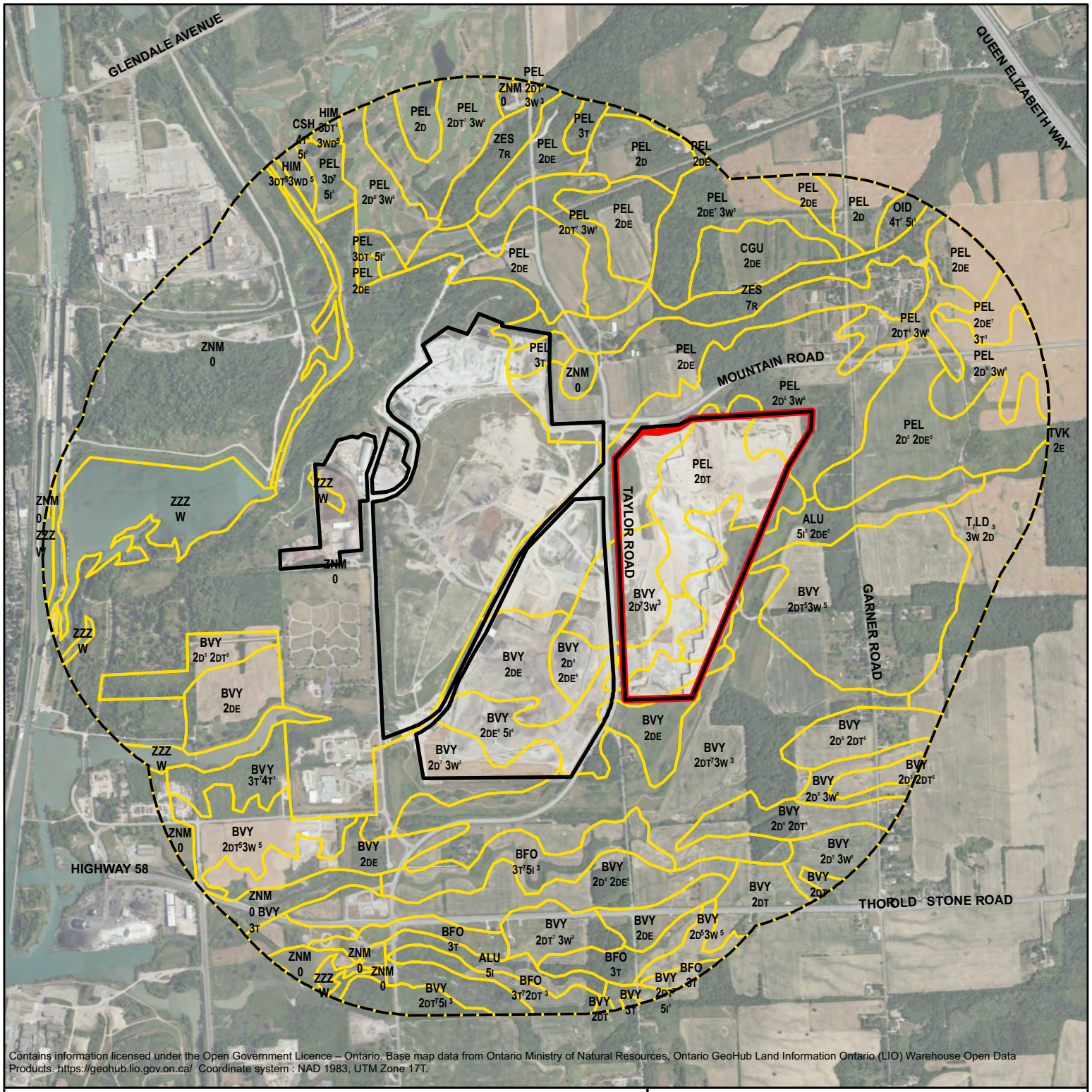
4.1.2 Canada Land Inventory

The Canada Land Inventory (CLI) is an interpretative system for assessing the effects of climate and soil characteristics on the limitations of land for growing common field crops. The CLI system has seven capability classes that descend in quality from Class 1, which have no significant limitations for common field crop production, to Class 7 lands, which have no capability for common field crop production. CLI Classes 1-3 are considered to be prime agricultural lands.

Soil capability subclasses are used to indicate the primary type of limitation or hazard for growing common field crops. Classes 2 through 7 lands have one or more significant limitations that restrict the production of common field crops. Each of these limitations are denoted by a capital letter which follows the numeric CLI Class. Only the most severe limitation(s) (i.e., capability subclass) is shown. For example, CLI Class 2DT lands have moderate limitations related to dense, clayey textures (D) and very gently sloping topography (T). There are thirteen subclasses described in CLI Report No. 2 (1971). Eleven of these subclasses have been adapted to Ontario soils. More information regarding the CLI Classification system is provided in Appendix B.

Site Study Area

The CLI Capability Classification System does not provide a CLI Class rating for Disturbed Lands. However, under the existing aggregate extraction licence, the SSA is to be rehabilitated to an agricultural condition similar to pre-extraction capabilities through the Aggregate Resources Act. Figure 2 shows that prior to extraction, the SSA was comprised primarily of CLI Class 2 (75.122%) lands, with smaller areas mapped as CLI Class 3 (13.57%) and CLI Class 5 (11.32%) lands. The CLI Capability Classes of these lands are summarized in Table 1 below.



Legend

- Site Study Area
- Walkers Resource Management Campus
- Local Study Area
- Soil

Soil Series Name → PEL ← Percentage of Area

CLI Class → 1[60] 3T[40] ← CLI Subclass

CLI AGRICULTURAL CAPABILITY CLASSES

Class 2 - Moderate limitations that restrict the choice of crops, or require moderate conservation practices.

Class 3 - Moderately severe limitations that restrict the choice of crops, or require special conservation practices.

Class 4 - Very severe limitations that restrict the range of crops or require special conservation practices, or both.

Class 5 - Very severe limitations that restrict their capability in producing perennial forage crops, and improvement practices are feasible.

Class 7 - Soils in this class have no capability for arable culture or permanent pasture.

Class 0 - Not placed in a capability class.

