



March 31, 2022
Our File: 222089

Via email: angus@lcdg.ca

GH1 Development Inc.
909 Davenport Road, 2nd Floor
Toronto, ON
M6G 2B7

Attention: Mr. Angus Knowles

Re: D-4 Study
Proposed Markdale Subdivision
Part Lots 95-97, Concession 1
Municipality of Grey Highlands
Grey County

Dear Mr. Knowles,

GM BluePlan Engineering Limited (GMBP) was retained by Mr. Angus Knowles of GH1 Development Inc. to undertake a Ministry of the Environment Conservation and Parks (MECP) D-4 Study (Guideline for Land Use On or Near Landfills and Dumps) for the vacant property (Site) directly adjacent the closed Markdale landfill site.

The entire Site are legally described as: Part of Lots 95, 96 & 97, Concession 1, N.E.T.S.R., Geographic Township of Artemesia, Municipality of Grey Highlands, County of Grey. The Study lands related specifically the D-4 Study are described as Part of Lot 95. The Site is located directly north of the Town of Markdale, on the north side of Highway 10 (as shown in Figure 1). The surrounding area of the subject property is mainly rural and open space is zoned as urban fringe near the Village of Markdale.

The Closed Landfill Property is located directly north of the Site and on the south side of the Rocky Saugeen River. The Closed Landfill Property is approximately 1.73 ha (4.29 acres) and described as Part of Lot 95, Concession 1, N.E.T.S.R., Geographic Township of Artemesia, Municipality of Grey Highlands, County of Grey. The former Markdale landfill site is inactive and has been closed since May 31st, 1975 (about 45 years).

PREVIOUS STUDIES

The D-4 Study Guidelines recommend that lands, within a 500 m radius of a landfill site, be evaluated to determine potential impacts from the landfill site prior to allowing development. To conform with this recommendation, it is our understanding that the Municipality formerly placed a development holding zone within the 500 m radius. However, based on the age, nature, and availability of information, it was apparent that the 500 m radius includes lands where impacts from the landfill were not anticipated. Consequently, the Municipality initiated D-4 Studies to revise the planning limits based on site-specific conditions.

The Closed Landfill Study – Markdale Site (CLSMS) by Gartner Lee was completed for the closed landfill site in March 2008. As part of this study, a review of available information and reports was completed to assess the potential for impacts from the landfill to the subject property followed by field work to confirm the environmental conditions at the property. The CLSMS provides information regarding the environmental conditions within the closed landfill site. As part of the CLSMS report, the following activities were conducted:

- 25 test pits to determine lateral extent and depth of fill
- Installation of 4 monitoring wells
- Groundwater sampling from the monitoring wells
- Surface water sampling at two locations
- Methane Gas sampling from the monitoring wells (2 events)

Following the CLSMS, a D-4 Study for The Closed Markdale Landfill Site was completed by Gamsby and Mannerow (now GM BluePlan) in April of 2008. The focus of the 2008 D-4 Study was to establish appropriate planning limits and restrictions based on the information collected as part of the CLSMS.

Since the Landfill has been closed and capped since 1975, the 2008 D-4 Study evaluated the potential impacts to the surrounding area due to:

1. Leachate impacts to surface water,
2. Leachate impacts to ground water, and
3. The generation of landfill gases, particularly methane.

Since the surrounding properties included in the former assessment were not within the Landfill Site, potential soil impacts and land settlement due to landfilling were not considered to be a concern. Additionally, since the Landfill is closed, capped and not operating, issues such as traffic, noise, and blowing litter were not considered to be a concern

Based on the findings of the former GMBP report, a reduction to the standard 500 m radius was delineated and an 'Area Requiring Further Study' was identified based on the combined potential impacts to surface water, groundwater, and methane gas production from the closed and capped Markdale Landfill.

Surface Water and Ground Water

Based on the findings of the former GMBP report, potential off-site impacts to surface water due to the Landfill are considered not to be a concern beyond the property boundary since:

- Surface water runoff from the Site flows towards the Rocky Saugeen River;
- The reported surface water quality results from the downgradient sample taken from the Rocky Saugeen River provided no indication of landfill impacts;

Additionally, the former GMBP report indicated that leachate impacts to shallow groundwater is only evident within the landfill site. Water quality results from the four wells onsite indicated minor landfill impacts in the shallow aquifer directly beneath the footprint and cross gradient, with no indication of leachate impacts in the other wells located around the perimeter of the site.

