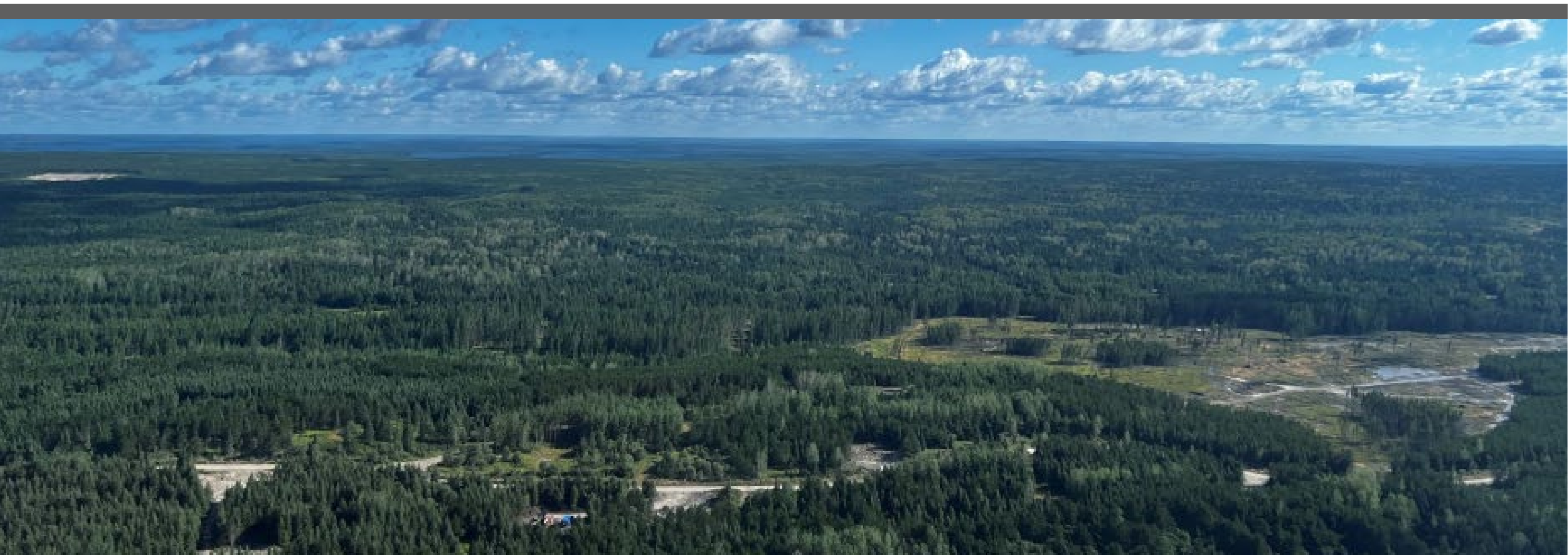
Great Bear Gold Project Impact Statement

Appendix H-2:

Hydrogeological Modelling Report



GREAT BEAR RESOURCES

GREAT BEAR PROJECT

GROUNDWATER MODELLING REPORT

DECEMBER 2025

GREAT BEAR PROJECT

GROUNDWATER MODELLING REPORT

GREAT BEAR RESOURCES

FINAL

PROJECT NO.: OMEMA2303
DECEMBER 2025

WSP CANADA INC.
6925 CENTURY AVENUE, SUITE 600
MISSISSAUGA, ON, CANADA L5N 7K2

T: +1 905-567-4444
WSP.COM

SIGNATURES

PREPARED BY:

ORIGINAL SIGNED BY

Keenan Lamb, M.Sc.E., P.Eng.
Lead Hydrogeological Engineer

REVIEWED BY:

ORIGINAL SIGNED BY

Simon Gautrey, MSc., MBA, P.Geo.
Senior Technical Director, Hydrogeology

TABLE OF CONTENTS

TABLES

FIGURES

1 INTRODUCTION

1.1 PROJECT BACKGROUND

Great Bear Resources Ltd. (Great Bear Resources) a wholly owned subsidiary of Kinross Gold Corporation, is proposing to develop a gold mine at the Great Bear Gold Project (the Project). The Project is located in the Red Lake mining district, in northwestern Ontario, approximately 25 kilometres (km) southeast of the Municipality of Red Lake (Figure 1-1).

There have been no prior mining operations completed on the Great Bear Project and no historical facilities or buildings within the Great Bear Project. Some of the land within the property boundary is occupied by historical and active gravel pits held by others. An Advanced Exploration (AEX) program consisting of underground exploration workings and limited surface infrastructure has been initiated.

1.2 OVERVIEW OF PROPOSED MINING

Great Bear Resources is proposing to develop the Great Bear gold deposit mainly using underground methods at depth and open pit mining methods at surface. The mine plan includes the following key activities which have the potential to impact local groundwater and/or surface water:

- Excavation and dewatering of the underground mine workings (UGM)
- Excavation and dewatering of two open pits (LP Central pit and Viggo pit)
- Establishment of the Viggo management facility (VMF) at the Viggo pit after mining ceases
- Construction and operation of a Tailings Management Facility (TMF)
- Construction of a mine rock stockpile (MRS)
- Construction of the low-grade ore stockpiles (LGO)
- Construction of the tailings management facility (TMF) pond and mine water pond (MWP).

The Site Plan is shown on Figure 1-2 (January 2025).

Construction of the mine site and associated infrastructure is expected to take up to approximately 3 years. Underground and open pit mining are expected to occur concurrently, with operation of the LP Central pit for up to about 9 years, followed by underground mining only for an additional 17 years, for a total operations period of approximately 26 years. Active closure of the site will follow operations and is expected to take up to 3 years and will be followed by a period of environmental monitoring and continued operation of the surface water management system after filling of the open pits with water and obtaining acceptable water quality for passive discharge to the environment.

The Project will have two open pits, the LP Central pit and the Viggo pit. The Viggo pit, consisting of two lobes (west and east), would be excavated from Year -3 (i.e., during construction) to Year -1 with a final footprint area of approximately 13.0 ha and a final pit floor elevation of approximately 250 metres above sea level (masl). The LP Central pit mining would be conducted from Year 1 to 8 with the open pit gradually increasing in footprint area to approximately 86.7 ha and a final pit floor elevation of approximately 110 masl, but is planned to remain dewatered until closure. The mine rock excavated from the UGM and open pits would be stored in the MRS located to the north of the LP Central pit with some mine rock (non potentially acid generating / metal leaching) to be used to construct the embankments for the TMF and foundations for other site facilities. The LP Central pit will be dewatered throughout the mine life and would be filled with water at the end of mine life. The MRS has been in part positioned so that seepage from MRS would be collected by LP Central pit. At the end of Viggo pit mining in Year -1, concentrate tailings (potentially acid generating; PAG) will be stored in the east VMF (formerly the Viggo pit). Concentrate tailings will be managed with a water cover during operations and will continue to be covered with water including from actively filled of the VMF with water at closure. Reject solution from the membrane filtration process will be stored in the west VMF during operations.

Ore processing and tailings production would start in Year 1 and continue until end of Year 26. The tailings would be stored behind earth-fill embankments constructed from local borrow material and mine rock. The tailings level would gradually increase to a final maximum elevation of approximately 418 masl at the end of ore processing. Tailings in the form of paste backfill will also be stored in the UGM through most of the mine life. The TMF pond will be built during the construction phase. As the east VMF continues to receive and store concentrate tailings during the operations phase, the available storage capacity in the east VMF for water storage decreases. Sub-phase two starts at approximately Year 16, which is when the volume of the east VMF approaches the volume that has been set aside as contingency, to store runoff from a potential design event. A MWP is proposed to be constructed downstream of the TMF pond to provide additional water storage for sub-phase two. LGO1 and LGO2 will store low-grade ore beginning in Year -2, which will be depleted prior to the commencement of closure.

The UGM, LP Central pit and the VMF (east and west) will be actively filled with water at the end of mine life. For the purpose of this study, it was assumed that the water level in UGM would be managed to maintain an elevation of approximately 355 masl at the Vent Raise adjacent to the LP Central pit, to allow flow under gravity from the UGM to LP Central pit. The assumed elevation of the filled LP Central pit is approximately 353 masl, which would be controlled by the elevation of an outlet at the Dixie Creek flood protection berm. The assumed elevation of the water-filled VMF after closure is approximately 354 masl, which is below the elevation of the rim of the pit.

1.3 SCOPE OF REPORT

This document has been prepared by WSP Canada (WSP) to summarize the numerical modeling of groundwater flow in the project area to inform Project design and approvals.

A three-dimensional (3D) groundwater flow model for the site was developed and calibrated to the site current conditions using steady-state baseline data (September / December 2023). The calibrated model was then used to predict the effects of project development (open pits and underground mine workings excavation, operation of a TMF, MRS and LGO) on local groundwater and surface water.

The modelling work described in this report is based on hydrogeological field work described in Hydrogeology Field Report (WSP 2025b) and baseline investigations described in Hydrogeology Baseline Report (WSP 2025a). Feedback received from 2023 to late 2024 from the Ministry of the Environment, Conservation and Parks (MECP) and technical reviewers on behalf of local Indigenous Nations on the groundwater flow model developed for AEX Program were considered in this report.

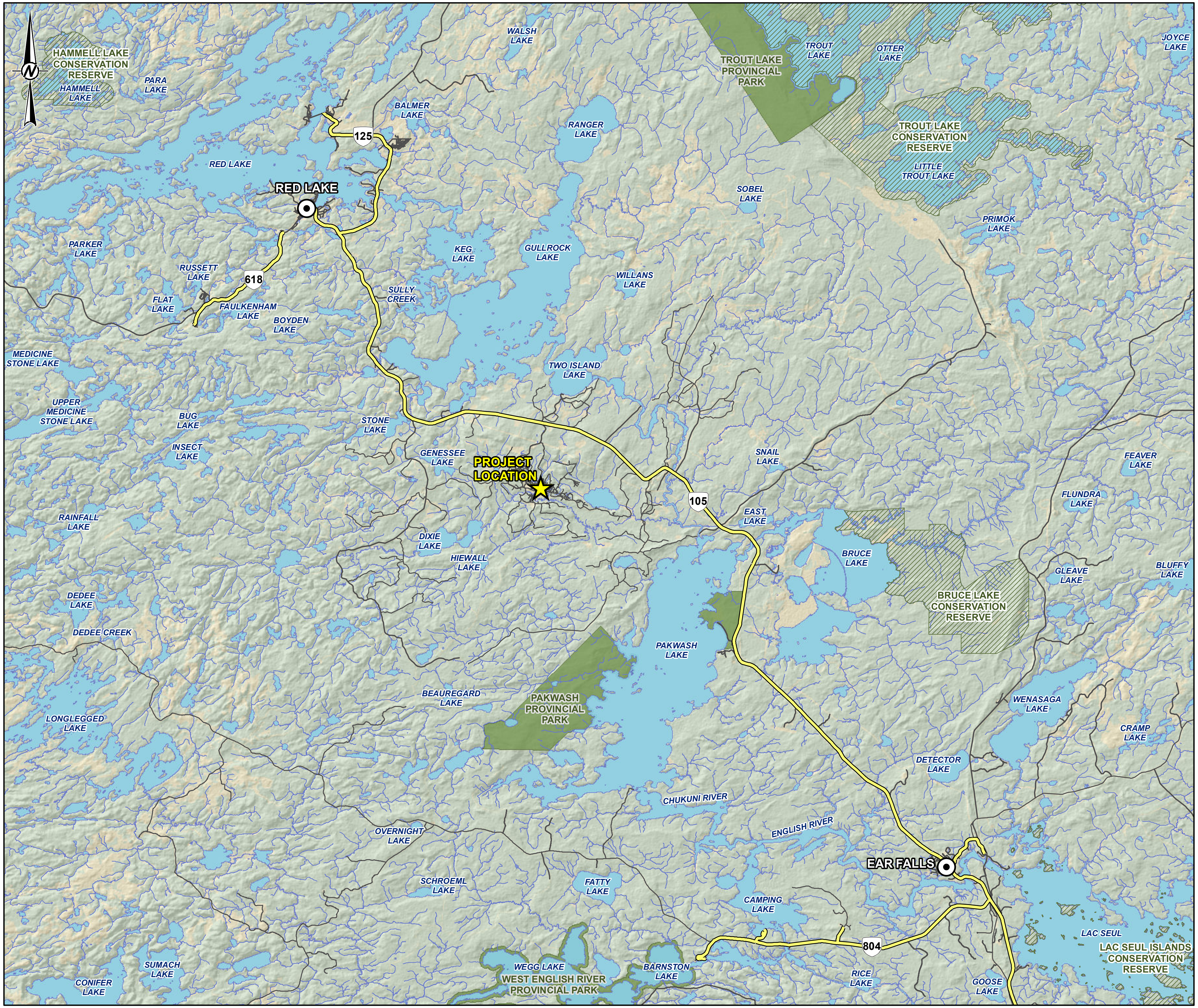
1.4 MODELLING OBJECTIVE

The main objective of the modeling work was to develop a 3D groundwater flow model that would inform both project design and assessment of potential impacts of the project on the local environment.

The specific objectives of hydrogeological modelling presented in this report are to:

- Develop a 3D numerical model which reflects hydrogeological conditions for pre-development of the Great Bear Project. This is used for calibration purposes
- Predict the effects of proposed open pit mining and underground mine workings on local groundwater and surface water, including:
  - The volume of inflow to the open pit and underground mine workings (at different stages of development and refilling with water)
  - The dimensions of the potential groundwater level influenced area (i.e., zone of influence)

  - Changes in local surface water features flow budgets (lakes and streams)
  - Predict seepage from the VMF under closure conditions.
- Predict the effects of proposed tailings discharge into a new TMF on local groundwater and surface water, including:
  - Seepage of pore water from the TMF
  - Effectiveness of proposed seepage mitigation options (ditches, pump stations and water management pond) in reducing long term seepage from the TMF to nearby surface water receivers.
- Predict seepage from TMF pond and MWP during mine operations
- Predict seepage from MRS to nearby surface water receivers during mine operations and under closure condition
- Predict seepage from LGO to nearby surface water receivers during mine operations.



KEY MAP

SCALE 1:30,000,000

LEGEND

★	PROJECT LOCATION
⊙	TOWN
▨	CONSERVATION RESERVE
🟩	PROVINCIAL PARK
═	HIGHWAY
—	LOCAL ROAD
—	RESOURCE/ RECREATION ROAD
—	WATERCOURSE
▭	WATERBODY

0 2.5 5 10

1:250,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. WATERCOURSES AND WATERBODY ACQUIRED FROM LAND INFORMATION ONTARIO (MNRF) AND MODIFIED TO MATCH AERIAL IMAGERY AND LIDAR.
3. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
PROJECT LOCATION

CONSULTANT
wsp

YYYY-MM-DD	2025-02-19
DESIGNED	----
PREPARED	MD
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
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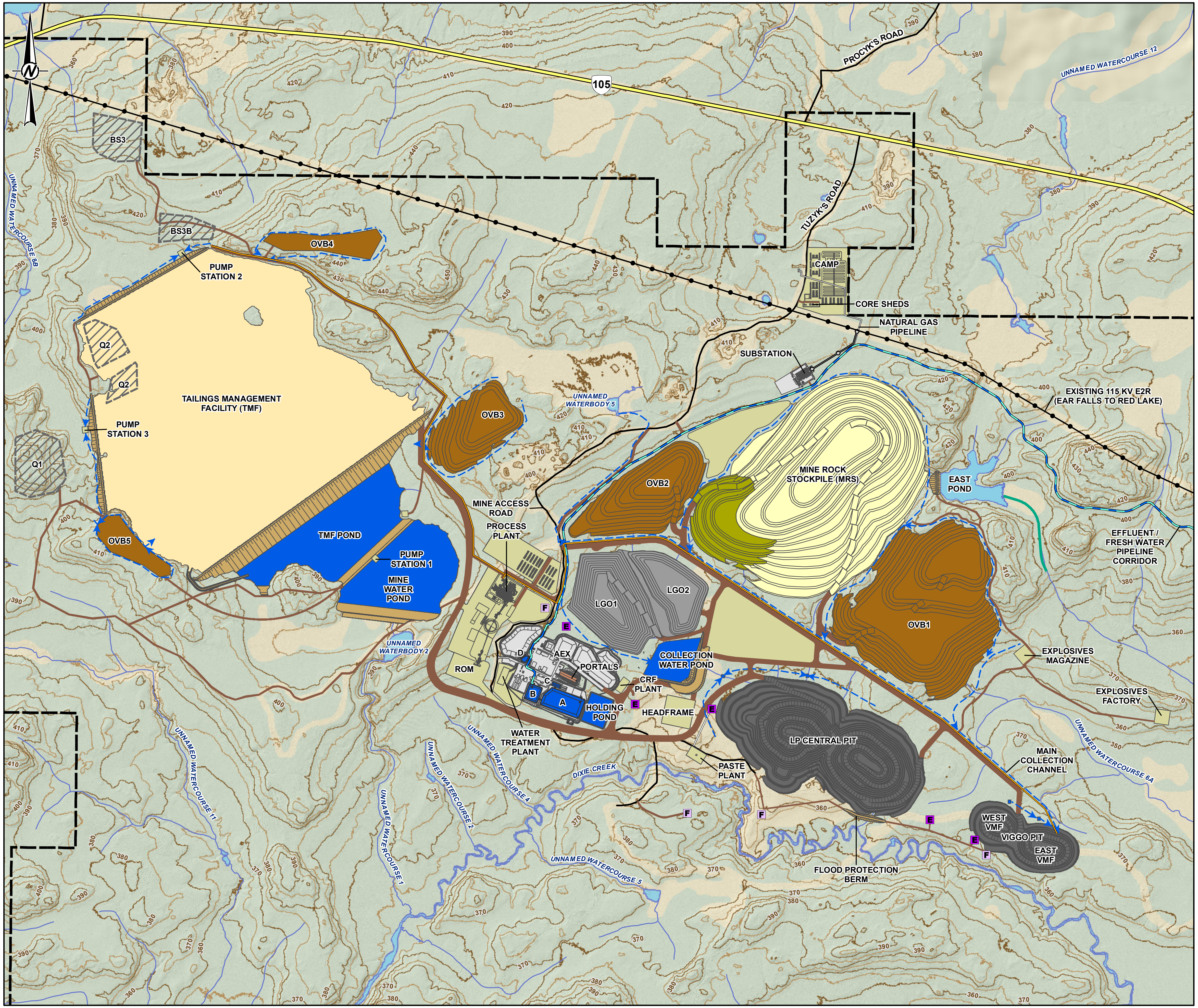