CLI AGRICULTURAL CAPABILITY SUBCLASSES

E	Erosion	– limitation caused by erosion
D	Undesirable Soil Structure	– subclass where soil structure and/or low permeability is a limitation
I	Inundation	– periodic flooding by streams or lakes
R	Consolidated Bedrock	– limited by bedrock near surface
T	Topography	– subclass where topography is a limitation
W	Excess Water	– presence of excess soil moisture, other than that brought about by inundation

SOIL SERIES

ALU	Alluvium	**BVY**	Beverly
CSH	Cashel	**BFO**	Brantford
CGU	Chinguacousy	**OID**	Oneida
HIM	Haldimand	**TLD**	Toledo
MAT	Malton	**ZES**	Escarpment
PEL	Peel	**ZZZ**	Water
TVK	Tavistock	**ZNM**	Not Mapped

Figure 2
Soils and CLI

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South Landfill Phase II, Walker's Niagara Campus

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Table 1. Regional Soil Series for SSA

Soil Series	CLI Class	Area (Ha)	% of SSA
Peel – Red Phase	**2D**	7.12	9.37
	2DE	6.14	8.06
	2DT	27.51	36.15
Beverly	**2D**	10.37	13.61
	2DE	6.03	7.92
Alluvium	**5I**	8.62	11.32
Malton – Red Phase	**3W**	7.14	9.37
Toledo	**3W**	3.19	4.20
Totals		**76.12**	**100.00%**

CLI Class 2D, 2E, and 2T soils have moderate limitations for common field crop production due to adverse undesirable soil structure, erosion, and topography, respectively. CLI Class 3W soils have moderately severe limitations for common field crop production due to excess water. CLI Class 5I soils have severe limitations that restrict their capability in producing perennial forage crops due to inundation from lakes or streams.

As stated above, the regional scale mapping is not reflective of the current agricultural capability of the SSA. The current conditions are more reflective of CLI Class 7 lands in terms of its relative productivity. These lands have no capacity for arable culture or permanent pasture. This is due to the lands being disturbed from the extraction of aggregate resources.

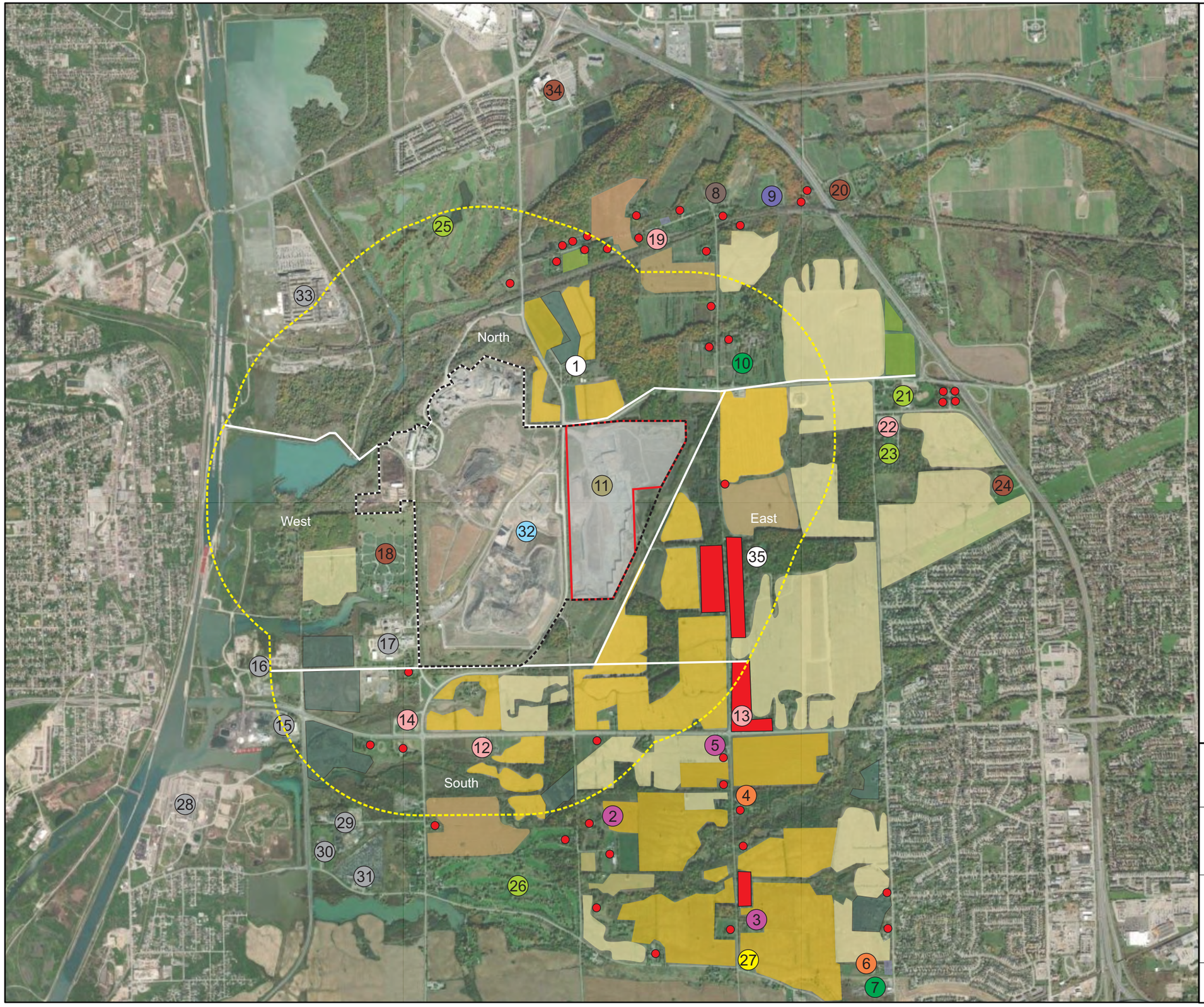
Local Study Area

Figure 2 shows that the LSA is comprised primarily of CLI Class 2 (46.66%) lands, with smaller areas mapped as CLI Class 3 (17.65%), CLI Class 4 (0.38%), CLI Class 5 (3.82%) lands, CLI Class 7 (2.36%), and CLI Class Not Rated (29.13%) lands. CLI Class 0 lands are associated with areas labelled as Not Mapped and are not assigned a capability rating through the CLI classification system.

As shown in Figure 2, the majority of the LSA are prime agricultural lands. The LSA has a higher agricultural capability than the SSA, in their current condition.

4.2 Land Use

A reconnaissance-level land use survey of the Walker Resource Management Campus and the LSA was completed on June 21, 2023. The land use survey identified the number and type of agricultural operations (both existing and retired), agriculture-related uses, on-farm diversified uses, and the extent and type of non-agricultural land uses in the area. Additionally, field crops observed in the LSA were identified and mapped. The identified land uses are numbered, and short descriptions of each use are provided in Appendix C. Cropping pattern and the locations of identified land uses are shown in Figure 3.