As shallow groundwater flow is inferred to flow northwesterly, the Rocky Saugeen River provides a natural flow divide in which potentially leachate influenced shallow groundwater would discharge to the river.

A total of 25 test pits completed for the CLSMS concluded that waste at the site is approximately 6 m deep and that the sediment on-site consists of silty sand overlying a sandy silt till layer. The 'rule of thumb' distance for lateral migration of methane gas, as recommended by the Ontario Ministry of Environment, is approximately 10 times the thickness of waste. Therefore, based on a waste thickness of 6 m, this represents a distance of 60 m.

Since the waste has a thickness of only 6 m, and the on-site geology is comprised of silty sand, which allows natural venting of methane gas, it is not anticipated that the methane gas will migrate past 60 m, as supported by the data collected as part of the CLSMS. In addition, the waste placed within the landfill is at the later stages of decomposition. Therefore, methane generation will have reduced from peak levels since the site was closed in 1975 and would not be anticipated to migrate past 60 m.

Gas monitoring was completed onsite for the CLSMS. Methane gas measurements in monitoring well locations (also screened within the unsaturated soils) indicated the occurrence of methane within the waste itself, reported to be between 9% and 100% in the spring and fall of 2006, respectively. The other wells had readings between 0% and 13%. However, methane gas under frozen conditions, when lateral subsurface gas migration is most prevalent, haven't been conducted to date.

In the absence of methane gas measurements under frozen conditions, a 120 m distance was incorporated into the 'Area Requiring Further Study'. This provided two times the migration distance over the 'rule of thumb' distance of 60 m. The 'Area Requiring Further Study' extends 120 m north, east and south of the landfill footprint. The boundary was based on the potential risk for methane migration from the landfill to adjacent properties. The 120 m is considered a conservative distance based on the geology of the site, volume of waste present, and the measured methane concentrations on-site.

The 120 m methane gas buffer zones provided the most protective, and final recommended areas where further D-4 Study was required prior to development. This 120 m area where it overlaps with the proposed development is subject of this D-4 Study.

PROPOSED DEVELOPMENT

The subject Site is approximately 32.89 ha (81.28 acres) in size. The Site is proposed to be developed in eight (8) Phases, resulting in 469 individual residential lots and several open space blocks. The Phases of development generally progress from the south portion of the property, to the north towards the Landfill Property. Approximately 33 lots are located within the 120 m radius (i.e., Area Requiring Further Study). It is further noted that approximately 7 proposed lots (i.e., Lots 122 to 127), are located within the 60 m radius. These lots are primarily associated with Phase 3 of the development (i.e., after the initial two Phases of development).

Also, within the 120 m radius, is a stormwater management block (SWM Block C), and Blocks D and N. Conveyance of stormwater is currently planned to continue through its existing path through Block D, towards the Rocky Saugeen River. It is understood that pre-engineering investigations for the development will generally progress in coordination with progression of development.

Potential for Impacts to the Development

A review of the historical D-4 Study information has been reviewed with consideration to the proposed development and the potential for impacts.

Landfill/Methane Gas

Based on the proposed development plans, several lots occur within the “potential” area of influence of methane and landfill derived gas. Based on the age of the landfill (i.e., 45 years) and the size and nature of waste placement that occurred in that era of waste disposal, it is anticipated that the potential for landfill gas to extend significantly beyond the landfill are limited. Based on all historic information, it is reasonable to expect that the proposed development would be able to proceed, with further study, and where needed mitigative measures.

Given the very real and serious implications of methane gas accumulation in structures, further work continues to be recommended to assess the potential for methane migration at the site. This work would include methane gas monitoring from appropriately installed methane probes between the landfill and structures within 60 m of the landfill.

In the event landfill gas measurements exceed MECP Guideline levels, mitigative measures (such as passive venting structures) and/or monitoring can be developed to support lots.

Methane gas generation is not expected to interfere with near surface stormwater features and infrastructure.

Groundwater/Surface Water

Based on the Landfill location adjacent to the Saugeen River, a high level of certainty is provided that groundwater and surface water flow is north, from the Site towards the Landfill and the River. Based on the review of the proposed lots and associated stormwater infrastructure, no impacts to the development are anticipated. Further, the development is not anticipated to exacerbate or influence conditions at the landfill as new preferential pathways are not being constructed that would intersect the waste or existing groundwater impacts that may exist below the landfill.

CONCLUSIONS AND RECOMMENDATIONS

Previous studies concluded that the potential for impacts from the 45 year old Landfill are limited in magnitude and likely limited to the direct vicinity of the landfill property. However, based on the absence of data for methane gas, a buffer area of 120 m was established as a limit for development without further investigation.