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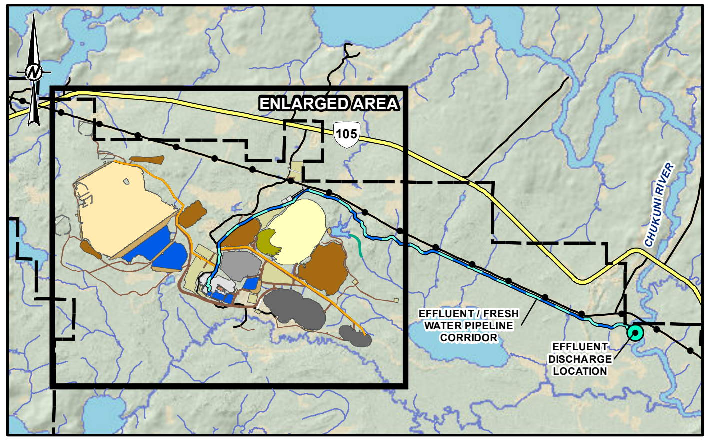

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LEGEND

▭	PROPERTY BOUNDARY
━	HIGHWAY (INCLUDING ENBRIDGE PIPELINE)
━	LOCAL ROAD
●━●	EXISTING TRANSMISSION LINE
─	WATERCOURSE
■	WATERBODY
─	MAJOR CONTOURS (10 M INTERVAL)
─	MINOR CONTOURS (5 M INTERVAL)

PROPOSED MINE FEATURE

■	OPEN PIT
■	MINE ROCK STOCKPILE (NPAG)
■	MINE ROCK STOCKPILE (PAG)
■	LOW GRADE ORE STOCKPILE (LGO)
■	OVERBURDEN STOCKPILE (OVB)
■	TAILINGS MANAGEMENT FACILITY (TMF)
■	DAM
■	POND
➝	COLLECTION DITCH
■	MINE FACILITIES / INFRASTRUCTURE
■	ROAD
■	PORTAL
▭	ADVANCED EXPLORATION SITE (AEX)
▨	ROCK QUARRY (Q) / SAND AND GRAVEL PIT (B)
━	DIVERSION CHANNEL
E	EXHAUST VENT RAISE
F	FRESH AIR VENT RAISE
○━	TRANSMISSION LINE
━	TAILINGS PIPELINE
═	PASTE PLANT PIPELINE
━	EFFLUENT / FRESH WATER PIPELINE CORRIDOR
◉	EFFLUENT DISCHARGE LOCATION

0 0.25 0.5 1

1:26,500 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE
2. VMF: VIGGO MANAGEMENT FACILITY
3. ROM: RUN OF MINE ORE
4. AEX PONDS: A-AEX MINE WATER POND, B-AEX TREATED WATER POND, C-AEX SETTLING POND, D-AEX SEDIMENT POND

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. CONTOURS ACQUIRED FROM 2022 LIDAR SURVEY.
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
6. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
SITE PLAN (TOPOGRAPHY)

CONSULTANT

YYYY-MM-DD	2025-09-05
DESIGNED	----
PREPARED	MD
REVIEWED	----
APPROVED	----

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2 CONCEPTUAL HYDROGEOLOGICAL MODEL

A conceptual hydrogeological model has been developed for the site. This represents the synthesis of all pertinent physical data / information (i.e., hydrogeology, geology, hydrology and physiography) into a framework that forms the basis for the construction of the numerical groundwater model. This conceptual model is based on the groundwater baseline investigation, and existing historical and publicly available information.

2.1 MODEL DOMAIN AND BOUNDARIES

Figure 2-1 illustrates the domain and boundary conditions for the conceptual hydrogeological model of the site. For the purpose of this study the model domain was assumed to be bounded by a series of lakes to the north, Chukuni River to the east, Unnamed Watercourse 7 and 7A and Dixie Lake to the south, which represent likely groundwater discharge locations. The model boundaries to the west are assumed to be no-flow boundaries representing either local groundwater flow divides (i.e. along local bedrock ridges) or inferred local groundwater flow lines.

2.2 LOCAL TOPOGRAPHY AND SUBWATERSHEDS

Figure 2-1 also illustrates the site topography and local subwatersheds. The site topography is generally undulating and in the vicinity of site generally slopes from northwest / west to southeast / east with an elevation range of 455 to 350 masl. Downstream and east of the development, Dixie Creek meanders through a large flat lying swampy area, which is only a few metres above the elevation of the Chukuni River.

Groundwater flow in the Project area is conceptualized to follow local topography with topographic highs representing local groundwater divides and low-lying areas and lakes representing local discharge areas. The proposed TMF is located in a low-lying area within the catchment area of Unnamed Waterbody 1 and surrounded by bedrock ridges to the north, east and west. The proposed LP Central pit and MRS are located within the catchment of Unnamed Watercourse 3. The proposed overburden stockpile sits astride the catchment areas of Unnamed Watercourse 3 and a tributary of Waterbody 6. The proposed Viggo pit / VMF is at the watershed divide of Dixie Creek and Unnamed Waterbody 6.

2.3 HYDROSTRATIGRAPHY

The Property is situated within the western Superior Province of the Canadian Shield physiographic region where the landscape is dominated by events from recent glacial activity. Site geological conditions have been established based on the site borehole drilling, publicly available information including Quaternary (Prest 1982 and Sharpe and Russel 1996) and Bedrock Geological mapping (Sanborn-Barrie and Skulski 2004); and preliminary faults investigation by WSP geotechnical group (WSP 2023b). Details of the overburden and bedrock geology at site are discussed in the hydrogeology baseline report (WSP 2025a).

In order to support groundwater conceptual and numerical modelling, a hydrostratigraphic model was developed in Leapfrog Works Version 2025.1 (Seequent 2020). This model utilized data from site boreholes, monitoring wells, test pits and diamond drill holes, as well as several other data sources including Quaternary geology map, geophysical investigation, satellite mapping and the site digital elevation model (DEM; WSP 2025a; WSP 2025b). The Quaternary geology and site borehole drillings are shown in Figure 2-2. The stratigraphic model also utilized control points to further constrain layer interpolation, which includes two linear regression analyses between overburden thickness and ground surface elevation, and between overburden thickness and till thickness from the available data.

2.3.1 HYDROSTRATIGRAPHIC MODEL

Figure 2-3 shows a 3D version of the developed hydrostratigraphic model. Five basic hydrostratigraphic units have been identified in the study area including four overburden units:

- Sand deposits
- Glaciolacustrine clay
- Glaciolacustrine silt
- Glacial till.

Bedrock in the study area can be subdivided into four subunits based on the variations of measured hydraulic conductivities with depth which are descried in Section 2.3:

- Shallow Bedrock (0 – 20 m)
- Intermediate Bedrock (20 – 80 m)
- Deep Bedrock 1 (80 – 300 m)
- Deep Bedrock 2 (> 300 m)

The hydrostratigraphic model developed in Leapfrog has a total of 2,995,084 triangular prism elements. The surface resolution (i.e., element size) was set at a maximum of 70 m and can be as small as 5 m. The top surface of the stratigraphic model (i.e., the ground surface DEM) was constructed using the site Lidar provided by Kinross, which is acquired from the publicly available provincial digital elevation model (MNRF, 2022).

Multiple contact surfaces were then developed according to the various surface types and surface chronology. Leapfrog uses FastRBF™ (Seequent 2020), a mathematical algorithm developed from radial basis functions, to create smooth surfaces between a series of contact points. The identified hydrostratigraphic units were implemented as deposit type surfaces.

The resulting layer thickness maps and the total overburden thickness as well as the borehole locations are depicted in Figures 2-4 to 2-7.

2.3.2 OVERBURDEN UNITS

Overall overburden thickness at the Project is shown in Figure 2-4. Total overburden thicknesses at site range from 0 (i.e., bedrock outcrops) to greater than 40 m based on drill hole data. The average overburden thickness, based on these data, is 13.1 m. Geophysical surveys conducted the areas of Dixie Creek and Unnamed Waterbody 1 additionally provided an indication of overburden thicknesses in these areas. The area of Unnamed Waterbody 1 and its associated watercourse Unnamed Tributary 1 comprises a zone of thick overburden, as shown in Figure 2-4. This is referred to as the Bedrock Valley Zone and is further discussed in Section 3.

The following described the main overburden units encountered in the Project area:

- Sand Deposits: The distribution of sand deposit thicknesses is shown in Figure 2-5. Sand deposits typically present to the north of the site, with thickness varying from almost absent at bedrock outcrops to greater than 15 m over bedrock lows. The sand layer is mainly overlying the glacial till and bedrock but is also observed as overlying the glaciolacustrine silts and clays in multiple low-lying areas at the proposed AEX portal and TMF. N-values for the sand are usually quite low and it retains little moisture above the water table. The sand layer is expected to act as a conduit to groundwater flow (aquifer) and can be a substantial recharge zone where it is exposed on surface.

- Glaciolacustrine Clay and Silt: Glaciolacustrine unit thicknesses are shown in Figure 2-6. Glaciolacustrine clay and silt typically present to the south of the site, with most locations in lower elevation areas exhibiting varved clays. Glaciolacustrine silts are typically present underlying glaciolacustrine clay and are expected to be more permeable than clay. The glaciolacustrine sediments are mainly underlain by glacial till but are also observed with underlying sand or bedrock at some locations. The clay and silt layers are generally thin with increasing elevation but can be quite variable in thickness, being absent where there is bedrock outcropping to over 21 m (i.e., BH23-212).
- Glacial Till: The distribution of glacial till thicknesses are given in Figure 2-7. A layer of glacial till, consisting of mostly sand and gravel with some silt/clay and occasional cobble / boulders overlies the bedrock at site. The till is generally quite compact, with N-value typically in the range of 40 to 50, although the shallow-most till is often comparatively loose. The till thickness is generally less than 15 m at most of the locations but is observed as over 35 m at BH23-122. Due to the variable composition of the till, its hydrogeologic behavior may locally vary between aquifer and aquitard; however, the unit is generally expected to behave as an aquifer due to the frequency of sand and gravel layers interbedded in the till.

2.3.3 BEDROCK UNITS

Bedrock lithologies at site consist primarily of mafic to felsic volcanic rock intercalated with sedimentary (siltstone, argillite) and various intrusive rocks as shown in Figure 2-8.

The southwestern portion of the Property is underlain by a folded sequence of mafic volcanic flows intercalated with argillite and siltstone, iron formation, minor local felsic volcanics and minor ultramafic rocks. The association of this rock is interpreted to be the sequence formed in a marine setting, in proximity to active venting in pre-existing anoxic basins. Felsic to intermediate rocks dominates the central portion of the property. The mafic rocks are in contact with a largely felsic / sedimentary rocks in the northeast portion of the property. Mafic volcanic dykes and sills are common throughout the property. They range from lamprophyre to gabbro / diorite.

Investigation on potential faults/shear zones across the site have been done by Kinross and by WSP as part of a separate rock mechanics investigation. Two shear zones and one traceable fault have been interpreted to be present at the site:

- The LP Shear Zone, an east-west striking regional scale shear fault is identified from core logging with moderate confidence
- a second shear zone parallel to the LP Shear Fault, called the Yauro Shear Zone
- the Auro Fault, mapped passing roughly northwest to southeast through the site.

Figure 2-9 shows the interpreted location of the near surface trace of these structures corresponding to surface water features and proposed underground mine works. The LP Shear and parallel shear zone are mapped with a steep north dip of approximately 80º. The Auro fault is mapped dipping east-northeast at 50º. All three faults intercept the UGM workings and the LP Central pit, although the Yauro Fault only intercepts the LP Central pit at shallow depth. None of the faults intercept Viggo pit.

Three dominant styles of mineralization are observed on the property within three target areas of gold mineralization as shown on Figure 2-9:

- Silica-sulfide replacement - Limb Zone (previously known as the Dixie Limb)
- Quartz veining - Hinge Zone
- Disseminated gold within high strain - LP Shear Zone.

2.4 HYDRAULIC CONDUCTIVITY

Hydraulic conductivity (K) data has been acquired for site materials from over 200 hydraulic tests conducted insitu in each of the main stratigraphic units or in laboratory from samples (WSP 2025b). The locations and hydrostratigraphy of these hydraulic conductivity estimates are shown in Figure 2-10. A summary of the hydraulic conductivity data including estimates derived though hydraulic testing, Hazen method and lab permeability testing, broken-down by hydrostratigraphic unit, is provided in Table 2-1. It should be noted that those values obtained through hydraulic testing are expected to be largely indicative of horizontal hydraulic conductivity (K_H) values, as these tests have generally been conducted in vertical wells.

The geometric mean hydraulic conductivity results of the sands is estimated to be 5.3×10^{-6} metres per second (m/s) based on 21 singe well response tests and ranges from 4.1×10^{-7} m/s to 1.3×10^{-4} m/s. The estimated hydraulic conductivity based on the 10 Hazen calculations ranges from 3.1×10^{-5} m/s to 4.0×10^{-4} m/s with a geometric mean of 9.2×10^{-5} m/s. Although there is some layering in the sands, the variation between vertical and horizontal hydraulic conductivities is not expected to play a significant role in groundwater flow, and the sands are considered to be isotropic with respect to horizontal and vertical hydraulic conductivity.

The glaciolacustrine geometric mean of hydraulic conductivity results is 4.2×10^{-8} m/s based on 12 field measurements, and ranges from 1.4×10^{-10} m/s to 3.0×10^{-6} m/s. Lab permeability testing (Flexiwall Permeameter) of 4 samples of glaciolacustrine materials returned results of 2.2×10^{-9} m/s to 1.5×10^{-8} m/s, indicating low permeabilities. Estimates of hydraulic conductivity made with the Flexiwall Permeameter are more representative of vertical hydraulic conductivity (K_Z) than the field measurements. Glaciolacustrine deposits are generally expected to have anisotropy ratios (K_H/K_Z) of about 10, but the actual anisotropy conditions at the site will be primarily site-specific depending on the deposit, which varies from silt to clay dominated depending on depositional environment (nearshore versus deeper water), and stress history. Varves are observed in most, but not all of the glaciolacustrine sediments, encountered during drilling. In the conceptual hydrogeological model, the hydraulic conductivity for the glaciolacustrine dominated by silt is assumed to be one order of magnitude larger than the glaciolacustrine dominated by clay.

Glacial till field test result hydraulic conductivities range from 4.1×10^{-8} m/s to 9.1×10^{-4} m/s with a geometric mean value of 6.8×10^{-6} m/s (based on 23 single well response test measurements). Glacial tills are generally expected to have anisotropy ratios (K_H/K_Z) of about 5, due primarily to the surcharging of the tills by glacial ice during cyclic advance / retreat, although this is a simple rule-of-thumb and conditions will be primarily site-specific.

Bedrock hydraulic conductivity has been assessed at site primarily by rising and falling head testing in shallow (< 20 m) bedrock holes and by packer testing in deep bedrock holes. The primary rock types encountered at site include felsic and mafic metavolcanics rocks, with very limited metasedimentary rock encountered. Comparison between the measured geometric mean values for the mafic and felsic metavolcanic rock demonstrates the similarity between K values for the two rock types, thus the conceptual model assumes that K is independent of rock types. Figure 2-11 depicted the hydraulic conductivities for bedrock assessed by packer testing. Although there are some exceptions which are discussed in more detail below, in general it appears that bedrock hydraulic conductivity tends to decrease with depth as is typical of bedrock in northern Ontario. The following general comments can be made for the packer testing results shown on Figure 2-11:

- Estimates of hydraulic conductivity for the shallow bedrock (< 20 m) span four orders of magnitude, ranging from less than 1.0×10^{-9} m/s to 6.3×10^{-5} m/s. Wide ranges in hydraulic conductivity within the uppermost bedrock is anticipated and is most likely associated with a shallow zone of weathering and/or increased fracturing.
- Hydraulic conductivity estimates for bedrock depths between 20 m and 80 m range from 1.0×10^{-9} m/s to 1.5×10^{-5} m/s with a geometric mean of approximately 1.7×10^{-7} m/s over this interval.
- Even deeper bedrock testing, ranging from 80 m to 300 m had hydraulic conductivity results ranging from 6.0×10^{-10} m/s to 2.6×10^{-5} m/s with a geometric mean of approximately 1.3×10^{-7} m/.

Several of the hydraulic test results showed higher than anticipated estimates given the deep test interval depths where the tested drillhole passed in close proximity one of the more than 2,500 open (ungrouted) exploration boreholes. In these cases, the hydraulic conductivity estimate was removed from the dataset of representative bedrock values by screening out test intervals which passed within less than 9 m from an open exploration drillhole. This screening removed 13 test results from the data pool. The dataset was also screened for those test intervals which intercepted identified fault or shear zones, which removed a total of 10 hydraulic tests. Inferred typical ranges that are anticipated with depth for the Project site are shown on Figure 2-11 as dashed lines. The relationship between hydraulic conductivity and depth illustrated on this figure are used in the development of the site conceptual hydrogeologic model.

Limited information is available on bedrock anisotropy at site, as most of the test holes are generally vertical and thus do not intercept vertical water-producing fractures. Nonetheless, bedrock is assumed to have mild to moderate anisotropy (i.e., $K_H/K_V \leq 10$) at shallow depths as horizontal flow produced within fractures also likely persist in the vertical direction as a result of weathering.

2.5 GROUNDWATER FLOW REGIME

2.5.1 GROUNDWATER LEVELS

Groundwater levels were monitored at all monitoring well locations on site (136 monitoring wells) and 8 drillholes equipped with 24 vibrating wire piezometers (VWPs) at varying depths, the locations of which are shown on Figure 2-12. The monitoring wells are screened in overburden and shallow bedrock with depths less then 20 m for most of the wells, while the depths of the VWPs range from 21.10 to 434.67 metres below ground surface (mbgs). Detailed groundwater level measurements for all monitoring wells can be found in the hydrogeology field data report (WSP 2025b).