Legend

- Site Study Area
- Walkers Resource Management Campus
- Local Study Area

Crop Type

- Soy
- Winter Wheat
- Corn
- Hay
- Orchard
- Vineyard
- Cultivated
- Scrubland
- Disturbed

Agricultural Uses

- Equestrian Operation
- Retired Livestock Operation
- Hobby Farm
- Remnant Farm
- Nursery
- Apiary

Agriculture-Related

- Winery

Non-Agricultural

- Commercial
- Industrial
- Quarry
- Institutional
- Recreational
- Landfill
- Non-Farm Residence
- Rural Residential Cluster

Figure 3
Land Use Mapping

Agricultural Existing Conditions Report
South Landfill Phase II
Walker's Niagara Campus

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To assist in describing the land uses present within the lands surrounding Walker Resource Management Campus, the land use map has been subdivided into areas to the north, south, east, and west of Walker Resource Management Campus. Additionally, the land use survey identified land use types and cropping patterns beyond the 1,000 m LSA to provide a more detailed description of land uses surrounding Walker Resource Management Campus.

4.2.1 Walker Resource Management Campus

Within Walker Resource Management Campus, the majority of lands have been disturbed by the South Landfill, East Landfill, and Southeast Quarry. Additionally, Walker Resource Management Campus contains a compost facility, office buildings, landfill leachate lagoons, an aggregate processing area, an asphalt plant, a clean wood site, and a landfill gas utilization and flaring area.

4.2.2 Local Study Area

North

North of Walker's Niagara Campus, small areas of land are cultivated with common field crops (corn and winter wheat) and smaller areas are cultivated with specialty crops (vineyard and orchard). There is one remnant farm, one equestrian operation, and one nursery located north of Walker Resource Management Campus. One agriculture-related use was also identified, which is a winery.

The remaining lands consist of scrubland, forested area, and non-agricultural land uses. The non-agricultural land uses include one recreational use, one industrial use, two institutional uses, one commercial use, and approximately eighteen non-farm residences.

East

East of Walker Resource Management Campus, the majority of lands are cultivated for common field crop production. Crops grown at the time of the land use survey include winter wheat, soy, and corn. There is also a smaller portion of land used for specialty crop production in the form of a vineyard.

The remaining lands consist of forested area and non-agricultural land uses. The non-agricultural land uses observed include two recreational uses, one commercial use, one institutional use, approximately five non-farm residences, and two separate rural residential clusters. Additionally, one remnant farm was observed during the land use survey.

South

South of Walker Resource Management Campus, the majority of lands are cultivated for common field crop production, including soy, winter wheat and corn. The remaining lands are forested and contain small amounts of scrubland and a golf course. Seven agricultural uses were identified south of Walker Resource Management Campus. These include three retired livestock operations, two hobby farms, a nursery and one apiary. Non-agricultural uses include three commercial uses, one recreational use, five industrial uses, approximately seventeen non-farm residences, and two rural residential clusters.

West

West of Walker Resource Management Campus, the majority of lands have been developed and show very little signs of agricultural influence. The Welland Canal separates the residential area of Thorold (west of the canal) from industrial, institutional, and commercial uses. There are no agricultural,

agriculture-related, or on-farm diversified land uses located west of Walker Resource Management Campus. The land use survey identified two industrial uses and one institutional use.

Summary

In summary, the lands surrounding the SSA are largely comprised of agricultural lands used for common field crop production. There are also several relatively large, forested areas and scrublands within the surrounding LSA. The land uses include a mix of agricultural and non-agricultural land uses. Non-agricultural land uses are more prevalent on lands in close proximity to the City of Niagara Falls and City of Thorold settlement area boundaries.

Although the lands north of the SSA are within the specialty crop area designation, there is little specialty crop production present within the LSA.

4.3 Land Improvements

The Ontario Ministry of Agriculture, Food and Agribusiness' (OMAFA) Agricultural Information Atlas (AgMaps) provides artificial drainage mapping for the province. This online tool was accessed to obtain drainage mapping for Walker Resource Management Campus and the LSA. Figure 4 below shows the drainage improvements within the SSA and LSA.

4.3.1 Walker Resource Management Campus

According to OMAFA's online mapping tool AgMaps, there are no investments in tile drainage within Walker Resource Management Campus and there are no constructed drains on or adjacent to the lands that were designed for agricultural purposes.