A subdivision is proposed to include lands within the 120 m of the landfill footprint. Based on this review, additional work is recommended prior to development to confirm the methane gas concentrations between the proposed building envelopes and the landfill footprint. We recommend that methane gas measurements be collected in the winter months from properly installed methane gas probes.

We understand that the current planning process accounts for all 8 Phases of the development, but that development of the entire subdivision will be on the scale of years. Since the lots within the 120 m limit are in the third Phase of development, it would likely be most efficient to complete the investigations in conjunction with the pre-engineering work for the first two Phases (as the fieldwork components would overlap).

Based on this review, it is reasonable to expect that proposed development plan within the 120 m will not be materially affected by the landfill or the outcomes of the proposed investigations. Even in the event the proposed monitoring finds adverse levels of impact, mitigative measures are available to prevent and mitigate against methane gas migration. Therefore, this D-4 Study supports the general development plans within 120 m of the landfill (as enclosed), subject to further investigation prior to registration of the lot fabric or issuance of the development permits for those lots within the 120 m.

STATEMENT OF LIMITATIONS

The scope of this study is limited to the items presented in this report. This study pertains specifically to the subject property identified herein and investigates the potential impacts to the subject lands associated with the closed Markdale Landfill. GM BluePlan Engineering Limited cannot guarantee the accuracy or reliability of information provided by others. GM BluePlan Engineering Limited does not accept liability for unknown, unidentified, undisclosed or unforeseen surface or sub-surface contamination that may be later identified.

All of which is respectfully submitted.

GM BLUEPLAN ENGINEERING LIMITED

Per:

A handwritten signature in blue ink, appearing to read 'J.K. Weller'.

J.K. Weller, C.Tech.

Per:

A handwritten signature in blue ink, appearing to read 'M.D. Nelson'.

M.D. Nelson, M.Sc., P.Eng., P.Geo.

File No. 222089

Enclosure: Figure 1 – Site Location
Conceptual Development Plan

FIGURES

**222089
D-4 Study
Proposed Markdale Subdivision**



LEGEND

 Approximate Site Boundary

Scale

1:15,400

March 2022

SITE LOCATION MAP

Part Lots 95-97, Concession 1
Municipality of Grey Highlands
Grey County

Figure No. 1



REDLINE REVISION MARCH 8, 2020

DRAFT PLAN OF SUBDIVISION OF
PART OF LOTS 95, 96 & 97
CONCESSION 1 N.E.T.S.R.
GEOGRAPHIC TOWNSHIP OF ARTEMESIA
MUNICIPALITY OF GREY HIGHLANDS
COUNTY OF GREY

SCALE 1 : 1000
0 10 20 30 40 50 60 METRES

METRIC
DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE
IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING
BY 0.3048.

PLAN CONTENTS

- A. BOUNDARY CERTIFICATION IS SET OUT BELOW
- B. LOCATION OF HIGHWAY IS SHOWN HEREON
- C. AS SHOWN HEREON
- D. THE PURPOSE OF THE PROPOSED LOTS IS RESIDENTIAL
- E. THE USE OF ADJOINING LANDS IS SHOWN HEREON
- F. LAYOUT AND DIMENSIONS OF PROPOSED LOTS ARE SHOWN HEREON
- G. EXISTING STRUCTURES ARE SHOWN HEREON
- H. MUNICIPAL WATER
- I. SOIL IS SANDY LOAM AND CLAY
- J. CONTOURS ARE SHOWN HEREON
- K. MUNICIPAL SERVICES - WATER & SEWER
- L. NO EXISTING EASEMENTS & RIGHTS OF WAY



SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND IN THE SUBDIVISION
(SHOWN IN HEAVY OUTLINE) AND THEIR RELATIONSHIP TO THE ADJACENT
LANDS ARE CORRECTLY SHOWN ON THIS PLAN.