Figure 2-13 shows the interpolated groundwater elevation contours within till/shallow bedrock unit which utilizing 34 groundwater level measurements in Fall/Winter 2023 (excluding dry wells). The interpolation was completed using the simple kriging interpolation scheme on a 20-by-20 m grid spacing. The contoured measured water levels show that groundwater elevations correlate with ground surface elevations; the highest water levels generally correspond to inland topographic highs and dissipate towards nearby topographic lows / surface waterbodies and watercourses. Groundwater flow across most of the site is primarily south towards Dixie Creek.

2.5.2 SEASONAL VARIATIONS

Seasonal variations in groundwater levels are depicted in the Hydrogeology Field Report (WSP 2025b) for different hydrogeological settings (Figure 6-2 to 6-5).

In general, groundwater levels show seasonal maxima at the end of spring freshet between May and June and during the early fall between September and October in response to heavy precipitation, prior to freeze-up. Groundwater levels gradually recede during the winter months due to a lack of recharge. Maximum seasonal variations in groundwater levels are less than 2 m.

2.5.3 VERTICAL HYDRAULIC GRADIENTS

Vertical hydraulic gradients have been assessed at the Project site for both the shallow groundwater flow system (i.e., between the uppermost bedrock and bedrock contact overburden units) characterized through twelve multi-level nested monitoring wells with screens usually less then 10 to 15 mbgs and the deep groundwater flow system (i.e., between the intermediate and deep bedrock) characterized through eight drillholes with VWPs instrumented at varying depths ranging from between 30 mbgs to as much as 430 mbgs. The average vertical hydraulic gradients calculated from the nested multi-level groundwater monitoring stations are summarized in Table 2-2and shown graphically on Figure 2-14. Detailed discussions on vertical hydraulic gradients can be found in Hydrogeology Baseline Report (WSP 2025a), some key findings are presented below:

- Shallow groundwater flow system:

  - Downward vertical hydraulic gradients are observed across the site generally in areas above approximately 380 masl, which represent the inferred groundwater recharge zones with sand or glacial till as the surficial materials.
  - Upward vertical hydraulic gradients are observed at MW7/22, MW11/22, and MW23-04, which are all located close to surface water features in low-lying areas. Upward gradients in these areas are likely due to the presence of the overlying glaciolacustrine clay / silt, which is expected to act as an aquitard/confining unit and reduce the hydraulic connection between the surface water features and the shallow groundwater flow system. Evidence of the glaciolacustrine clays acting as an aquitard can also be observed from anecdotal evidence of artesian conditions recorded at some exploration drillholes which are also shown on Figure 2-14.
- Deep groundwater flow system:
  - Downward gradients are observed at BH22-07, BH23-13, BH23-20 and MW8/22.
  - No large gradient is observed in BH22-12 and BH23-04.
  - An upward gradient is observed in BH22-21, which is located adjacent to Dixie Creek.

2.6 SURFACE WATER HYDROLOGY

Surface water hydrology has been assessed by WSP as part of the baseline studies for the Great Bear Project (WSP 2025c). An overview of the Project surface water hydrology is presented here as it provides semi-quantitative information on the groundwater discharge, which is derived from low-flow creek gauging, that is relevant to estimating the recharge to the groundwater system.

2.6.1 SURFACE WATER FEATURES

Figure 2-15 shows the surface water features and pertinent local watershed boundaries. The Property is primarily located in the watershed of Dixie Creek, which flows into the Chukuni River, and ultimately discharges into Pakwash Lake.

The Chukuni River is a large regulated system, with flow controlled by the Snowshoe Rapids Dam, and is the proposed receiving environment for water from the Great Bear Property. The Water Survey of Canada (WSC) station Chukuni River near Ear Falls (05QC001) is located downstream of the Snowshoe Rapids Dam and upstream of the confluence with Dixie Creek. The watershed area for this station is approximately 4,920 km^2. The historic data from 1963 to 2021 was used to develop the monthly and annual flow statistics for this station. The Chukuni River has an estimated mean annual flow of 2,255,040 cubic metres per day (m^3/d) and an approximate 7Q20 flow of 160,704 m^3/d, where the 7Q20 flow is defined as the lowest 7-day average flow in a 20-year return interval (WSP, 2025c).

The WSC station at Long-Legged River below Long-Legged Lake (05QE012), which is located approximately 30 km to the southwest of the site. The watershed area for this station is approximately 548 km^2. The historic data from 1980 to 2019 was used to develop the monthly and annual flow statistics for this station. These values were then prorated to local station HF-01 that intersects along Dixie Creek based on catchment areas. The catchment area for station HF-01 is approximately 357 km^2. The average annual estimated flow for Dixie Creek as of station HF-01 is 216,864 m^3/d and an approximate 7Q20 flow of 18,144 m^3/d (WSP 2023a).

There are a number of lakes or notable waterbodies within the Property area, including Dixie Lake, Genessee Lake, Gullrock Lake, Stone Lake, Two Island Lake, Unnamed Waterbody 1, and Unnamed Waterbody 6 (Figure 2-15). The physical characteristics and water levels of these lakes are summarized in Table 2-3.

2.6.2 SURFACE WATER FLOW

As part of the hydrometric baseline monitoring program that was initially established in 2022 for the Great Bear Project, a series of thirteen hydrologic baseline monitoring stations, which are designed to monitor the continuous flow conditions, were installed at the Project. During the 2023 monitoring program, additional supplemental low-flow streamflow spot measurements at a number of the smaller tributaries within the Project area were taken by Great Bear Resources staff to assist in characterizing baseflow conditions. The locations of all monitoring stations are shown in Figure 2-16. Details of the flow measurements can be found in the Hydrology Baseline Report (WSP 2025c).

Estimating the baseflow conditions have been influenced by the following:

- **Beaver activities**: major beaver dams were noted along Dixie Creek approximately 2 km downstream of the Dixie Lake outlet and also at approximately 0.5 km upstream of HF-08 (the Genessee Lake outflow station), resulting in intermittent low flow periods in portions of its reach (e.g. following the removal of the beaver dam at the outlet of Genessee Lake in early 2024, the lake level reportedly drop one to two meters).
- **Dry year**: The streamflow results used to calibrate this model were drawn from observations made in 2023. Total precipitation measured at the site during 2023 was 485.2 mm which is considerably lower than the mean annual values based on long term records (WSP 2025c). This will result in lower stream flow and baseflow contributions to surface water features than is observed in typical years, especially for those smaller watersheds, i.e., such as the several unnamed watercourses across the Project site, which have a smaller catchment area and less capacity to attenuate changes in precipitation than a larger catchment may have.
- **Measurement challenges**: it is more difficult to measure the low flows at smaller tributaries accurately.

Due to the above reasons, the estimated baseflows based on the flow data from 2023 were used as calibration references instead of critical calibration targets. Selected hydrometric stations, at which the related watershed areas are covered by the model domain, were used as initial calibration references for groundwater inflow and summarized in Table 2-4. As a first approximation, baseflows for stations HF-04, HF-08 and HF-06 were estimated based on the low flow ranges interpreted from stream discharge hydrographs from Hydrogeology Baseline Report (WSP 2025a). While for the other stations with only spot flow measurements available, the flow measurements in early summer or fall/winter months 2023, when surface water - groundwater interactions are expected to be greatest, are assumed to approximate baseflow ranges. Streamflow measurements are ongoing and will be available for use as calibration targets should future revisions of the model be required.

2.6.3 GROUNDWATER RECHARGE

Groundwater recharge is a key component affecting the overall distribution of water levels and groundwater flows in a watershed / aquifer. This is represented by the net value of precipitation minus evapotranspiration and runoff. The climate and hydrology for the Property are summarized in the Hydrology baseline report (WSP 2025c). Historical data from Red Lake A climate station (Station ID 6016975), which is the nearest Environment and Climate Change Canada (ECCC) station located approximately 25 km northwest of the Property, was used to characterize the climate conditions for the Program. The mean annual precipitation for the Property is estimated to be 686 millimetres (mm).

Groundwater recharge for the Property will generally be highest during the spring freshest and late fall, when snowmelt and rainfall peak and evapotranspiration is reduced, and is typically focused on locations where the landscape is favourable (i.e., flat to gently sloping, minimal interception / transpiration yet shaded from evaporation, permeable soil). A common / simple approximation of groundwater recharge for a given watershed equates the baseflow to groundwater recharge (Jassas & Merkel 2014; Scanlon et al. 2002).

The average calculated baseflow for the Chukuni River based on the historical data ranges from 7.4 to 14.4 m^3/s (depending on the separation method). Normalizing this to the drainage area of 4,920 km^2 yields a long-term average groundwater recharge value ranging from 47 to 92 mm/yr (7% to 15% of the annual average precipitation; WSP 2025a), with seasonal values spanning a much broader range. It should be noted; however, that since a regulated dam is located upstream on the Chukuni River, that low flow estimates are potentially affected by dam operation.

At the scale of the Dixie Creek watershed, recharge can be estimated from the flow data collected at the HF-01 hydrometric station located on the Dixie Creek at Tote Road. The lowest observed flows at this monitoring station occur during the late summer, early fall period and are roughly 55,000 m^3/day (WSP 2025c). When normalized over the catchment area of 357 km^2 for this watershed this represents an average recharge of about 56 mm/yr which represents an average recharge rate across the entire Dixie Creek watershed that has several different types of surficial deposits, and it is anticipated that some of these, such as the glaciofluvial sands will have a higher recharge rate, while others, such as the glaciolacustrine clays will be lower. Recharge estimate obtained from low flow data collected at HF-07, of watersheds that are composed of primarily glaciolacustrine clays or bedrock, is about 11.8 mm/yr. This was estimated based on a low flow rate of about 6,000 m^3/day (preceding the spring freshet and before substantial beaver activity was noted) normalized over the watershed area of 187 km^2.

2.7 AQUIFER SYSTEM

The overburden sequence in low lying areas to the south of the site were identified as an essentially continuous glaciolacustrine layer (with the exception of occasionally bedrock outcrops) underlain by glacial till that rests against the upper, moderately fractured bedrock. This sequence of sediments and bedrock suggests that a local aquifer with marginal productivity for water supply exists in the upper fractured bedrock and potentially the glacial till sediments, which is sandwiched between low permeability units of the varved clay and deeper, more competent bedrock. Recharge through the glaciolacustrine unit is anticipated to be low given the low hydraulic conductivity of the unit.

Dixie creek is characterized as generally meandering and having a flat slope with the streambed characterized by glaciolacustrine except two cascading sections located downstream of HF-03, one is about four meters drop and located approximately 300 m to 400 m downstream of HF-03, and the other one is located about 2.1 km further downstream of approximately two meters elevation drop. Both these cascading areas are characterized by coarse stones in the stream bed. Drilling near these sites, along with geophysical lines along the north side of the creek, indicate that the cascades are near areas of bedrock highs and till outcropping. Neither bedrock nor till are strong aquifers, thus groundwater-surface water interaction at these features is expected to be poor.

Further to the north, at higher elevations, the glaciolacustrine sediments are absent, and glaciofluvial sediments, or exposed till and bedrock are found. The continuous sand layer to the north of the site is underlain by glacial till and is expected to act as a conduit to groundwater flow (aquifer) where saturated and can be a primary recharge zone where it is exposed at surface.

Except in the vicinity of Unnamed Waterbody 1, the proposed TMF is mainly underlain by glaciofluvial sediments surrounded by local topographic highs observed with bedrock/till outcrops or with a thin sand cover to the north, east and west. The area around Unnamed Waterbody 1 is observed with an area of organics/glaciolacustrine clay that is disconnected from the larger clay plain by an esker. Water levels in this lake are about 10 m higher than groundwater levels observed at nearby monitoring well MW4/22, which is screened in the sand and glacial till below the clay, indicating the lake is perched.

The underground mine workings will extend down below the overburden and into the competent deep bedrock. The bulk of the groundwater inflow is anticipated to be within the shallow fractured bedrock where the workings are close to surface. Groundwater flow at depth in bedrock is almost entirely through open fractures, which are expected to decrease in frequency with depth, resulting in decreasing permeability with depth; except possibly where there may be localized increases in fractures around geologic structures such as faults. One local fault (LP Shear Fault) with a steep dip of 80 degrees was identified passing through the proposed underground workings and has a possibility of passing under the

Dixie Creek as shown in Figure 2-9. However, the prospect of substantial groundwater and surface water interaction is expected to be low given the packer testing results show marginally increased hydraulic conductivity at LP Shear Fault and the presence of intervening overburden layers.

Table 2-1: Summary of Hydraulic Conductivity (m/s) by Hydrostratigraphic Unit

Unit	Number of Tests	Hydraulic Conductivity (m/s)		
		Minimum	Maximum	Geo-Mean
Sand (SWRTs [1])	21	4.1×10^{-7}	1.3×10^{-4}	5.3×10^{-6}
Sand (Hazen Formula)	10	3.1×10^{-5}	4.0×10^{-4}	9.2×10^{-5}
Glaciolacustrine (SWRTs [1])	12	1.4×10^{-10}	3.0×10^{-6}	4.2×10^{-8}
Glaciolacustrine (Flexiwall Permeameter) [2]	4	2.2×10^{-9}	1.5×10^{-8}	4.2×10^{-9}
Glacial Till (SWRTs[1])	23	4.1×10^{-8}	9.1×10^{-4}	6.8×10^{-6}
Shallow Bedrock (0 to 20 m)	51	1.0×10^{-9}	6.3×10^{-5}	1.5×10^{-7}
Intermediate Bedrock (20 to 80 m)	44	1.0×10^{-9}	1.5×10^{-5}	1.0×10^{-7}
Deep Bedrock 1 (80 to 300 m)	36	6.0×10^{-10}	2.6×10^{-5}	1.3×10^{-7}
Deep Bedrock 2 (> 300 m)	7	5.6×10^{-9}	2.0×10^{-8}	1.0×10^{-8}

Notes:

[1] SWRT is short for single well response test.

[2] Four soil samples were collected from MW10-22 (2 samples), MW11-22 (1 sample) and MW12-22 (1 sample).

Table 2-2: Vertical Hydraulic Gradients of Groundwater Levels

Well	Easting	Northing	Ground Surface Elevation	Screen Depth		Completion Unit	Vertical Hydraulic Gradient	Direction
				Top	Bottom			
	(m E)	(m N)	(masl)	(mbgs)	(mbgs)		(m/m)	
BH22-202 Deep	453725.96	5635840.92	381.54	11.28	14.33	Bedrock	-0.041	Down
BH22-202 Shallow	453719.77	5635842.86	381.77	4.57	6.10	Silty Sand		
BH23-AEX-08 Deep	455743.42	5634584.38	374.94	9.45	12.50	Bedrock	-0.002	Down
BH23-AEX-08 Shallow	455743	5634582	374.94	5.75	8.80	Silt and Sand		
MW1/22 Deep	451784.56	5635460.96	386.50	8.55	11.60	Bedrock	-0.112	Down
MW1/22 Shallow	451783.44	5635461.85	386.39	3.65	5.17	Silty Clay		
MW2/22 Deep	455332.93	5637002.84	422.47	4.00	7.05	Bedrock	-0.058	Down
MW2/22 Shallow	455334.64	5637000.75	422.26	1.10	2.62	Sand		
MW4/22 Deep	454380.98	5634972.60	380.97	33.82	39.92	Sand and Gravel Till	-0.003	Down
MW4/22 Intermediate	454377.57	5634969.92	380.97	12.18	18.28	Sand and Gravel Till		
MW7/22 Deep	459896.06	5634208.01	349.13	3.82	5.37	Bedrock	0.037	Up
MW7/22 Shallow	459897.37	5634208.10	349.09	1.89	2.80	Sand and Gravel Till		
MW9/22 Deep	456186.58	5636221.00	399.47	22.85	25.90	Sand and Gravel Till	-0.002	Down
MW9/22 Shallow	456184.43	5636219.90	399.48	10.05	13.10	Sand		
MW10/22 Deep	454863.90	5633548.80	359.28	9.55	12.60	Sand and Gravel Till	-0.045	Down
MW10/22 Intermediate	454863.27	5633549.12	359.27	6.95	8.47	Silty Sand		
MW11/22 Deep	457574.91	5633532.63	352.20	8.07	11.12	Bedrock	0.042	Up
MW11/22 Shallow	457575.93	5633532.52	352.06	4.10	7.15	Clayey Silt / Sand and Gravel Till		
MW12/22 Deep	455954.36	5634079.01	365.09	8.75	11.80	Sand and Gravel Till	-0.112	Down
MW12/22 Intermediate	455953.10	5634079.44	365.16	5.80	6.41	Silty Clay		
MW23-02 Deep	452479.24	5634687.95	378.19	17.68	20.73	Silty Sand	-0.008	Down
MW23-02 Shallow	452477.62	5634687.60	378.25	10.67	13.72	Silty Sand		
MW23-04 Intermediate	459148.75	5634095.18	349.78	6.10	7.62	Silty Clay	0.043	Up
MW23-04 Shallow	459147.17	5634091.11	349.48	2.44	3.96	Clayey Silt		