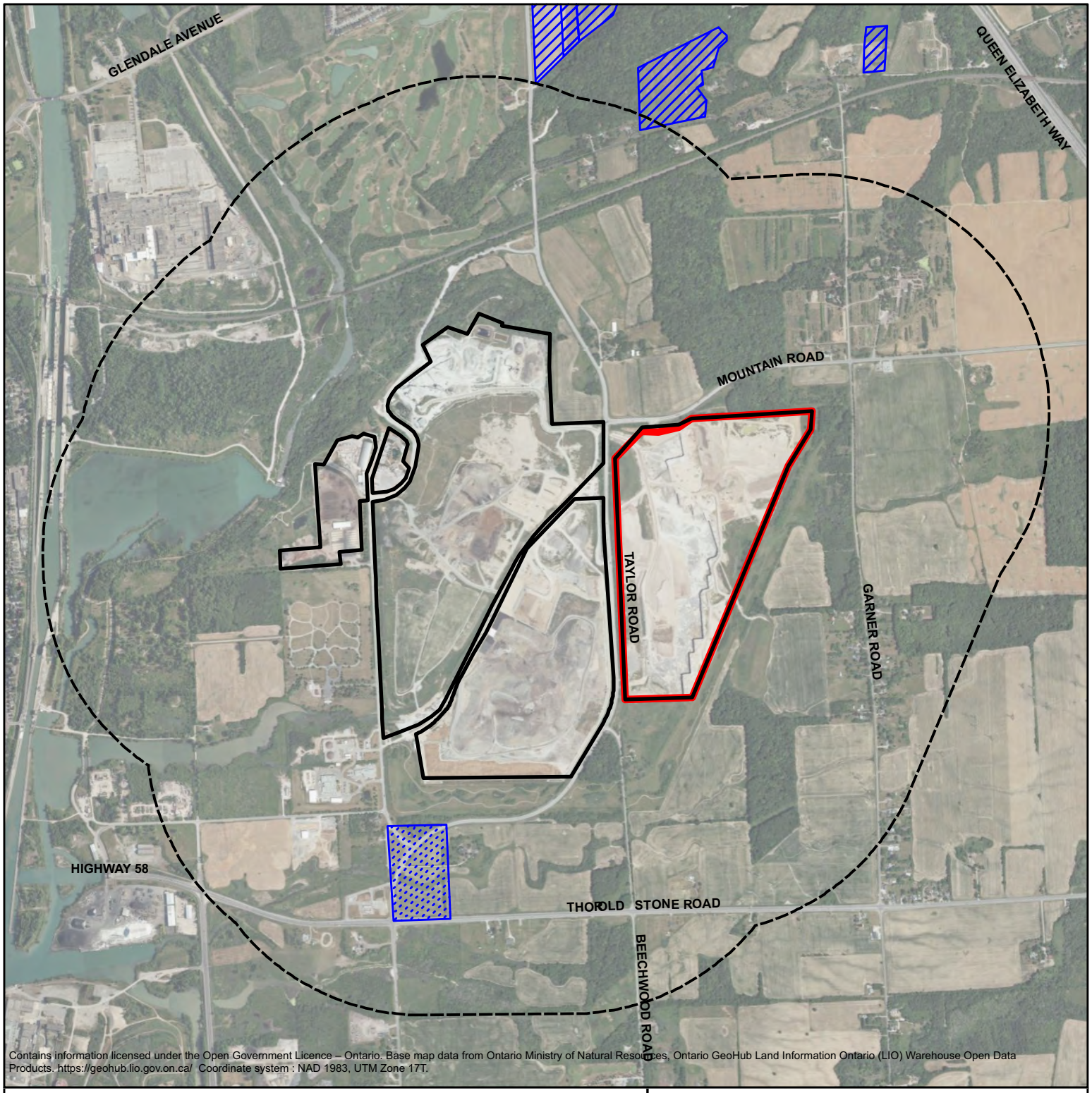
4.3.2 Local Study Area

Within the LSA, there is a limited amount of investment in tile drainage. According to AgMaps, there is a small area of random tile drainage that has been installed immediately south of Walker Resource Management Campus. Additionally, there is a small area of systematic tile drainage installed in the northern portion of the LSA, immediately north of Warner Road. The installation date of the random tile drainage was not available through AgMaps, however, the systematic tile drainage was installed in 2015.

According to AgMaps, there are no constructed drains (i.e., municipal drains) within the LSA.

4.4 Fragmentation

Fragmentation of agricultural lands can have a negative impact on the viability of agricultural lands and its long-term preservation for agricultural purposes. Fragmentation of farmlands can diminish the economic viability of the agricultural area by reducing farming efficiency and increasing operating costs for farmers who must manage multiple small, separated parcels. Larger farm parcels can accommodate a wider range of agricultural activities and ensure long term viability of the property. In contrast, smaller farm parcels cannot offer the same flexibility and may not be viable as standalone parcels. Generally, smaller farm parcels cannot sustain a family farm without a secondary source of income (off farm) to maintain the agricultural operation.



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Legend

- Site Study Area
- Walkers Resource Management Campus
- Local Study Area
- Tile Drainage - Random
- Tile Drainage - Systematic

Figure 4
Land Improvements

Agricultural Existing Conditions Report
South Landfill Phase II, Walker's Niagara Campus

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Additionally, agricultural areas which have been fragmented often have a higher occurrence of non-agricultural land uses, which in turn can result in more frequent occurrences of conflict arising between agricultural and non-agricultural land uses. Agricultural areas with lower levels of fragmentation are considered to be more viable economically for agricultural uses and generally have fewer sources of non-agricultural land use conflicts. In most cases, these areas have a higher priority for protection. High levels of fragmentation in an agricultural area lower the areas agricultural priority.

The Provincial Planning Statement (PPS) policies recognize the impact of fragmentation on agricultural lands and try to minimize the fragmentation of agricultural lands for non-agricultural uses. For example, the PPS policies do not permit lot creation in prime agricultural areas for residential purposes. New permitted development in prime agricultural areas should avoid further fragmentation of the agricultural land base whenever possible.

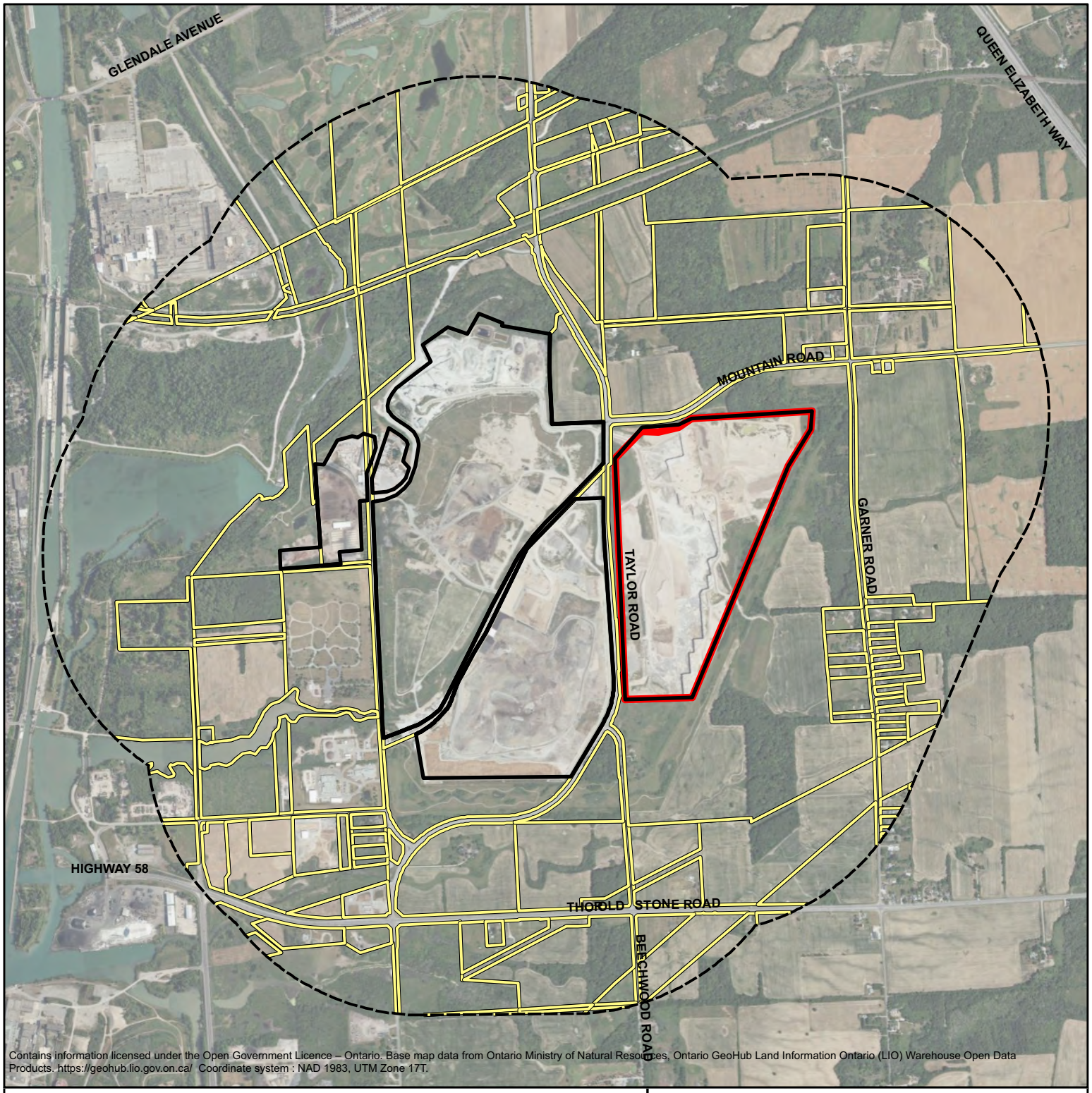
The LSA includes a mix of parcel sizes ranging from single residential (<1 ha) to large agricultural parcels (>60 ha). Several parcels within the agricultural land base are not suitably sized for a variety of agricultural uses. Excluding the parcels on which Walker Resource Management Campus is located, there are 135 parcels within the LSA. Of these 135 parcels, the average parcel size is 8.55 ha, and 61 parcels are equal to or less than 2 ha in size. The lot fabric is shown in Figure 5 below.