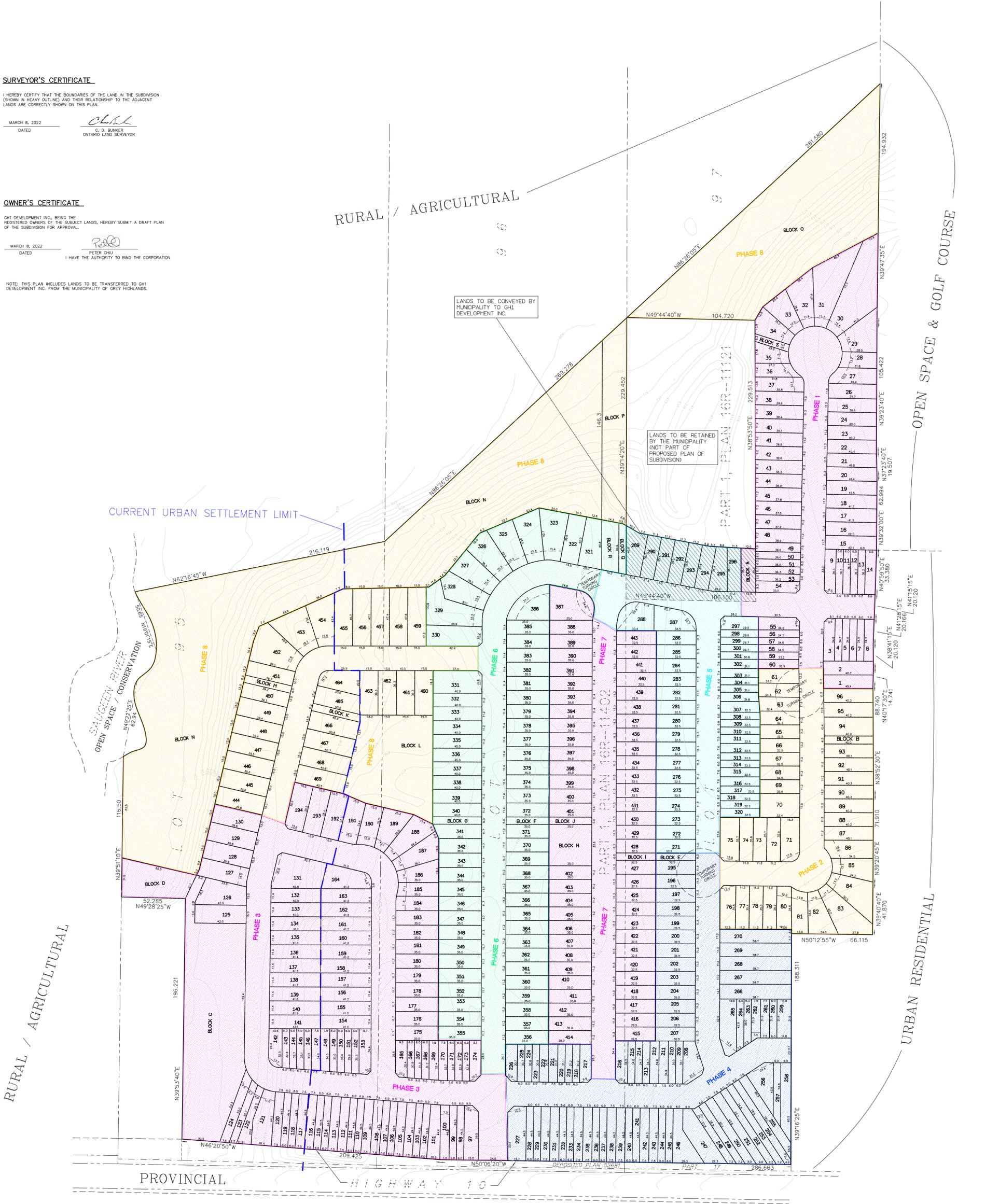
MARCH 8, 2022
DATED
C. D. Bunker
C. D. BUNKER
ONTARIO LAND SURVEYOR

OWNER'S CERTIFICATE

GHI DEVELOPMENT INC. BEING THE
REGISTERED OWNERS OF THE SUBJECT LANDS, HEREBY SUBMIT A DRAFT PLAN
OF THE SUBDIVISION FOR APPROVAL.

MARCH 8, 2022
DATED
Peter Chi
PETER CHI
I HAVE THE AUTHORITY TO BIND THE CORPORATION

NOTE: THIS PLAN INCLUDES LANDS TO BE TRANSFERRED TO GHI
DEVELOPMENT INC. FROM THE MUNICIPALITY OF GREY HIGHLANDS.



RURAL / AGRICULTURAL

RURAL / AGRICULTURAL

OPEN SPACE & GOLF COURSE

URBAN RESIDENTIAL

PROVINCIAL HIGHWAY 10

OPEN SPACE / RURAL

MARCH 8, 2022

T. A. BUNKER SURVEYING LTD.
150 JOHN ST. N. GRAVENHURST, ONTARIO, P. O. BOX 1180, PIP 1V4
705-687-5883
www.BunkerSurveying.ca