Table 2-3: Local Area Lake Characteristics

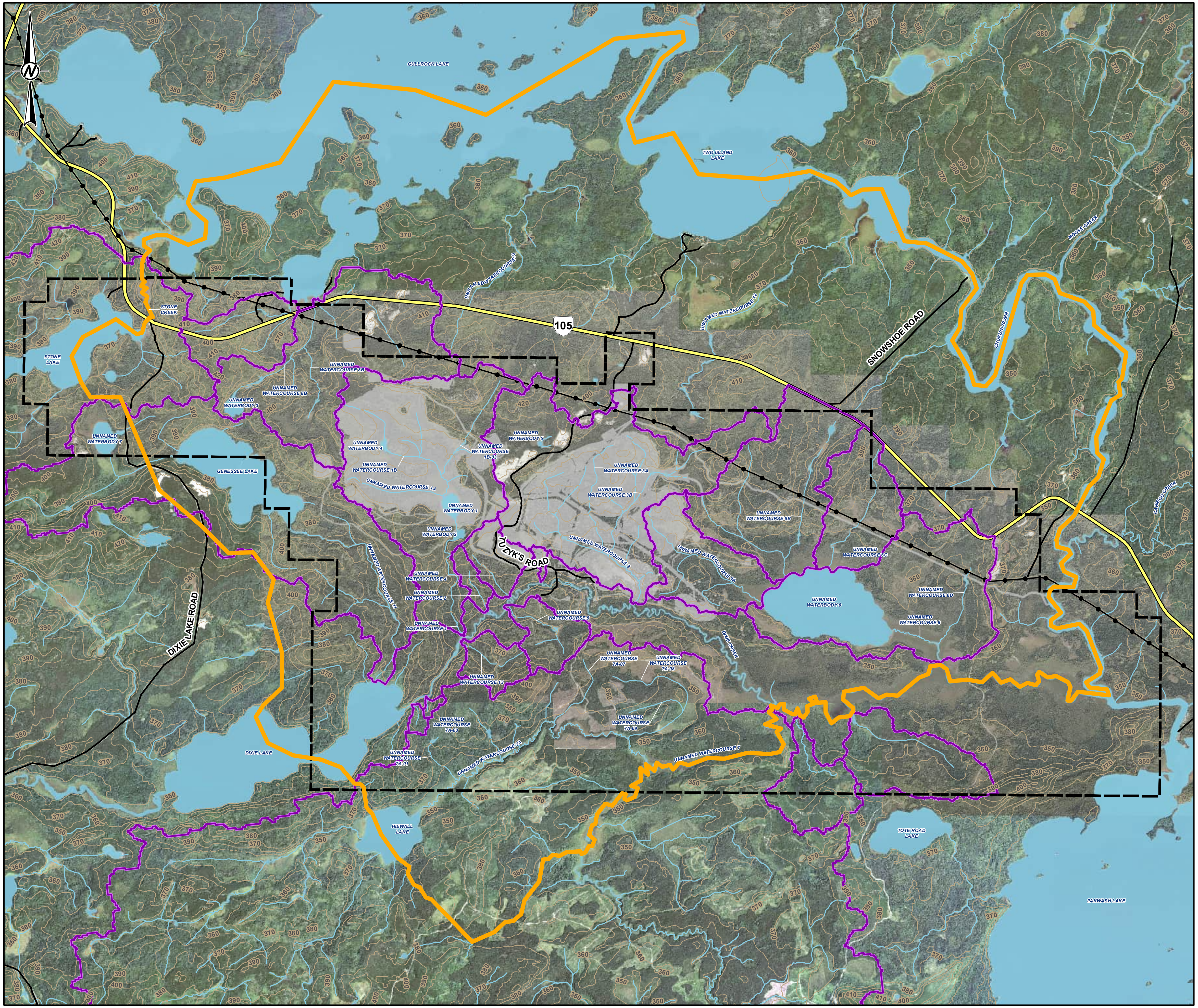
Name	Surface Area (ha)	Average Depth (m)	Drainage Area (ha)	Average Water Elevation (masl)
Dixie Lake	345	2.4	18,677	352.4 [1]
Genessee Lake	181	4	1,110	379.3
Gullrock Lake	6,280	7.5	404,900	355.7
Stone Lake	225	-	4098	367.8
Unnamed Waterbody 6	222	1.3	1,520	347.3
Unnamed Waterbody 1	10	0.3	696	379.2

Note:
[1] Water elevation measured in late May 2023

Table 2-4: Low Flow Measurements at Selected Hydrometric Stations

Description	Station ID	Flow Measurement (m^3/d)	
		Time	Observed
Unnamed Watercourse 3	HF-04	2022/2023 [1]	300
Genesse Lake Outflow	HF-08	2022/2023 [1]	120
Gullrock Lake Inflow	HF-09	Sep./Oct. 2023	190 ~ 605
Unnamed Waterbody 1 Outflow	HF-06	2022/2023 [1]	150
Unnamed Watercourse 6A	Station 09	June/Sep. 2023	<147 ~ 409
Unnamed Watercourse 4	Station 17	June/Sep. 2023	18 ~ 397
Unnamed Watercourse 2	Station 18	June/Sep. 2023	106 ~ 181
Unnamed Watercourse 13	Station 19	Sep./2023	Standing water
Unnamed Watercourse 5	Station 20	Sep./2023	Low water, back flow
Unnamed Watercourse 7A-07	Station 21	Sep./2023	Standing water

Note:
[1] Baseflow were determined from stream discharge hydrographs.



LEGEND

- 🟧 DOMAIN OF CONCEPTUAL HYDROGEOLOGICAL MODEL
- ▭ PROPERTY BOUNDARY
- ▨ GREAT BEAR PROJECT FOOTPRINT
- 🟪 LOCAL SUBCATCHMENT
- ═ HIGHWAY
- — LOCAL ROAD
- ●—● EXISTING TRANSMISSION LINE
- — CONTOURS (10 M INTERVAL)
- — WATERCOURSE
- 🟦 WATERBODY

0 1 2 4

1:70,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. AERIAL IMAGERY PROVIDED BY GREAT BEAR RESOURCES (SCENE DATE: SEPTEMBER 2022).
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
6. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
DOMAIN OF CONCEPTUAL HYDROGEOLOGICAL MODEL

CONSULTANT

YYYY-MM-DD	2025-07-28
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REVIEWED	----
APPROVED	----

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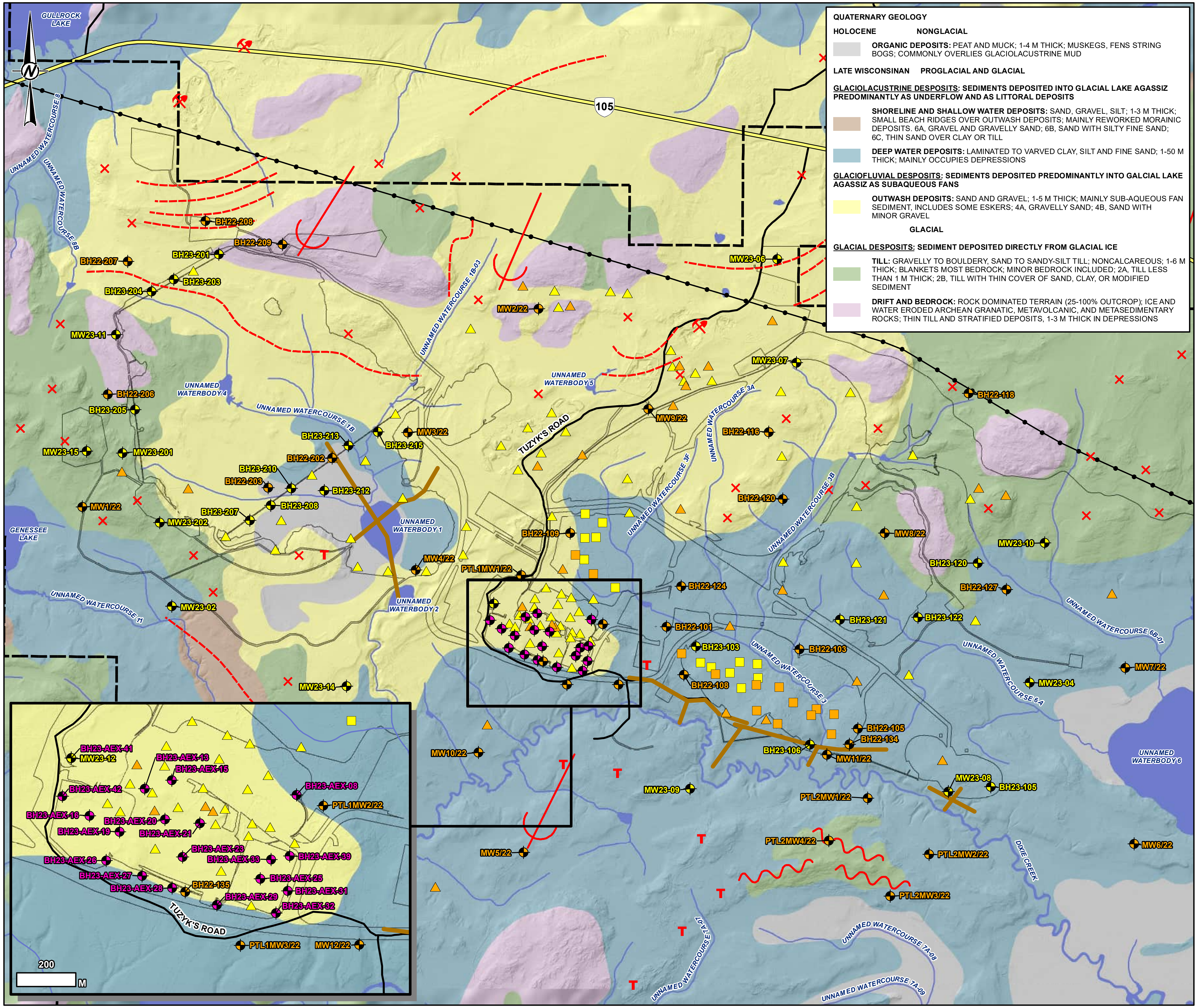


QUATERNARY GEOLOGY

HOLOCENE **NONGLACIAL**

▭ **ORGANIC DEPOSITS:** PEAT AND MUCK; 1-4 M THICK; MUSKEGS, FENS STRING BOGS; COMMONLY OVERLIES GLACIOLACUSTRINE MUD

LATE WISCONSINAN **PROGLACIAL AND GLACIAL**

GLACIOLACUSTRINE DESPOSITS: SEDIMENTS DEPOSITED INTO GLACIAL LAKE AGASSIZ PREDOMINANTLY AS UNDERFLOW AND AS LITTORAL DEPOSITS

▭ **SHORELINE AND SHALLOW WATER DEPOSITS:** SAND, GRAVEL, SILT; 1-3 M THICK; SMALL BEACH RIDGES OVER OUTWASH DEPOSITS; MAINLY REWORKED MORAINIC DEPOSITS. 6A, GRAVEL AND GRAVELLY SAND; 6B, SAND WITH SILTY FINE SAND; 6C, THIN SAND OVER CLAY OR TILL

▭ **DEEP WATER DEPOSITS:** LAMINATED TO VARVED CLAY, SILT AND FINE SAND; 1-50 M THICK; MAINLY OCCUPIES DEPRESSIONS

GLACIOFLUVIAL DESPOSITS: SEDIMENTS DEPOSITED PREDOMINANTLY INTO GALCIAL LAKE AGASSIZ AS SUBAQUEOUS FANS

▭ **OUTWASH DEPOSITS:** SAND AND GRAVEL; 1-5 M THICK; MAINLY SUB-AQUEOUS FAN SEDIMENT, INCLUDES SOME ESKERS; 4A, GRAVELLY SAND; 4B, SAND WITH MINOR GRAVEL

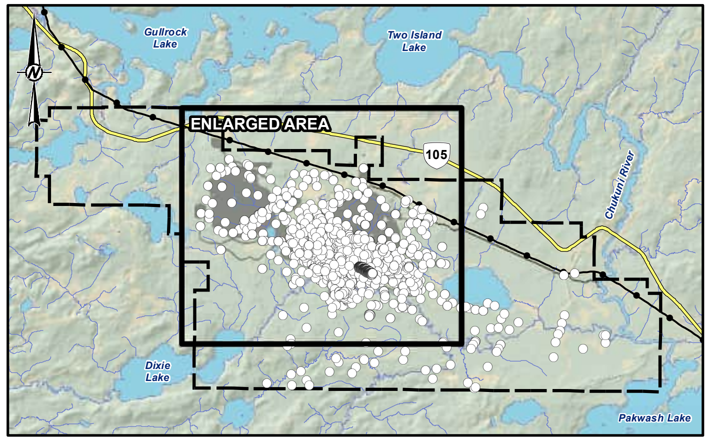
GLACIAL

GLACIAL DESPOSITS: SEDIMENT DEPOSITED DIRECTLY FROM GLACIAL ICE

▭ **TILL:** GRAVELLY TO BOULDERY, SAND TO SANDY-SILT TILL; NONCALCAREOUS; 1-6 M THICK; BLANKETS MOST BEDROCK; MINOR BEDROCK INCLUDED; 2A, TILL LESS THAN 1 M THICK; 2B, TILL WITH THIN COVER OF SAND, CLAY, OR MODIFIED SEDIMENT

▭ **DRIFT AND BEDROCK:** ROCK DOMINATED TERRAIN (25-100% OUTCROP); ICE AND WATER ERODED ARCHEAN GRANATIC, METAVOLCANIC, AND METASEDIMENTARY ROCKS; THIN TILL AND STRATIFIED DEPOSITS, 1-3 M THICK IN DEPRESSIONS

KEY MAP



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LEGEND

- PROPERTY BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- HIGHWAY
- LOCAL ROAD
- EXISTING TRANSMISSION LINE
- WATERCOURSE
- WATERBODY
- GEOPHYSICAL PROJECT TRACE
- SAND AND OR GRAVEL PIT
- × SMALL BEDROCK OUTCROP (NOT SHOWN FOR UNIT 1)
- T SMALL OUTCROPS OF TILL
- ABANDONED SHORELINE FEATURES
- GLACIAL STRIATION (ICE FLOW DIRECTION INFERRED)
- TRANSVERSE MORAINE RIDGE
- ■ 2022 PIT SLOPE DRILLING
- ▲ 2022 WSP BOREHOLE
- 2022 WSP MONITORING WELL
- 2023 MONITORING WELL
- ■ 2023 TEST PIT
- ▲ 2023 WSP BOREHOLE
- AEX PORTAL MONITORING WELL

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1:30,000 KILOMETRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. QUATERNARY GEOLOGY BASE MAPPING IS EXTRACTED FROM QUATERNARY GEOLOGY OF RED LAKE-CONFEDERATION LAKE AREA; SHARPE, D R; RUSSELL, H A J. GEOLOGY SURVEYS OF CANADA, OPEN FILE 2876, 1996.
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
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6. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
QUATERNARY GEOLOGY

CONSULTANT

wsp

YYYY-MM-DD	2025-07-28
DESIGNED	----
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APPROVED	----

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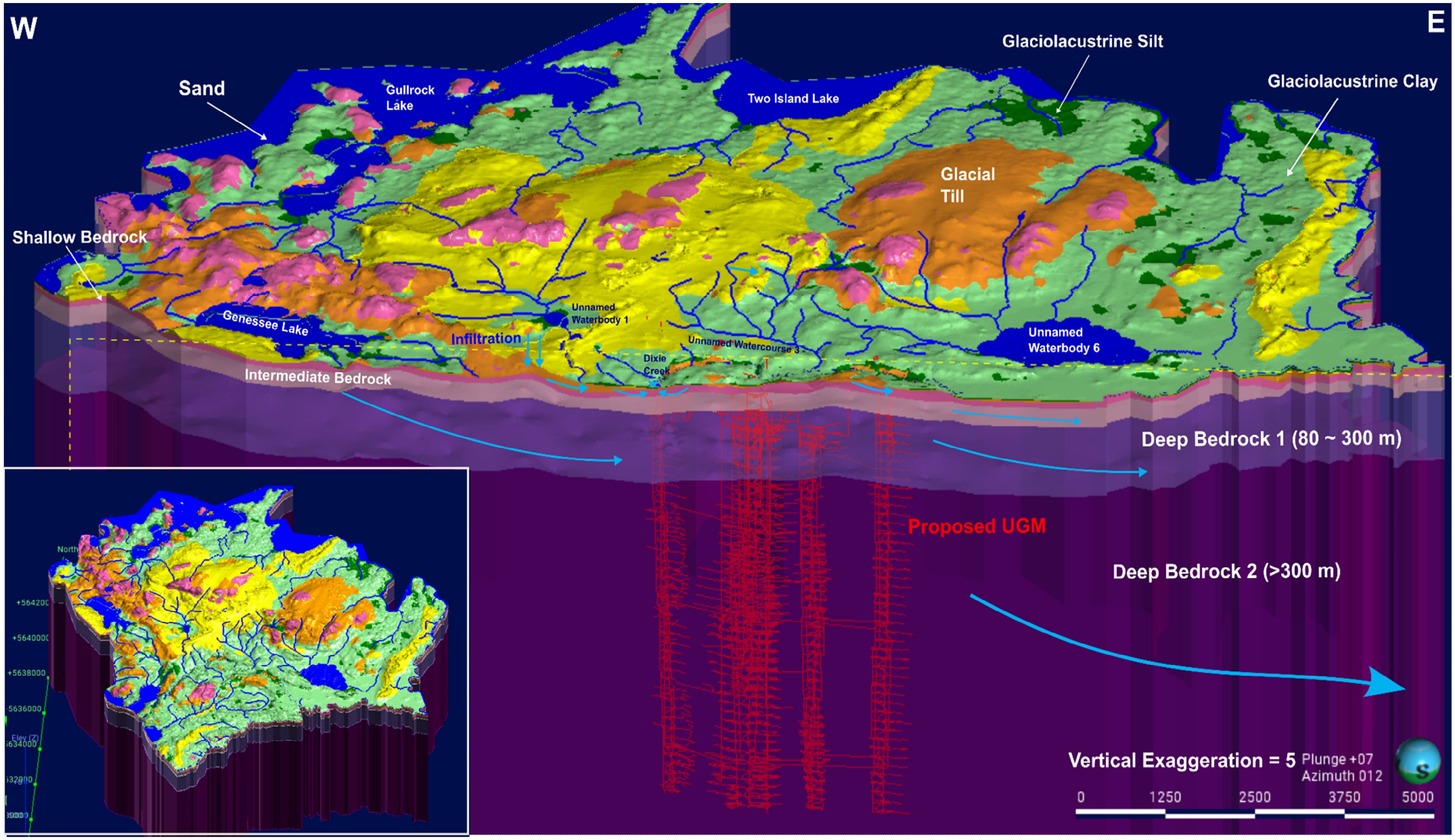
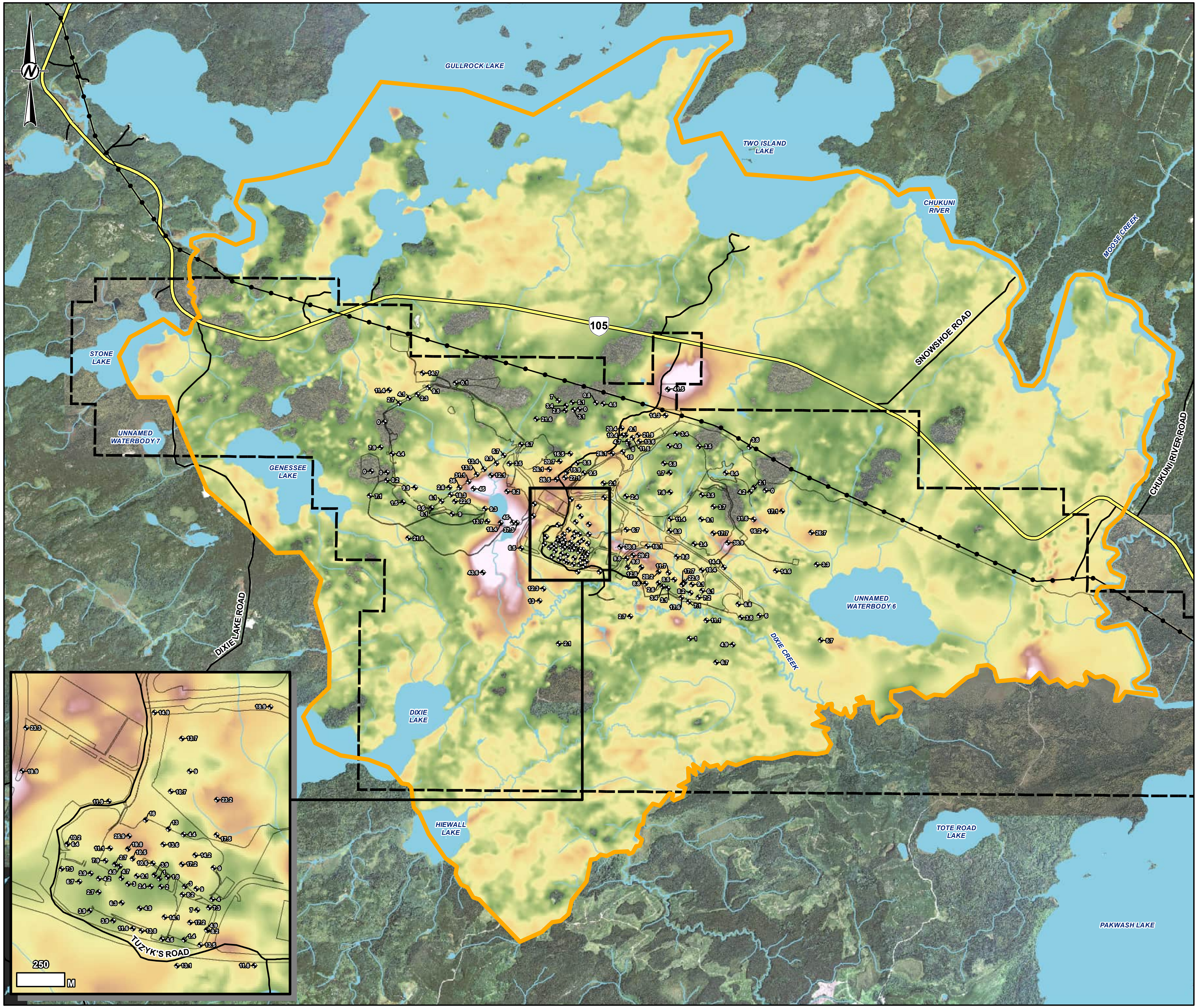