The lands surrounding Walker Resource Management Campus have been fragmented through the development of non-agricultural uses, primarily the development of rural residential uses. The high level of fragmentation in the LSA, the abundance of non-agricultural land uses, and the lack of large contiguous agricultural parcels makes these lands less desirable to farm and lowers their agricultural priority.

4.5 Agricultural Economy

The agri-food network includes the infrastructure, services and other agri-food assets needed to sustain and enhance the prosperity of the agri-food sector. We reviewed the Agricultural Systems Portal to identify whether there are any elements of the agri-food sector in the LSA. Of the 36 listed layers, none were identified within the LSA. The closest element of the agri-food network is Big Reds, a provincially licensed meat plant, located within the Town of Thorold's urban area.

The Agricultural Systems Portal shows that there are a total of 49 farms reporting within the City of Niagara Falls. These are summarized in Table 2 below.



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Legend

- Site Study Area
- Walkers Resource Management Campus
- Local Study Area
- Fragmentation

Figure 5
Fragmentation

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South Landfill Phase II, Walker's Niagara Campus

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Table 2: Reported Farms in Niagara Falls – 2021 Census	
Farm Type	Number Reported
Total Number of Farm Reporting	49
Cattle Ranching	3
Hogs and Pigs	0
Poultry and Egg Production	6
Sheep and Goats	2
Oilseed and Grain	8
Vegetable and Melon	4
Fruit and Tree Nut	6
Greenhouse, Nursery, and Floriculture	5
Dairy Cattle and Milk Production	1
Beef Cattle Ranching	2
Chicken and Egg Production	2
Broilers and Other Chickens	3
Turkey Production	0
Poultry Hatcheries	0
Apiculture	4
Horse Equine	2

None of the reporting farms were identified within the LSA. It should also be noted that according to this data source, the City of Niagara Falls has the smallest number of farms reporting among the twelve municipalities within the Region.

5. CONCLUSIONS

The Agricultural Existing Conditions Report was prepared following a desktop review of a variety of existing agricultural-related data sources and a reconnaissance-level land use survey. The results of this exercise are summarized as follows:

1. The SSA are disturbed lands as a result of aggregate extraction and there is presently no capability for common field crop production;
2. The land uses within the LSA include a mix of predominantly non-agricultural land uses with some lower intensity agricultural uses. No agricultural uses are located on the SSA and the lands currently contain an active quarry operation;
3. There are no agricultural investments (i.e., agricultural land improvements and infrastructure) within the SSA. Minimal investments in systematic and random tile drainage are present within the LSA. There are eleven agricultural operations with investments in agricultural infrastructure in the LSA;

4. The land base within the LSA is highly fragmented, predominantly by the non-agricultural land uses (e.g., residential dwellings); and
5. No components of the agri-food network were identified within the SSA, nor the LSA.

The examination of the existing conditions for agriculture show that the area is a relatively low priority agricultural area. Although agricultural uses, agriculture-related uses, and on-farm diversified uses are all permitted in the prime agricultural area within the LSA, establishing more intensive farm operations here would face significant constraints mainly due to the prevalence of existing non-agricultural uses.

6. REFERENCES

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APPENDIX A

Soil Series Descriptions

Beverly

Beverly soils have developed from silty clay lacustrine deposits greater than one metre in depth. The calcareous C horizon is generally encountered at approximately 45 cm from the surface. The overlying B horizon is also comprised of silty clay textures and is susceptible to compaction during periods of saturation. These soils are imperfectly drained and moderately to slowly permeable. The surface runoff is medium to high, depending on the surface textures and degree of slope. The water table is often located in the surface and subsurface horizons for long periods of the growing season, particularly where heavy farm machinery has caused the subsoil to become compacted. The water holding capacity of these soils ranges from medium to high. Excess water in the subsoil results in the formation of prominent yellowish-brown to yellowish-red mottles. The surface texture of Beverly soils is commonly silty clay loam, however, loamy and coarse phases of Beverly soils have also been mapped. The surface horizon (Ap) is generally between 15 and 20 cm thick, pH values are usually neutral, and the mean organic matter contents is 3.6 percent.

Beverly soils are considered to be good agricultural soils and are rated as CLI Class 2D. The main limitation for these soils is their high clay content which can result in soil structural problems if not carefully managed. Artificial drainage of these soils is necessary to achieve successful yields. On steeper slopes, these soils are susceptible to erosion and steps must be taken to ensure it does not become a problem which will result in decreased yields.

Toledo

Toledo soils have developed from the same silty clay lacustrine deposits as the Beverly soil series, however, these soils are poorly drained. The calcareous C horizon is encountered at depths ranging between 40 and 60 cm. The overlying B horizon is gleyed and prominent mottles are found throughout this and the C horizons. The soil texture is silty clay and, as with the Beverly soil, they are susceptible to compaction when saturated. Surface textures, usually 15 to 20 cm thick, are commonly silty clay loam, however, peaty, loamy and coarse phases of this soil are also found.

Toledo soils have a high water holding capacity, are slowly permeable and the groundwater remains near the surface throughout much of the year. The surface runoff is medium to high and depends on the surface textures and degree of slope. To produce common field crops artificial drainage is required. Toledo soils that are artificially drained, or where it can be feasibly installed, are rated as CLI Class 3W. In areas where artificial drainage can not be feasibly installed these soils are rated as CLI Class 5W.

Peel – Red Phase

Peel soils are derived from clayey lacustrine sediments (40-100 cm in depth) that overly a reddish hued, dense, clay loam till. They are imperfectly drained, moderately to slowly permeable and generally occur on nearly level to very gentle slopes. The calcareous clay-loam till parent material (Ckg) is generally encountered at 50-65 cm below the surface, while the overlying lacustrine sediments consist mostly of silty clay loam to silty clay. These soils are stone free and are generally good agricultural soils provided that tile drainage can be installed to effectively remove excess water from the rooting zone and allow early cultivation of the soil. These soils are susceptible to compaction under wet conditions and crop yields are often limited as a result of poor soil structure. Peel soils with drainage improvements are considered to be

CLI Class 2D on nearly level slopes. The 2D indicates a moderate limitation for the production of common field crops as a result of poor soil structure.

Malton

Malton soils have developed from fine glaciolacustrine sediments that overlie glacial till material. The textures of the upper soil horizons are commonly silty clay loam to silty clay. The texture of the calcareous glacial till underlying the lacustrine sediments is often a clay loam. Malton soils are poorly drained and slowly permeable. The soil is commonly saturated by groundwater throughout much of the year including during the growing season. Where compaction of the subsoil has occurred, perched conditions are also common. Due to their clayey textures, Malton soils have a relatively high water holding capacity and surface runoff is slow. Prominent yellowish-brown to brown mottles occur in the subsoil (Bg horizon) and underlying glacial till (Ckg horizon). On the Subject Lands, the red phase of the Malton soil has been mapped.

If Malton soils are tile drained they are considered to be CLI Class 3W for common field crop production. The excess water in the soil profile during the growing season causes moderately severe limitations for field crop production. Where it is not feasible or practical to artificially drain these soils, they are rated CLI Class 5W. Due to the high water content and fine textures, these soils are highly susceptible to compaction and care must be taken to stay off these soils with heavy machinery during wet periods.

Alluvium

Alluvium soils have a variety of soil textures and drainage conditions. Typically, they consist of finer textured sediments and are imperfectly to poorly drained. These soils are confined to floodplains where sediments are deposited as a result of recent flooding. Surface horizons are usually comprised of relatively thick accumulations of mineral and organic material. The underlying sediments can be highly variable in texture and buried horizons and organic materials are common.

Most of the soils mapped as Alluvial are rated as CLI Class 5I due to the potential for inundation, although in some areas where the risk of flooding is not as great these soils are rated CLI Class 3I.

Disturbed

Although Disturbed lands are not mapped on the Subject Lands through the regional scale mapping, the existing quarry operation on the Subject Lands has removed the soils mapped at the regional scale and they are considered Disturbed lands in their current condition.

Disturbed lands are not agricultural soils, have no soil profile development, and have no agricultural capabilities. Disturbed lands are not assigned a CLI Capability Class through the CLI Classification System.

APPENDIX B

Canada Land Inventory Information

Canada Land Inventory Soil Capability Classification for Agriculture

The Canada Land Inventory (CLI) classification system was developed to classifying soil capability for agricultural use for use across Canada. CLI is an interpretative system which assesses the effects of climate and soil characteristics on the limitations of land for growing common field crops. It classifies soils into one of seven capability classes based on the severity of their inherent limitations to field crop production. Soils descend in quality from Class 1, which is highest, to Class 7 soils which have no agricultural capability for the common field crops. Class 1 soils have no significant limitations. Class 2 through 7 soils have one or more significant limitations, and each of these are denoted by a capability subclass.

In Ontario the document, "Classifying Prime and Marginal Agricultural Soils and Landscapes: Guidelines for Application of the Canada Land Inventory in Ontario" (OMAFRA, 2008) provides a Provincial interpretation of the CLI classification system. These guidelines are based on the "Canada Land Inventory, Soil Capability Classification for Agriculture" (ARDA Report No. 2, 1965) and have been modified for use in Ontario. In Ontario, CLI Classes 1 to 4 lands are generally considered to be arable lands and Classes 1 to 3 soils and specialty crop lands are considered to be prime agricultural lands.

The following definitions were taken from Classifying Prime and Marginal Agricultural Soils and Landscapes: Guidelines for Application of the Canada Land Inventory in Ontario (2008).

Definitions of the Capability Classes

Class 1 - Soils in this class have no significant limitations in use for crops. Soils in Class 1 are level to nearly level, deep, well to imperfectly drained and have good nutrient and water holding capacity. They can be managed and cropped without difficulty. Under good management they are moderately high to high in productivity for the full range of common field crops

Class 2 - Soils in this class have moderate limitations that reduce the choice of crops, or require moderate conservation practices. These soils are deep and may not hold moisture and nutrients as well as Class 1 soils. The limitations are moderate and the soils can be managed and cropped with little difficulty. Under good management they are moderately-high to high in productivity for a wide range of common field crops.

Class 3 - Soils in this class have moderately severe limitations that reduce the choice of crops or require special conservation practices. The limitations are more severe than for Class 2 soils. They affect one or more of the following practices: timing and ease of tillage; planting and harvesting; choice of crops; and methods of conservation. Under good management these soils are fair to moderately high in productivity for a wide range of common field crops.

Class 4 - Soils in this class have severe limitations that restrict the choice of crops, or require special conservation practices and very careful management, or both. The severe limitations seriously affect one or more of the following practices: timing and ease of tillage; planting and harvesting; choice of crops; and methods of conservation. These soils are low to medium in productivity for a narrow to wide range of common field crops, but may have higher productivity for a specially adapted crop.

Class 5 - Soils in this class have very severe limitations that restrict their capability to producing perennial forage crops, and improvement practices are feasible. The limitations are so severe that the soils are not capable of use for sustained production of annual field crops. The soils are capable of producing native or tame species of perennial forage plants and may be improved through the use of farm machinery. Feasible improvement practices may include clearing of bush, cultivation, seeding, fertilizing or water control.

Class 6 - Soils in this class are unsuited for cultivation, but are capable of use for unimproved permanent pasture. These soils may provide some sustained grazing for farm animals, but the limitations are so severe that improvement through the use of farm machinery is impractical. The terrain may be unsuitable for the use of farm machinery, or the soils may not respond to improvement, or the grazing season may be very short.

Class 7 - Soils in this class have no capability for arable culture or permanent pasture. This class includes marsh, rockland and soil on very steep slopes.

Definitions of the Prime and Non-prime Agricultural Lands

In Ontario, CLI Classes 1, 2 and 3 and specialty crop lands are considered prime agricultural lands. Non-prime agricultural lands are comprised of CLI Class 4-7 lands.

Organic soils (Muck) are not classified under the CLI system but are mapped and identified as O in the provincial mapping.