Notes

3D Hydrostratigraphy Model	
Groundwater Modelling Report	
Kinross Great Bear Project	
Figure Number	2-3
Project Number	OMEMA2303
Date	August 2024
Drawn	TY
Reviewed	SG



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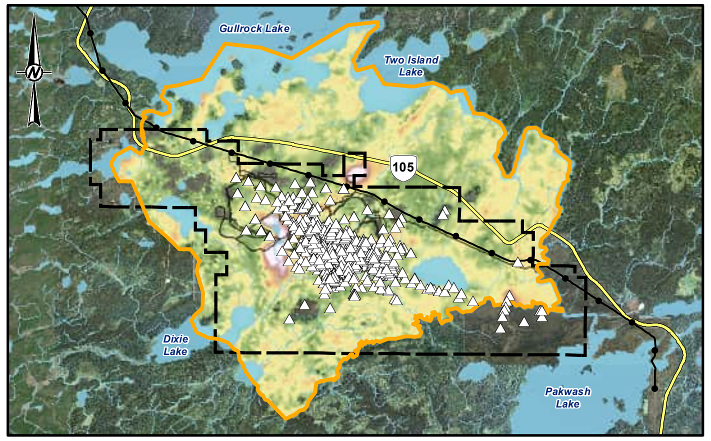

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LEGEND

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- ▭ GREAT BEAR PROJECT FOOTPRINT
- ━ HIGHWAY
- ━ LOCAL ROAD
- ●━● EXISTING TRANSMISSION LINE
- ━ WATERCOURSE
- ▬ WATERBODY
- △ RESOURCE EXPLORATION HOLE
- ⊕ BOREHOLE (LABELLED THICKNESS IN M)

OVERBURDEN LAYER THICKNESS
THICKNESS UNIT: METRES
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0 1 2 4
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NOTE(S)

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CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
OVERBURDEN THICKNESS

CONSULTANT
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CA0031271.9255	0001	A	2-4

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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm
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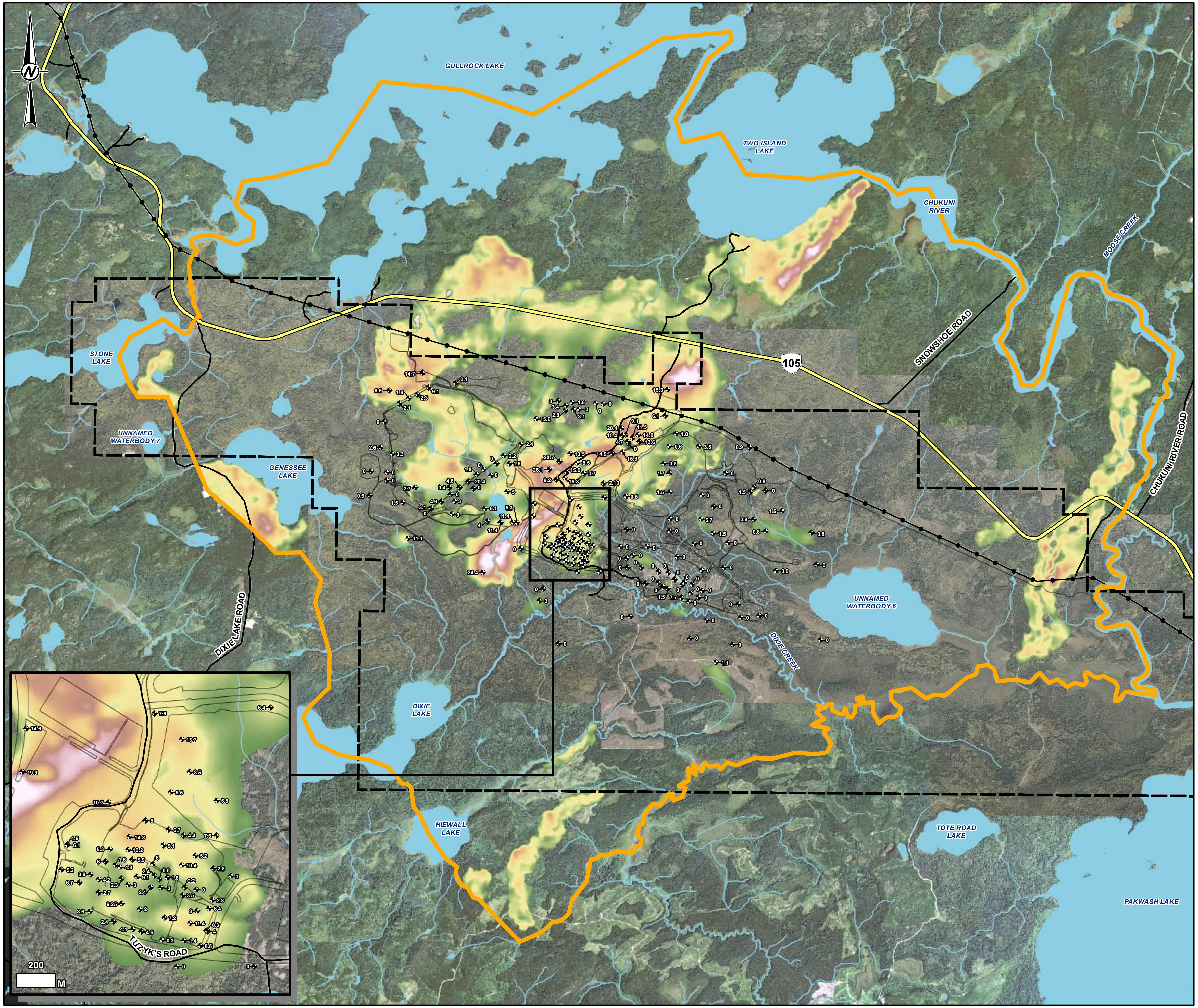

LEGEND

- ▭ DOMAIN OF CONCEPTUAL HYDROGEOLOGICAL MODEL
- ▭ PROPERTY BOUNDARY
- ▭ GREAT BEAR PROJECT FOOTPRINT
- ═ HIGHWAY
- — LOCAL ROAD
- ●—● EXISTING TRANSMISSION LINE
- — WATERCOURSE
- ▬ WATERBODY
- ⊕ BOREHOLE (LABELLED THICKNESS IN M)

SAND LAYER THICKNESS
THICKNESS UNIT: METRES
31.2
0

0 1 2 4
1:70,000 KILOMETRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. AERIAL IMAGERY PROVIDED BY GREAT BEAR RESOURCES (SCENE DATE: SEPTEMBER 2022).
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
6. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
SAND LAYER THICKNESS

CONSULTANT
wsp

YYYY-MM-DD	2025-07-28
DESIGNED	----
PREPARED	DB
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271.9255	0001	A	2-5

PATH: S:\Clients\Kinross\Great_Bear_Project\99_PROJ\CA0031271_9255\40_PROD\0001_EA_Hydrogeo\2-5_Sand_Thickness_6.mxd PRINTED ON: 2025-07-28 AT: 9:57:18 AM

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25mm
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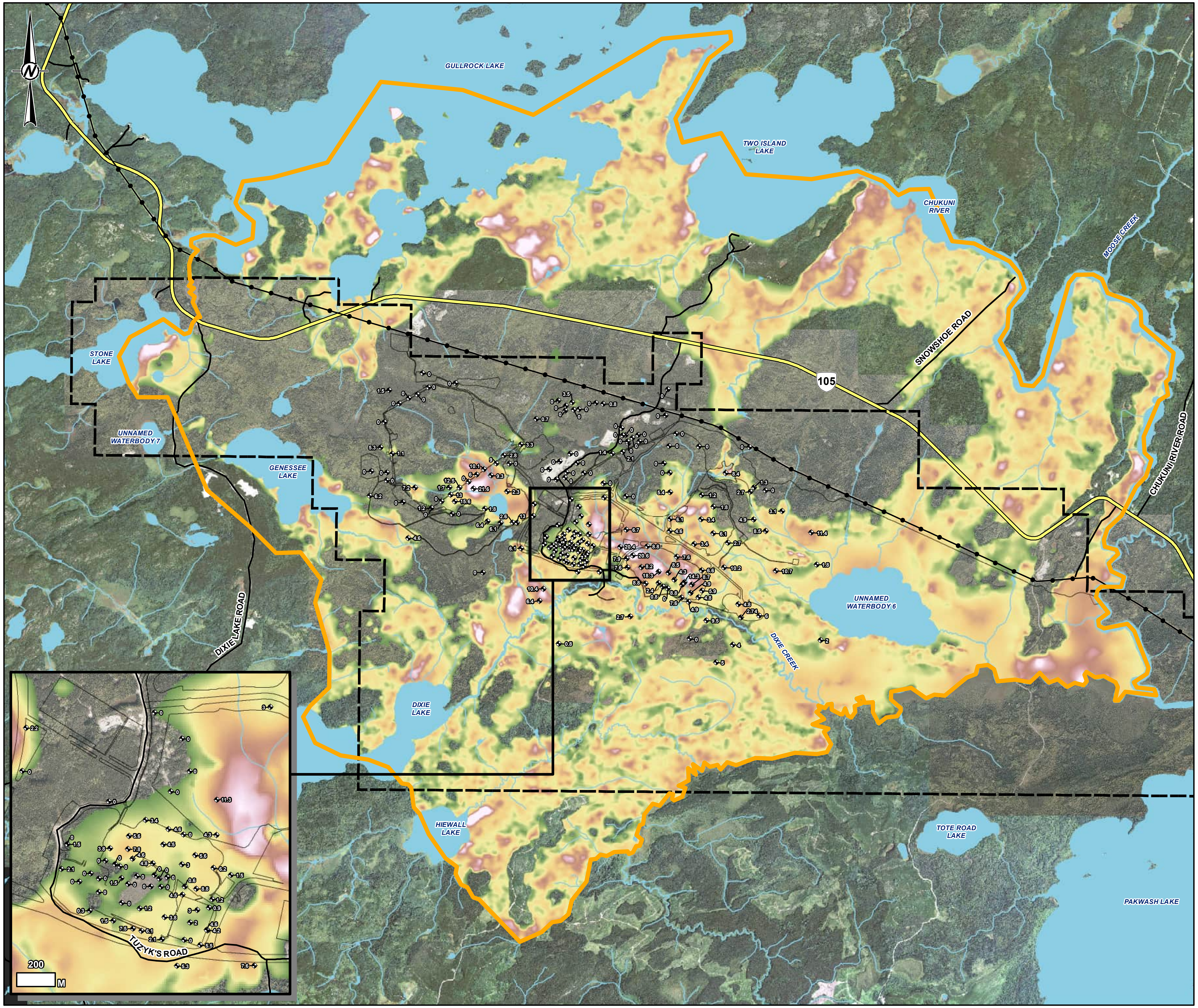


LEGEND

- ▭ DOMAIN OF CONCEPTUAL HYDROGEOLOGICAL MODEL
- ▭ PROPERTY BOUNDARY
- ▭ GREAT BEAR PROJECT FOOTPRINT
- ━ HIGHWAY
- ━ LOCAL ROAD
- ●━● EXISTING TRANSMISSION LINE
- ━ WATERCOURSE
- ■ WATERBODY
- ⊕ BOREHOLE (LABELLED THICKNESS IN M)

GLACIOLACUSTRINE LAYER THICKNESS

THICKNESS UNIT: METRES

22.8

0

0 1 2 4

1:70,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. AERIAL IMAGERY PROVIDED BY GREAT BEAR RESOURCES (SCENE DATE: SEPTEMBER 2022).
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
6. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT

GREAT BEAR RESOURCES

PROJECT

GREAT BEAR PROJECT

TITLE

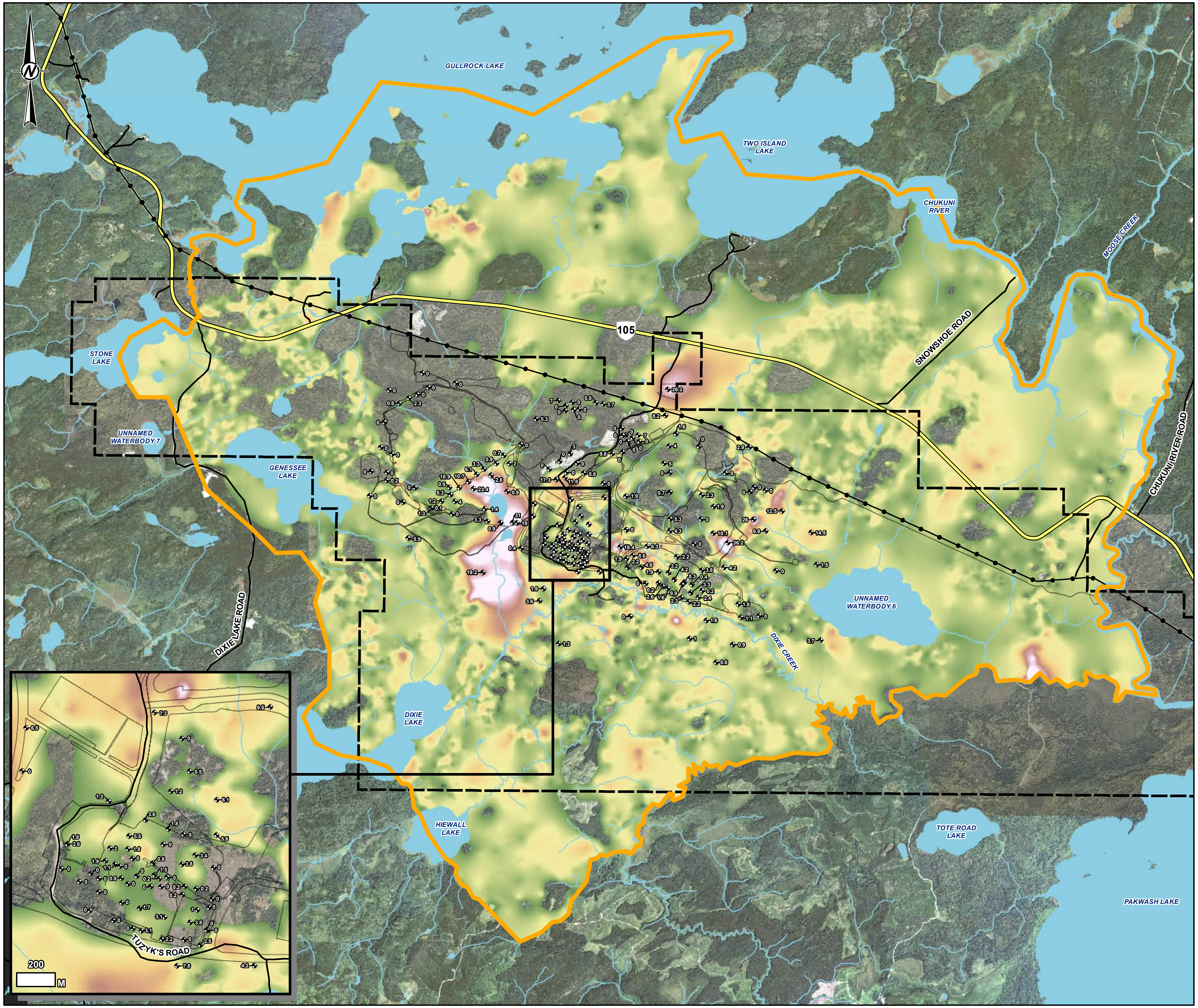
GLACIOLACUSTRINE LAYER THICKNESS

CONSULTANT

wsp

YYYY-MM-DD	2025-07-28
DESIGNED	----
PREPARED	DB
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271.9255	0001	A	2-6