Definitions of the Capability Subclasses

Capability Subclasses indicate the kinds of limitations present for agricultural use. Thirteen Subclasses were described in CLI Report No. 2. Eleven of these Subclasses have been adapted to Ontario soils.

Subclass Definitions:

Subclass C - Adverse climate: This subclass denotes a significant adverse climate for crop production as compared to the "median" climate which is defined as one with sufficiently high growing-season temperatures to bring common field crops to maturity, and with sufficient precipitation to permit crops to be grown each year on the same land without a serious risk of partial or total crop failures. In Ontario this subclass is applied to land averaging less than 2300 Crop Heat Units.

Class	Crop Heat Units
1	>2300
2C	1900-2300
3C	1700-1900
4C	<1700

Subclass D - Undesirable soil structure and/or low permeability*:* This subclass is used for soils which are difficult to till, or which absorb or release water very slowly, or in which the depth of rooting zone is restricted by conditions other than a high water table or consolidated bedrock. In Ontario this subclass is based on the existence of critical clay contents in the upper soil profile.

Class	Soil Characteristics
2D	The top of a clayey horizon >15 cm thick occurs within 40 cm of the soil surface. Clayey materials in this case must have >35% clay content.
3D	The top of a very fine clayey (clay content >60%) horizon >15 cm thick occurs within 40 cm of the soil surface

Subclass E - Erosion*:* Loss of topsoil and subsoil by erosion has reduced productivity and may in some cases cause difficulties in farming the land e.g. land with gullies.

Class	Soil Characteristics
2E	Loss of the original plough layer, incorporation of original B horizon material into the present plough layer, and general organic matter losses have resulted in moderate losses to soil productivity.
3E	Loss of original solum (A and B horizons) has resulted in a plough layer consisting mostly of

	Loamy or Clayey parent material. Organic matter content of the cultivated surface is less than 2%.
4E	Loss of original solum (A and B horizons) has resulted in a cultivated layer consisting mainly of Sandy parent material with an organic matter content of less than 2%; shallow gullies and occasionally deep gullies which cannot be crossed by machinery may also be present.
5E	The original solum (A and B horizons) has been removed exposing very gravelly material and/or frequent deep gullies are present which cannot be crossed by machinery.

Subclass F - Low natural fertility*:* This subclass is made up of soils having low fertility that is either correctable with careful management in the use of fertilizers and soil amendments or is difficult to correct in a feasible way. The limitation may be due to a lack of available plant nutrients, high acidity, low exchange capacity, or presence of toxic compounds.

Class	Upper Texture Group (>40 and <100 cm from surface)	Lower Texture Group (remaining materials to 100 cm depth)	Drainage Class	Additional Soil Characteristics[1]
2F	Sandy	Sandy or very gravelly	Rapid to imperfect	Neutral or alkaline parent material with a Bt horizon within 100 cm of the surface
3F	Sandy	Sandy or very gravelly	Any drainage class	Neutral or alkaline parent material with no Bt horizon present within 100 cm of surface
3F	Sandy	Loamy or Clayey	Any drainage class	Acid parent material
3F	Loamy or clayey	Any Texture Group	Any drainage class	Acid parent material
4F	Sandy	Sandy or very gravelly	Any drainage class	Acid parent material
4F	Very gravelly	Any texture	Rapid to imperfect	Neutral to alkaline parent material
5F	Very Gravelly	Any texture	All drainage classes	Acid parent material

[1] "Acid" means pH<5.5; "Neutral" pH 5.5 to 7.4; "Alkaline" pH>7.4 as measured in 0.01 M CaCl2 (CSSC, 1998). PH 's measured in distilled water tend to be slightly higher (up to 0.5 units).

Bt horizon should be fairly continuous and average more than 10cm thickness

Subclass I - Inundation by streams or lakes: Flooding by streams and lakes causes crop damage or restricts agricultural use.

Class	Soil Characteristics
3I	Frequent inundation with some crop damage; estimated frequency of flooding is less than once every 5 years (Floodplain); includes higher floodplain-terraces on which cultivated field crops can be grown.
5I	Very frequent inundation with some crop damage; estimated frequency of flooding is at least once every 5 years (Floodplain); includes active floodplain areas on which forage crops can be grown primarily for pasture.
7I	Land is inundated for most of the growing season; often permanently flooded (Marsh)

Subclass M – Moisture deficiency: Soils in this subclass have lower moisture holding capacities and are more prone to droughtiness.

Class	Soil Texture Groups		Drainage	Additional Soil Characteristics
	Upper materials1	Lower materials2		
2M	15 to 40 cm of loamy or finer materials	Sandy to Very Gravelly	Well	
2M	40 to < 100 cm of sandy to very gravelly material.	Loamy to Very Fine Clayey	Well	
2M	Sandy		Rapid to well	Well developed Bt3 horizon occurs within 100 cm of surface
3M	Sandy material to > 100cm		Rapid	Bt horizon absent within 100 cm of surface
4M	Very Gravelly to > 100 cm		Rapid	Bt horizon present within 100 cm of surface
5M	Very gravelly to > 100cm		Very rapid	Bt horizon absent within 100cm

Subclass P - Stoniness: This subclass indicates soils sufficiently stony to hinder tillage, planting, and harvesting operations.

Class	Soil Characteristics
2P	Surface stones cause some interference with tillage, planting and harvesting; stones are 15-60 cm in diameter, and occur in a range of 1-20 m apart, and occupy <3% of the surface area. Some stone removal is required to bring the land into production.
3P	Surface stones are a serious handicap to tillage, planting, and harvesting; stones are 15-60 cm in diameter, occur 0.5-1m apart (20-75 stones/100 m^2), and occupy 3-15% of the surface area. The occasional boulder >60 cm in diameter may also occur. Considerable stone removal is required to bring the land into production. Some annual removal is also required.
4P	Surface stones and many boulders occupy 3-15% of the surface. Considerable stone and boulder removal is needed to bring the land into tillable production. Considerable annual removal is also required for tillage and planting to take place.
5P	Surface stones 15-60 cm in diameter and/or boulders >60 cm in diameter occupy 15-50% of the surface area (>75 stones and/or boulders/100 m2).
6P	Surface stones 15-60 cm in diameter and/or boulders >60 cm in diameter occupy >50% of the surface area.

Subclass R - Shallowness to Consolidated Bedrock: This subclass is applied to soils where the depth of the rooting zone is restricted by consolidated bedrock. Consolidated bedrock, if it occurs within 100 cm of the surface, reduces available water holding capacity and rooting depth. Where physical soil data were available, the water retention model of McBride and Mackintosh was used to assist in developing the subclass criteria.

Class	Soil Characteristics
3R	Consolidated bedrock occurs at a depth of 50-100 cm from the surface causing moderately severe restriction of moisture holding capacity and/or rooting depth.
4R	Consolidated bedrock occurs at a depth of 20-50 cm from the surface causing severe restriction of moisture holding capacity and/or rooting depth.
5R	Consolidated bedrock occurs at a depth of 10 to 20 cm from the surface causing very severe restrictions for tillage, rooting depth and moisture holding capacity. Improvements such as tree removal, shallow tillage, and the seeding down and fertilizing of perennial forages for hay and grazing may be feasible.

6R	Consolidated bedrock occurs at a depth of 10-20 cm from the surface but improvements as in 5R are unfeasible. Open meadows may support grazing.
7R	Consolidated bedrock occurs at < 10cm from the surface.

Subclass S - Adverse soil characteristics: This subclass denotes a combination of limitations of equal severity. In Ontario it has often been used to denote a combination of F and M when these are present with a third limitation such as T, E or P.

Subclass T - Topography

The steepness of the surface slope and the pattern or frequency of slopes in different directions are considered topographic limitations if they: 1) increase the cost of farming the land over that of level or less sloping land; 2) decrease the uniformity of growth and maturity of crops; and 3) increase the potential of water and tillage erosion.

Determination of Subclass T for Very Gravelly and Sandy Soils

Slope %	<2		2-5		5-9		9-15		15-30		30-60		>60	
Slope type	S	C	S	C	S	C	S	C	S	C	S	C	S	C
Class				2T	2T	3T	3T	4T	5T	5T	6T	6T	7T	7T

Slope %	<2		2-5		5-9		9-15		15-30		30-60		>60	
Slope type	S	C	S	C	S	C	S	C	S	C	S	C	S	C
Class				2T	3T	3T	4T	4T	5T	5T	6T	6T	7T	7T

S = Simple Slopes >50 m in length

C =Complex Slopes <50 m in length

Subclass W - Excess water:

The presence of excess soil moisture, other than that brought about by inundation, is a limitation to field crop agriculture. Excess water may result from inadequate soil drainage, a high water table, seepage or runoff from surrounding areas.

Soil Textures and Depths	**Depth to Bedrock** (cm)	**Soil Class** (Drainage in place or feasible)	**Soil Class** (Drainage not feasible)
Very gravelly, sandy, or loamy extending >40 cm from the surface, or, <40 cm of any other textures overlying very gravelly, sandy or loamy textures	>100	2W	4W, 5W
>40 cm depth of clayey or very fine clayey textures, or, <40 cm of any other texture overlying clayey or very fine clayey textures	>100	3W	5W
<40 cm of peaty material overlying any texture	>100	3W	5W
All textures	50-100	4W	5W
All textures	0-50	NA	5W

APPENDIX C

Land Use Notes

Land Use Survey Notes – June 21st, 2023 – C22109 – Chad Fernandez			
Weather	**Temperature**	**Cloud Conditions**	**Wind**
Sunny	24°	Clear	22km/h SE

Site No.	Type of Use	Type of Operation	Description of Operation
1	Agricultural	Remnant Farm	Brown Farm OFA Member Fencing installed Barn with tin roof House has been demolished Lands leased as part of larger cash crop operation
2	Agricultural	Retired Livestock Operation	Former dairy operation Uncapped cement silo Pole barn used as implement shed Stockpile of pallets
3	Agricultural	Retired Livestock Operation	Old bank barn in fair condition Accessory buildings No sign of livestock Appears retired
4	Agricultural	Hobby Farm	6 goats observed Small barn in fair condition Paddock in fair condition
5	Agricultural	Retired Livestock Operation	Small retired livestock operation Uncapped cement silo Fencing in place
6	Agricultural	Hobby Farm	New pole barn Small garden Small orchard at front of property
7	Agricultural	Nursery	Silverleaf Nursery & Garden Center
8	Agricultural	Equestrian Operation	Small stable in good condition 2 small steel feed bins Pasture area
9	Agriculture-Related	Winery	Perridiso Estate Winery
10	Agricultural	Nursery	Gauld Nurseries
11	Non-Agricultural	Quarry	Walker's Southeast Quarry
12	Non-Agricultural	Commercial	Boondocks Pet Resort
13	Non-Agricultural	Commercial	Mitchell Contracting
14	Non-Agricultural	Commercial	Commercial plaza Tim Hortons Petro Canada
15	Non-Agricultural	Industrial	Inland Truck & Trailer Ltd.
16	Non-Agricultural	Industrial	Steed & Evans Construction equipment supplier

Site No.	Type of Use	Type of Operation	Description of Operation
17	Non-Agricultural	Industrial	Industrial park Niagara Fleet Garage Silverline Group Thorold Public Works
18	Non-Agricultural	Institutional	Lakeview Cemetery
19	Non-Agricultural	Commercial	Total Contracting & Landscaping
20	Non-Agricultural	Institutional	Warner Methodist Cemetery
21	Non-Agricultural	Recreational	Regency Athletic
22	Non-Agricultural	Commercial	Club Italia Restaurant
23	Non-Agricultural	Recreational	Niagara Sport & Social Club Beach volleyball courts Soccer field
24	Non-Agricultural	Institutional	Redeemer Bible Church
25	Non-Agricultural	Recreational	Royal Niagara Golf Club Golf Course
26	Non-Agricultural	Recreational	Beechwood Golf & Social Club Golf Course
27	Agricultural	Apiary	Niagara Honey Bees on site and sale of honey
28	Non-Agricultural	Industrial	HOPA Ports – Thorold Multimodal Hub
29	Non-Agricultural	Industrial	Rankin Asphalt Asphalt mixing plant
30	Non-Agricultural	Industrial	Iafrate Machine Works Machine shop
31	Non-Agricultural	Industrial	Thorold Auto Parts & Recycling
32	Non-Agricultural	Landfill	Walker Industries Landfill
33	Non-Agricultural	Industrial	General Motor of Canada Company Car manufacturing
34	Non-Agricultural	Institutional	Niagara College Niagara-on-the-Lake Campus
35	Agricultural	Remnant Farm	Uncapped cement silo Barn uncapable of housing livestock No evidence of livestock

Land Use Summary			
	Total Number	**Active**	**Retired or Remnant**
Agricultural Use	11	1 – Equestrian Operation 2 – Hobby Farm 2 – Nursery 1 – Apiary	3 – Retired Livestock Operation 2 – Remnant Farm
Agriculture-related Use	1	1 - Winery	0
On-farm Diversified Use	0	0	0
	Total Number	**Type**	
Non-Agricultural Use	23*	1 – Quarry 1 – Landfill 4 – Recreational 5 – Commercial 8 – Industrial 4 - Institutional	

*Does not include non-farm residences.