LEGEND

- DOMAIN OF CONCEPTUAL HYDROGEOLOGICAL MODEL
- PROPERTY BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- HIGHWAY
- LOCAL ROAD
- EXISTING TRANSMISSION LINE
- WATERCOURSE
- WATERBODY
- BOREHOLE (LABELLED THICKNESS IN M)

GLACIAL TILL LAYER THICKNESS

THICKNESS UNIT: METRES

39.9

0

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. AERIAL IMAGERY PROVIDED BY GREAT BEAR RESOURCES (SCENE DATE: SEPTEMBER 2022).
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
6. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
GLACIAL TILL LAYER THICKNESS

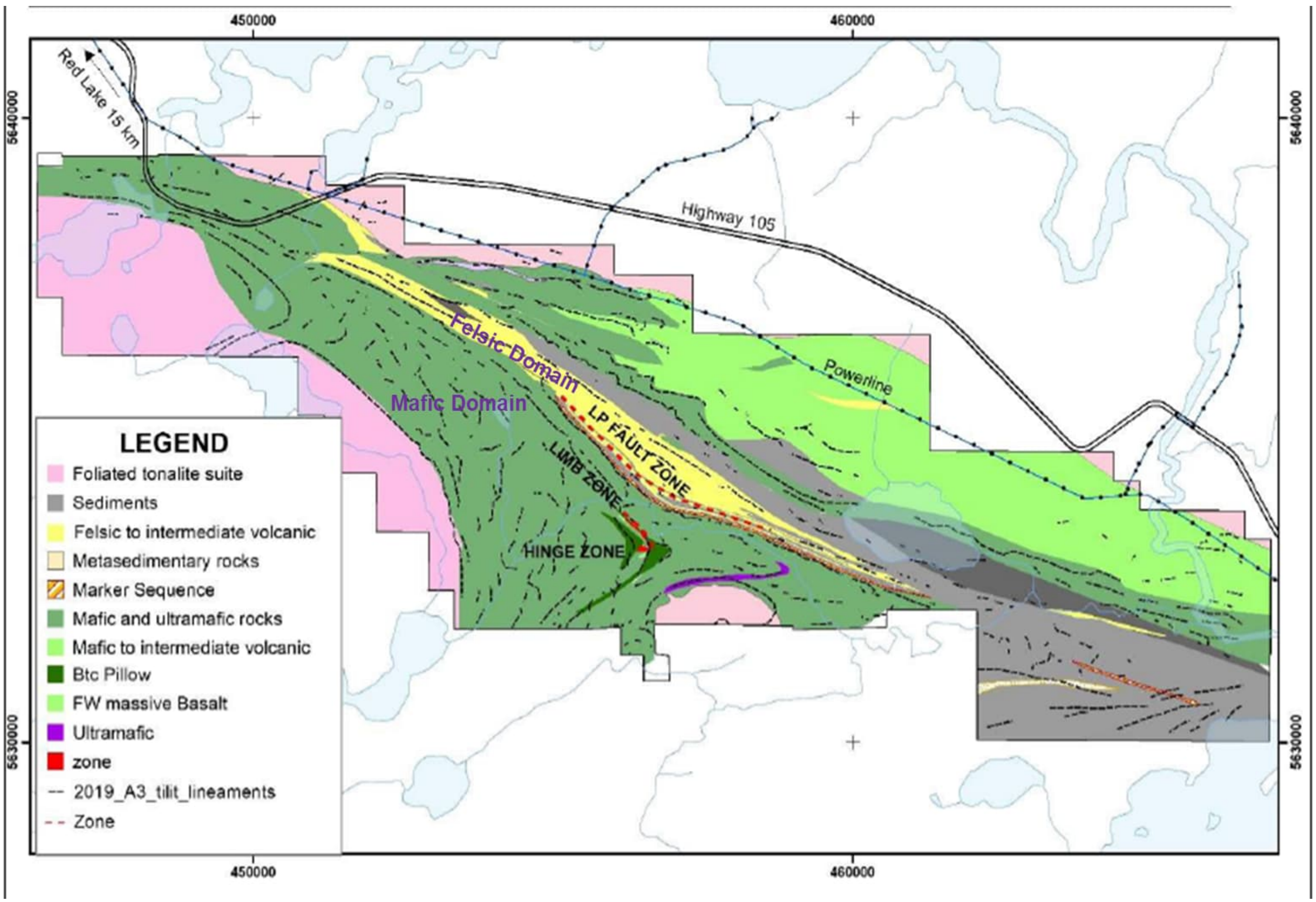
CONSULTANT

wsp

YYYY-MM-DD	2025-07-28
DESIGNED	----
PREPARED	DB
REVIEWED	----
APPROVED	----

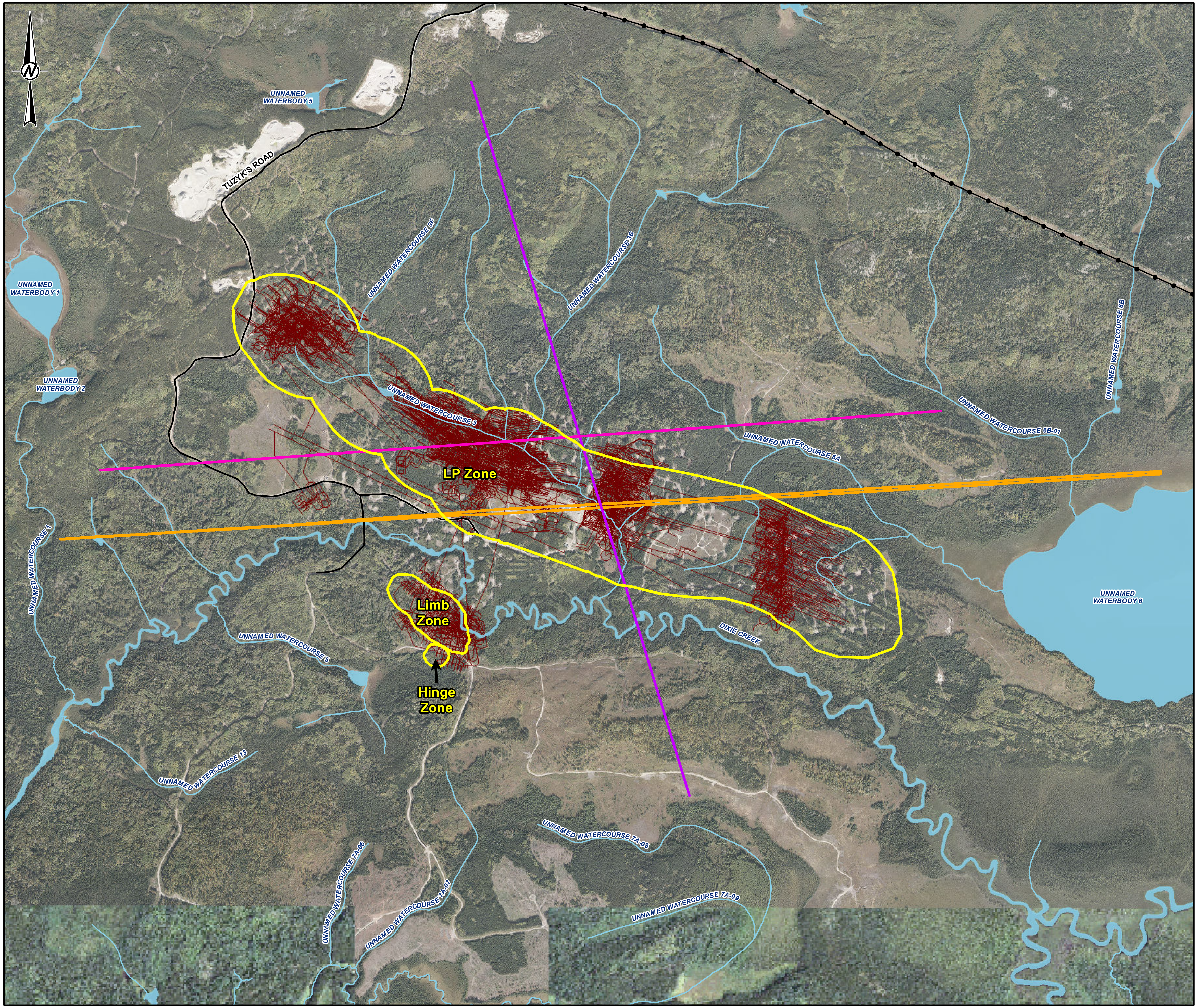
PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271.9255	0001	A	2-7

PATH: S:\Clients\Kinross\Great_Bear_Project\99_PROJ\CA0031271_9255\40_PROD\0001_EA_Hydrogeo\2-7_Glacial_Till_Thickness_5.mxd PRINTED ON: 2025-07-28 AT: 10:01:26 AM



Notes

Interpreted Local Geology	
Groundwater Modelling Report	
Kinross Great Bear Project	
Figure Number	2-8
Project Number	OMEMA2303
Date	August 2024
Drawn TY	Reviewed SG



LEGEND

- UNDERGROUND WORKINGS
- MINERALIZED ZONES
- LP SHEAR ZONE
- YAURO SHEAR ZONE
- AURO FAULT
- LOCAL ROAD
- EXISTING TRANSMISSION LINE
- WATERCOURSE
- WATERBODY

0 0.25 0.5 1
1:22,500 KILOMETRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. AERIAL IMAGERY PROVIDED BY GREAT BEAR RESOURCES (SCENE DATE: SEPTEMBER 2022).
3. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
4. UNDERGROUND WORKING CURRENT AS OF APRIL 2024.
5. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

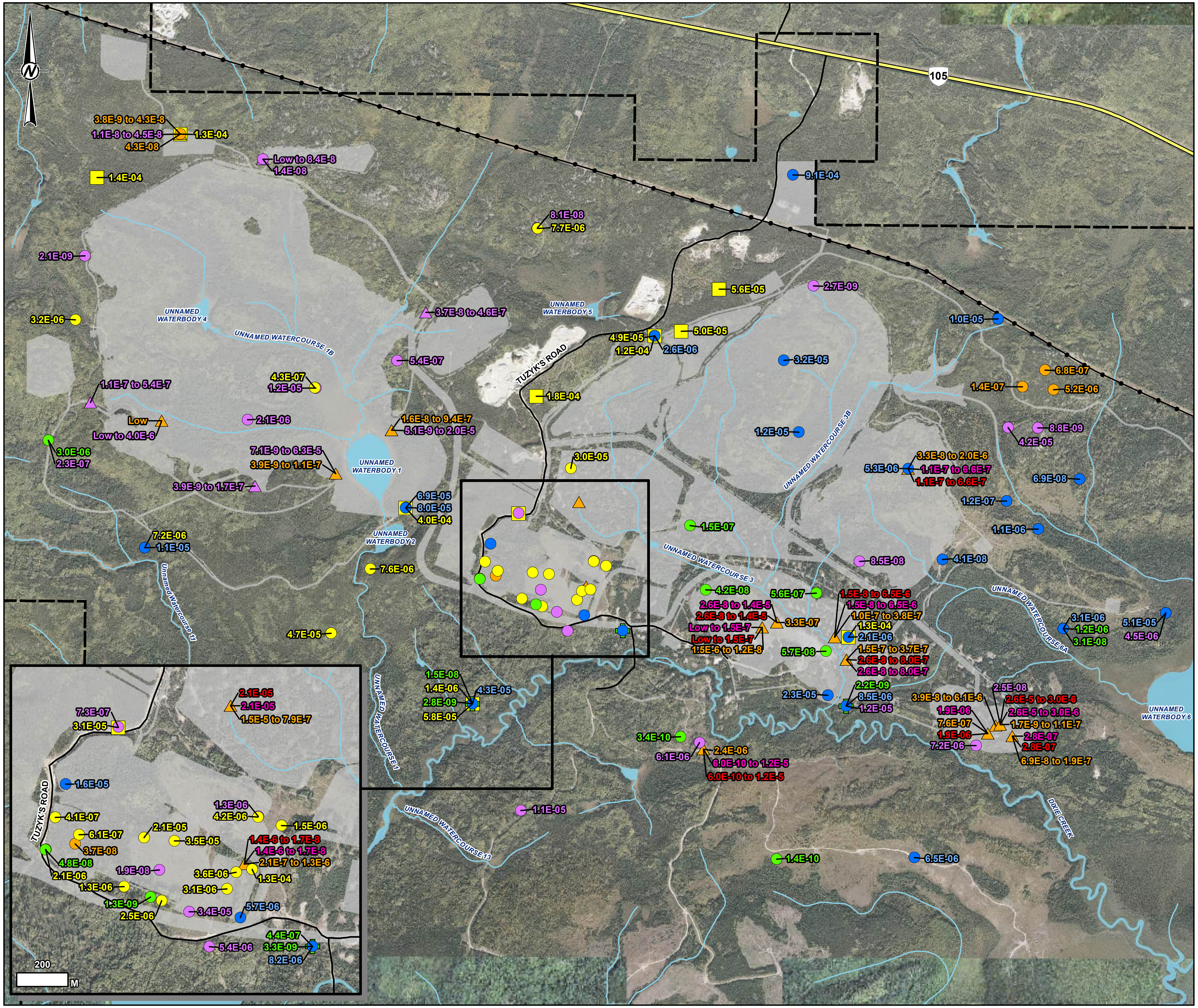
TITLE
MINERALIZED ZONES

CONSULTANT

wsp

YYYY-MM-DD	2025-02-19
DESIGNED	----
PREPARED	MD
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	2-9



LEGEND

- PROPERTY BOUNDARY
- GREAT BEAR PROJECT FOOTPRINT
- HIGHWAY
- LOCAL ROAD
- EXISTING TRANSMISSION LINE
- WATERCOURSE
- WATERBODY

SITE HYDRAULIC CONDUCTIVITY MEASUREMENT LOCATIONS
(LABELLED WITH HYDRALIC CONDUCTIVITY (M/SEC))

TEST TYPE

- ✚ FLEXIWALL PERMEAMEATER
- ☐ HAZEN FORMULA
- △ PACKER TEST
- ○ SINGLE WELL RESPONSE TEST

STRATIGRAPHIC UNIT

- ● GLACIAL TILL
- ● GLACIOLACUSTRINE
- ● SAND
- ● SHALLOW BEDROCK (0 TO 20 M)
- ● INTERMEDIATE BEDROCK (20 TO 80 M)
- ● DEEP BEDROCK (80 TO 300 M)
- ● DEEP BEDROCK (> 300 M)

0 0.25 0.5 1
1:28,000 KILOMETRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. AERIAL IMAGERY PROVIDED BY GREAT BEAR RESOURCES (SCENE DATE: SEPTEMBER 2022).
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
6. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

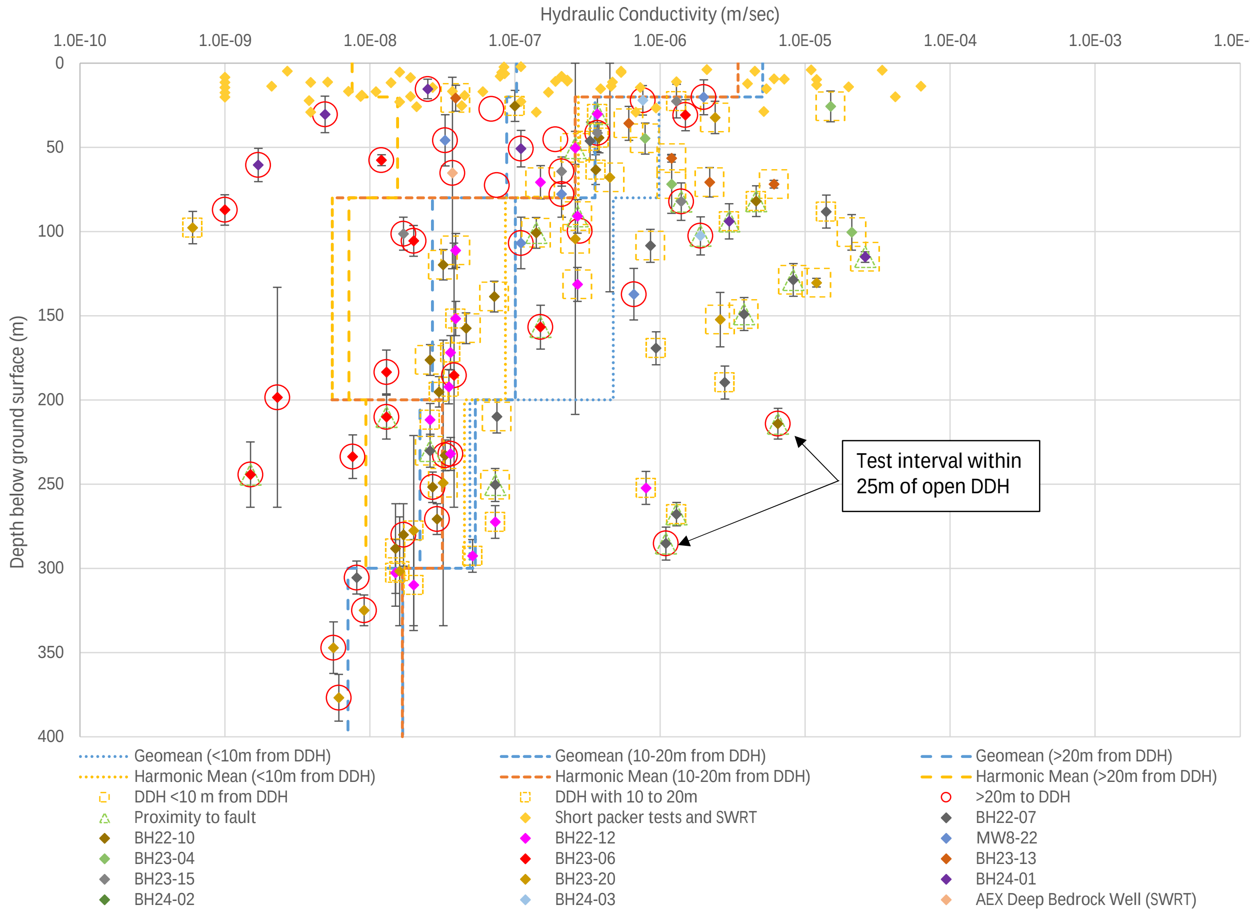
TITLE
SITE HYDRAULIC CONDUCTIVITY MEASUREMENT LOCATIONS

CONSULTANT

wsp

YYYY-MM-DD	2025-07-28
DESIGNED	----
PREPARED	DB
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271.9255	0001	A	2-10



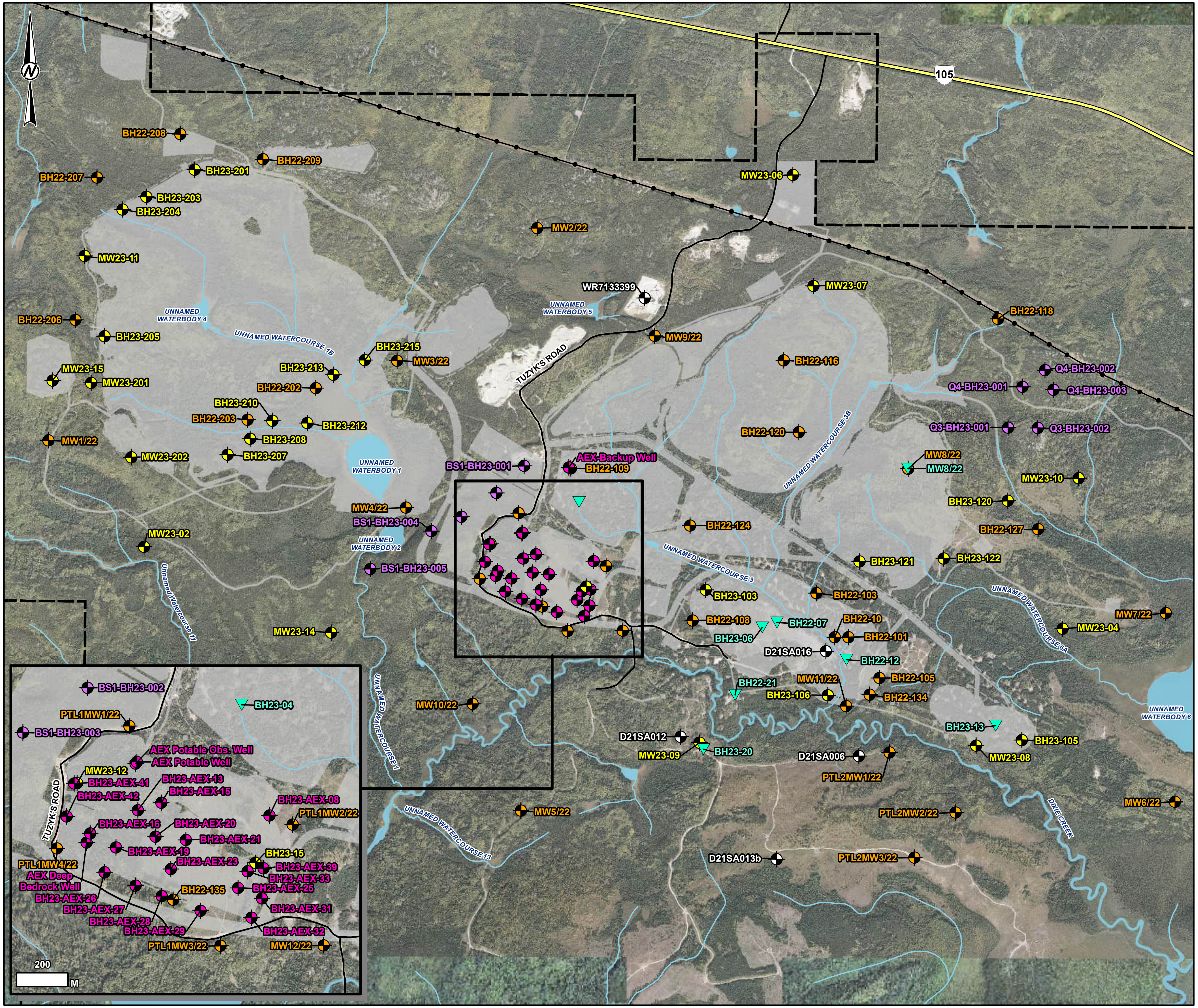
Notes

Select Packer Testing Data

GREAT BEAR RESOURCES

Great Bear Project

Figure Number		2-11	
Project Number		OMEMA2303	
Date		Nov-24	
Drawn	MR	Reviewed	SG



LEGEND

⬚	PROPERTY BOUNDARY
▨	GREAT BEAR PROJECT FOOTPRINT
⊕	2023 MONITORING WELL
⊕	2022 MONITORING WELL
⊕	AEX PORTAL MONITORING WELL
⊕	TBTE MONITORING WELL
⊕	HISTORICAL MONITORING WELL
▼	VWP
═	HIGHWAY
—	LOCAL ROAD
•—•	EXISTING TRANSMISSION LINE
—	WATERCOURSE
▨	WATERBODY

0 0.25 0.5 1

1:28,000 KILOMETRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. AERIAL IMAGERY PROVIDED BY GREAT BEAR RESOURCES (SCENE DATE: SEPTEMBER 2022).
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
6. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
MONITORING WELL LOCATIONS

CONSULTANT
wsp

YYYY-MM-DD	2025-07-28
DESIGNED	----
PREPARED	DB
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271.9255	0001	A	2-12

PATH: S:\Clients\Kinross\Great_Bear_Project\99_PROJ\CA0031271_9255\40_PROD\0001_EA_Hydrogeo\2-12_MW_Locations_7.mxd PRINTED ON: 2025-07-28 AT: 10:01:16 AM

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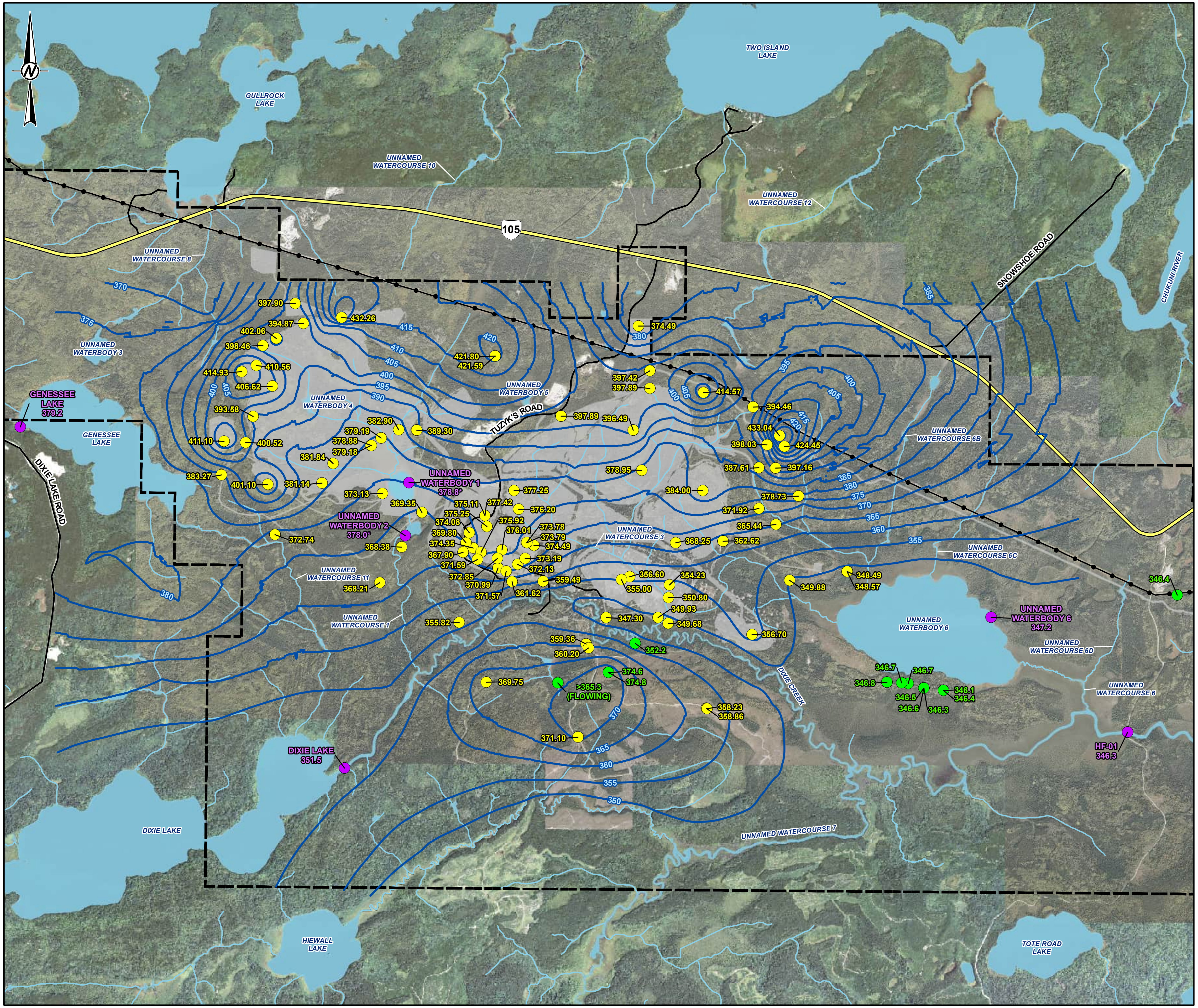

LEGEND

- ⬚ PROPERTY BOUNDARY
- ▭ GREAT BEAR PROJECT FOOTPRINT
- ● MEASURED GROUNDWATER LEVELS (AVERAGE VALUES FROM 2022 - 2033 QUARTERLY MONITORING ROUNDS)
- ● MEASURED GROUNDWATER LEVELS (DATA COLLECTED FROM EXPLORATION DRILLHOLES)
- ● SURVEYED WATER LEVEL (SUMMER 2023, MASL) (*UNNAMED WATERBODY 1 AND UNNAMED WATERBODY 2 ARE PERCHED ABOVE THE WATER TABLE AND HAVE NOT BEEN INCLUDED IN THE INTERPOLATION OF THE GROUNDWATER EQUIPOTENTIAL CONTOURS)
- — INTERPRETED GROUNDWATER LEVEL CONTOURS (LABELLED WITH ELEVATION (MASL))
- — HIGHWAY
- — LOCAL ROAD
- •—• EXISTING TRANSMISSION LINE
- — WATERCOURSE
- ▭ WATERBODY

0 0.5 1 2

1:50,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. AERIAL IMAGERY PROVIDED BY GREAT BEAR RESOURCES (SCENE DATE: SEPTEMBER 2022).
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / JUNE 2025.
6. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
SHALLOW GROUNDWATER LEVELS AND EQUIPOTENTIALS

CONSULTANT

wsp

YYYY-MM-DD	2025-07-28
DESIGNED	----
PREPARED	DB
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271.9255	0001	A	2-13

PATH: S:\Clients\Kinross\Great_Bear_Project\99_PROJ\CA0031271_9255\40_PROD\0001_EA_Hydrogeo\2-13_Interpreted_GW_Contours_8.mxd PRINTED ON: 2025-07-28 AT: 9:48:57 AM

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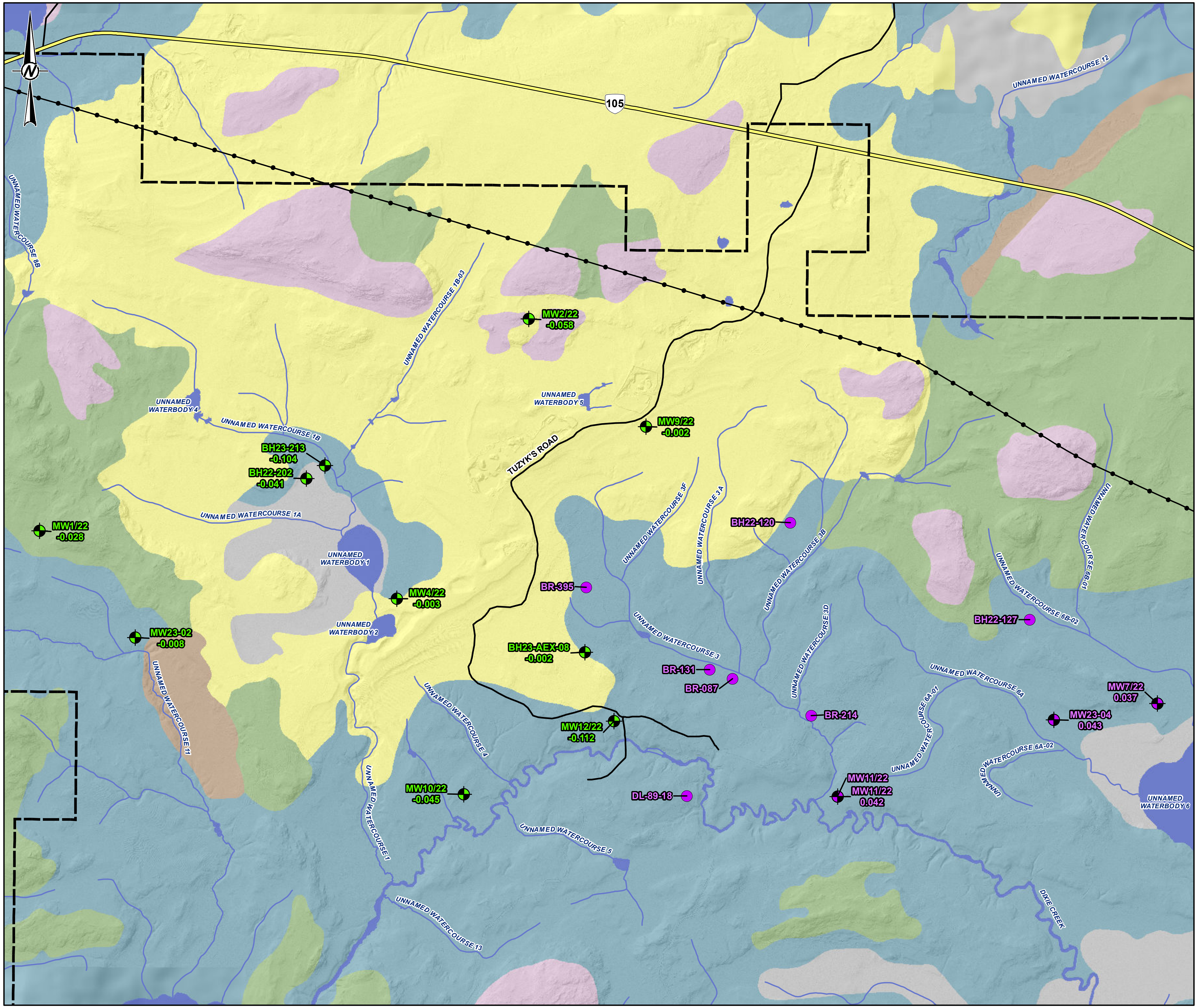
25mm



LEGEND

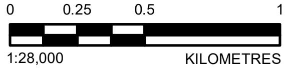
- PROPERTY BOUNDARY
- HIGHWAY
- LOCAL ROAD
- EXISTING TRANSMISSION LINE
- WATERCOURSE
- WATERBODY
- ● BOREHOLE OBSERVED WITH ARTESIAN CONDITION

MONITORING WELLS LABELLED WITH VERTICAL HYDRAULIC GRADIENT

- UPWARD HYDRAULIC GRADIENT
- DOWNWARD HYDRAULIC GRADIENT

QUATERNARY GEOLOGY

- ORGANIC DEPOSITS
- GLACIOLACUSTRINE DEPOSITES (DEEP WATER DEPOSITS)
- GLACIOLACUSTRINE DEPOSITES (SHORELINE AND SHALLOW WATER DEPOSITS)
- OUTWASH DEPOSITS (SAND AND GRAVEL)
- TILL
- BEDROCK



NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. QUATERNARY GEOLOGY BASE MAPPING IS EXTRACTED FROM QUATERNARY GEOLOGY OF RED LAKE-CONFEDERATION LAKE AREA; SHARPE, D R; RUSSELL, H A J. GEOLOGY SURVEYS OF CANADA, OPEN FILE 2876, 1996.
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
VERTICAL HYDRAULIC GRADIENT

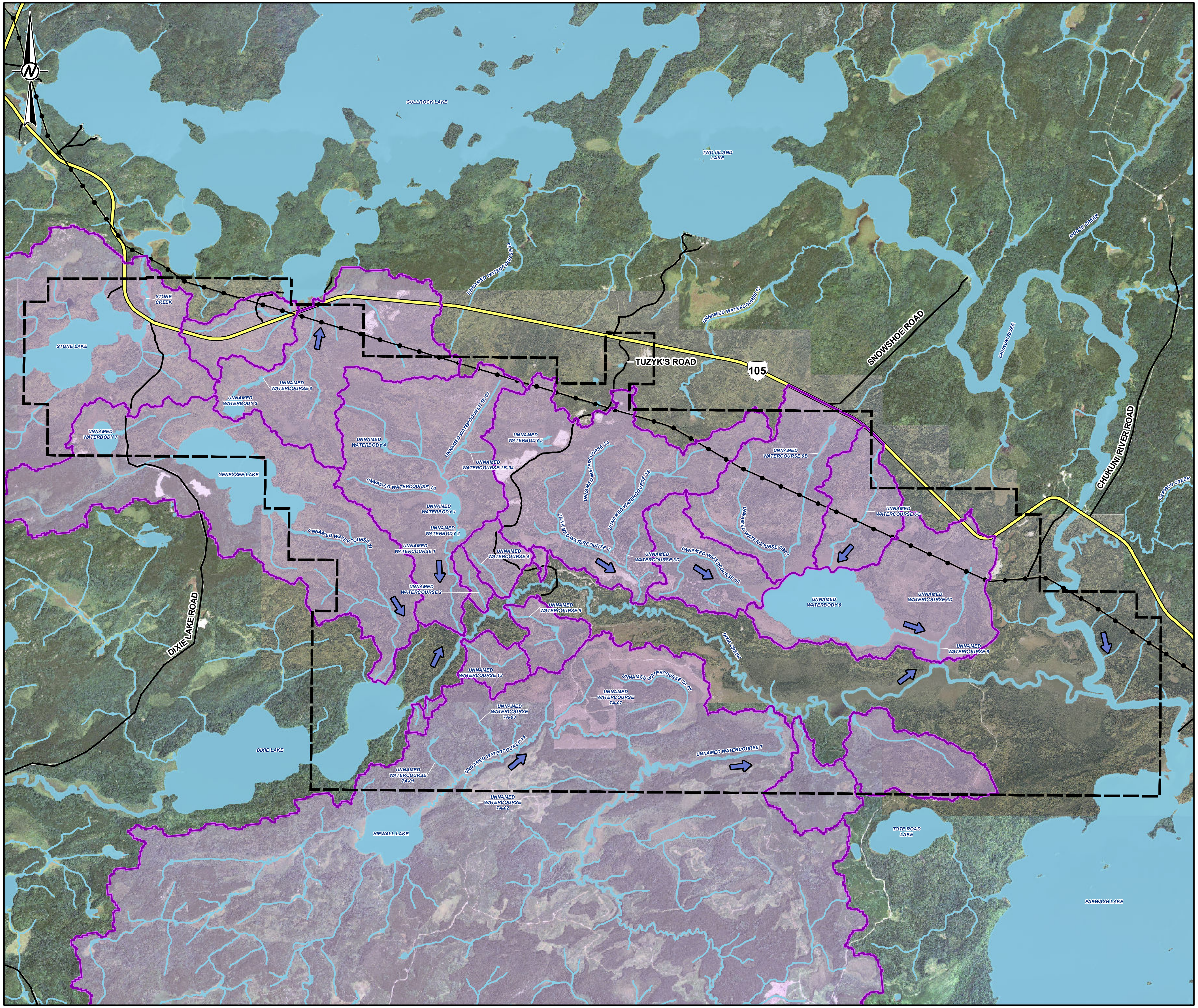
CONSULTANT

wsp

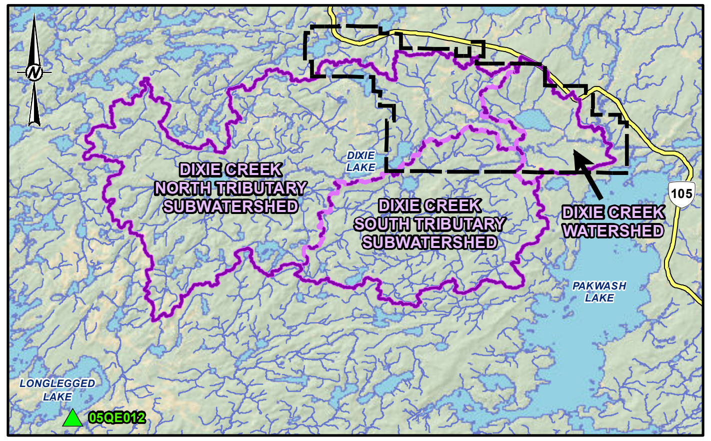
YYYY-MM-DD	2025-02-19
DESIGNED	----
PREPARED	MD
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	2-14

PATH: X:\CA\CAOAK\300-OAK\MIS-FS1-ProjectF\2023\Projects\OMEMA2303_Kinross_Great_Bear_Envt\7_GIS\HydroGeo\PFS_Modelling_Report_2024\MXD\Vertical_Gradients_Shallow_Flow_4.mxd PRINTED ON: 2025-02-19 AT: 10:42:59 AM



KEY MAP



SCALE 1:485,000

LEGEND

- ▭ PROPERTY BOUNDARY
- ▲ HYDROMETRIC STATION
- ▭ PROPERTY SUBCATCHMENT
- ▭ DIXIE CREEK SUBWATERSHED
- ▭ DIXIE CREEK WATERSHED
- ━ HIGHWAY
- ━ LOCAL ROAD
- ●━● EXISTING TRANSMISSION LINE
- ━ WATERCOURSE
- ▭ WATERBODY
- ➡ FLOW DIRECTION

0 1 2 4

1:70,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. AERIAL IMAGERY PROVIDED BY GREAT BEAR RESOURCES (SCENE DATE: SEPTEMBER 2022).
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
LOCAL WATERSHED AREAS

CONSULTANT

YYYY-MM-DD	2025-02-19
DESIGNED	----
PREPARED	MD
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	2-15

PATH: X:\CA\CAOAK300-OAK\MIS-FS1-ProjectF\2023\Projects\OMEMA2303_Kinross_Great_Bear_Envt\7_GIS\HydroGeo\PFS_Modelling_Report_2024\MXD\Local_Watersheds_5.mxd PRINTED ON: 2025-02-19 AT: 10:41:24 AM

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25mm

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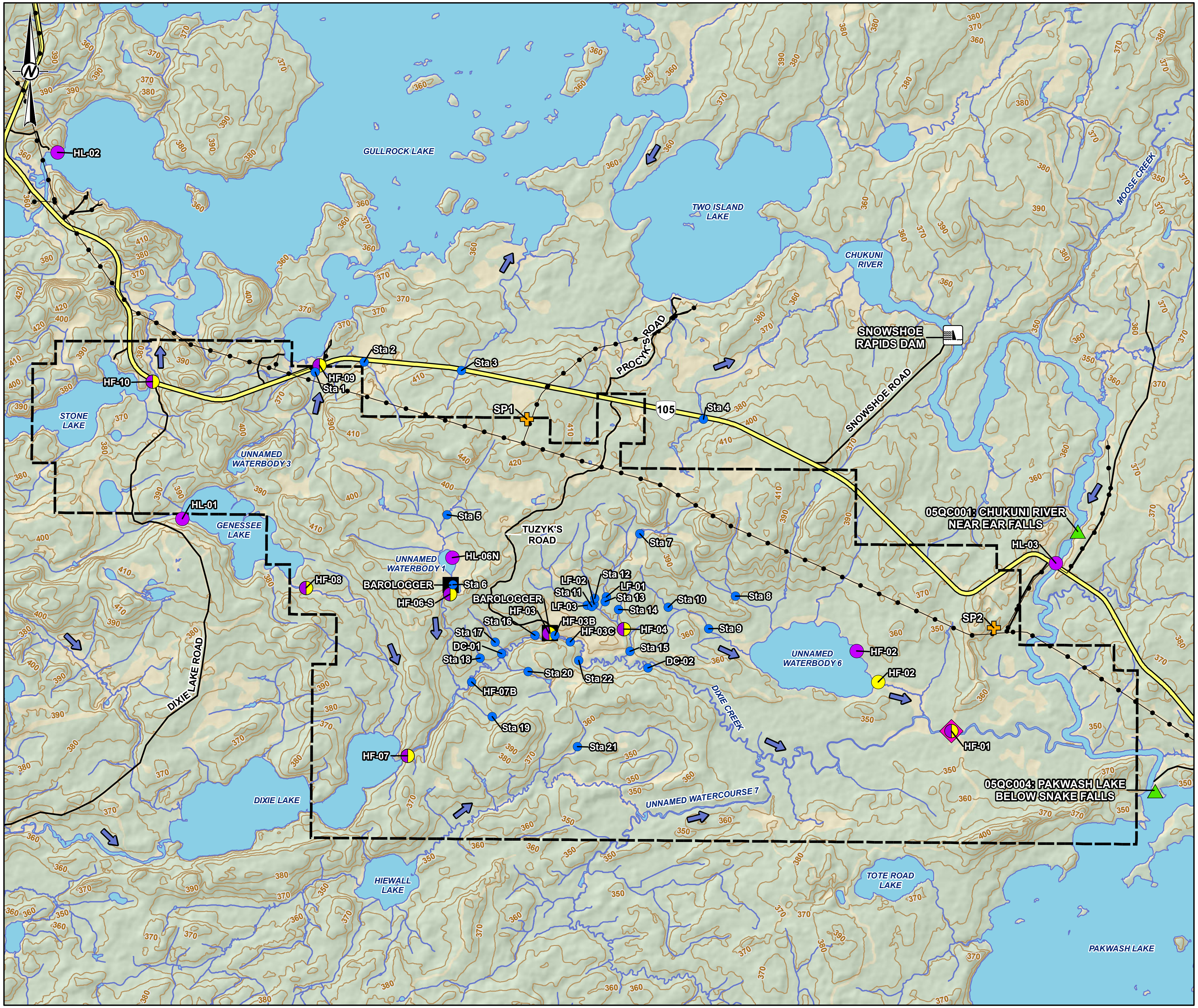


LEGEND

- ⬚ PROPERTY BOUNDARY
- HIGHWAY
- LOCAL ROAD
- POWER LINE
- WATERCOURSE
- WATERBODY
- CONTOURS (10 M INTERVAL)
- ▲ WATER SURVEY OF CANADA STATION
- ✚ METEOROLOGICAL STATION
- SNOWSHOE RAPIDS DAM
- ➡ FLOW DIRECTION
- ● ADDITIONAL HYDROMETRIC STATIONS

REGULAR HYDROMETRIC STATION
(BY INSTRUMENTATION)

- ■ BAROLOGGER
- ● LEVEL
- ● FLOW
- ◐ LEVEL AND FLOW
- ◆ SONTEK IQ

0 1 2 4
1:72,000 KILOMETRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
3. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
HYDROMETRIC STATIONS

CONSULTANT

wsp

YYYY-MM-DD	2025-02-19
DESIGNED	----
PREPARED	MD
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	2-16

3 SIMULATION OF PRE-MINING BASELINE CONDITIONS

Groundwater modelling was conducted for two phases: 1) pre-mining site conditions for model calibration and 2) mine operations conditions to predict the effects of project development (open pits and underground mine workings excavation, operation of a TMF, MRS and LGO) on local groundwater and surface water. This section of the report describes the model development and calibration to pre-mining baseline conditions.

3.1 NUMERICAL METHODS

The three-dimensional groundwater flow model was developed using the commercial finite-element groundwater modelling code FEFLOW 7.2, developed by WASY GmbH (Diersch 2014). These numerical groundwater flow models consider 3D steady-state flow conditions and implement an Equivalent Porous Media (EPM) approach, which is deemed sufficient for characterizing the overall groundwater flow regime at the scale of this analysis. FEFLOW represents a robust industry-standard modelling code, capable of simulating complex subsurface conditions and providing sophisticated visualizations of simulation results.

3.1.1 MODEL DOMAIN AND DISCRETIZATION

The groundwater model domain and mesh are shown in Figure 3-1. The domain was selected based on logical inferred hydrological boundaries and covers an area of approximately 179.2 km^2. There are a total of 17,692,221 triangular prism elements and 9,003,930 nodes. The perimeter of the model is primarily bounded by a series of lakes to the north, Chukuni River to the east, Unnamed Watercourse 7 and 7A and Dixie Lake to the south, which represent likely groundwater discharge locations. The model boundaries to the west are assumed to be no-flow boundaries representing either local groundwater flow divides (i.e. along topographic divides / local bedrock ridges) or inferred local groundwater flow lines.

The horizontal dimension of the finite elements generally ranges from <1 m to over 200 m, with typical elements sizes at the proposed underground mine workings area being approximately 18 m. Elements were generally refined along surface water feature shorelines and at the proposed underground mine workings area and main site features.

Vertically, the model is divided into 129 numerical layers ranging from 1.2 to 40.8 m in thickness (thickest elements corresponding to the deepest numerical layer). The layer thickness increases gradually from the top layer of 1.2 m until it reaches 18 m thick at Layer 49, from where a constant layer thickness of 18 m was defined to the depth (approximately 1,540 m below ground surface) where the proposed underground mine workings will extend (Layer 121). Layer 13 corresponds to the site DEM, while Layer 1 to 12 corresponds to the site features above the ground surface. The numerical mesh extends to a total depth/thickness of 1,764 m below ground surface.

3.1.2 SIMULATED HYDROSTRATIGRAPHY

Model hydrostratigraphy was assigned on an elemental basis based on the Leapfrog hydrostratigraphic model (Section 2.2.1). The simulated overburden hydrostratigraphy consists of four sub-units of glaciolacustrine clay, glaciolacustrine silt, sand, and glacial till. Bedrock was further divided into four units, corresponding to the variations of measured hydraulic conductivities with depth (Section 2.3):

- Shallow Bedrock (0 – 20 m)
- Intermediate Bedrock (20 – 80 m)
- Deep Bedrock 1 (80 – 300 m)

- Deep Bedrock 2 (> 300 m)

The initial input parameters were assigned based on field measurements described in Section 2. These parameters were subsequently adjusted as part of model calibration (Section 3.2.3), within reasonable limits based on the field data. The simulated hydrostratigraphic units and initial values are summarized below in Table 3-1.

Initially, the hydraulic properties of the sand, till and shallow bedrock were assumed to be homogeneous for a given model layer. However, an additional three K zones with K values different from the general calibrated K values were introduced to reproduce the observed groundwater levels in specific areas. These isolated K zones were delineated based on available field data that span these areas, namely the distribution of measured K values (Figure 2-10) and their contrast which general site conditions, bedrock topography, measured groundwater levels and model calibration results. Generally, this refers to the demarcation of the bedrock valley zone (Section 2.3) as well as a bedrock ridge zone and a permeable overburden zone which are differed from the general site conditions. More details are provided in Section 3.2.3.

3.1.3 BOUNDARY CONDITIONS

Boundary conditions for the baseline / existing conditions are shown in Figure 3-2. Three types of boundary conditions were applied to the model:

- Constant Head (1st type): Constant head boundary conditions were applied at the locations of lakes, Dixie Creek, Chukuni River and a few tributaries. Lake level elevations were assigned based on water level monitoring summarized in Table 2-3 where available or otherwise based on the DEM elevations. The constant head values for creeks were applied based on DEM elevations.
- Recharge (2nd type): Recharge was assigned on an elemental basis based on the surficial hydrostratigraphic layers and the overall average values described in Section 2.6. Detailed recharge values are provided in Table 3-1.
- Fluid Transfer (3rd type): Initial fluid transfer nodes were assigned for the small streams present at site. The reference elevation for fluid transfer nodes was set as the DEM elevation at each node and the in and out fluid transfer rates were initially set to 1/d (representing a high value such that groundwater - surface water exchange would not be impeded). The fluid transfer rates were further adjusted for some of the streams during model calibration to calibrate the baseflow flow rates.

3.1.4 CALIBRATION METHOD

The pre-mining baseline conditions model (Model ID: GB_Base) was calibrated to the measured groundwater level data from Fall/Winter 2023 (Section 2.4.1), which includes 106 water level measurements from site monitoring wells and VWPs excluding dry wells. The simulated groundwater inflows from the baseline conditions model were also compared to interpreted baseflow rates as listed in Table 2-4 but were not used as a critical calibration targets. Calibration was conducted by incrementally adjusting the model input hydraulic conductivity, recharge values, and fluid transfer rates within reasonable limits defined by field measurements until both the simulated baseflow rates and the simulated groundwater levels provided an acceptable match to the observed values, as indicated by goodness-of-fit parameters.

3.2 MODEL CALIBRATION RESULTS

3.2.1 GOODNESS-OF-FIT

Figure 3-3 displays the resulting calibration scattergram for the simulated versus observed groundwater levels. The calibration plot shows generally good agreement between the simulated and observed hydraulic head measurements: the correlation coefficient (R) is 0.99, the mean absolute error (MAE) is 3.5 m (4.4% of the observed range), and the standard deviation of residuals (SD_{RES}) is 4.1 m (5.2% of the simulated range). These represent satisfactory results, as they are less than the target threshold of <10%.

Simulated head contours from the calibrated model and the model residuals at each monitoring location are shown in Figure 3-4. These plots show that the overall direction of groundwater flow and groundwater levels are generally consistent between the two datasets: groundwater levels typically correlate with topography, decreasing from the inland topographic highs towards the lows / surface water features. The most obvious water level bias based on the residuals is at MW4/22 near the Unnamed Waterbody 1. This location is at a bedrock low with the largest overburden / till thickness measured of over 40 m. The higher simulated hydraulic head at MW4/22 is mainly influenced by the water level simulated at the Unnamed Waterbody 1, which is likely to be a perched water table that occurs above the main water table due to the presence of the glaciolacustrine deposits.

The simulated groundwater contributions (baseflow rates) to each selected hydrometric station were compared to the baseflow estimates and are summarized in Table 3-2. Due to the reasons discussed in Section 2.5.2, estimated baseflows were only used as calibration references instead of critical calibration targets. Most of the baseflow conditions observed in the small tributaries were reasonably reproduced except for stations HF-08 (Genesse Lake outflow) and HF-09 (Gullrock Lake inflow), where the simulated groundwater inflows are much higher than the estimated values. Each of these exceptions is discussed below:

- The estimated low baseflows at station HF-08, downstream of Genesse Lake, is thought to be mainly due to the beaver dam located at the outlet of the lake, thus normal baseflow at this location are expected to be closer to the simulated value given the relatively large watershed area. The position of the lake at the headwaters of a sub watershed may also contribute to a larger portion of the recharge bypassing the flow station as groundwater flow. Furthermore, a large portion of the HF-08 catchment area is occupied by wetlands, which during the hot, dry year of 2023, may have resulted in a large portion of the available precipitation being lost to evapotranspiration.
- Only three flow measurements (one in early spring 2024 and two in Fall 2023) are available at HF-09 at the time of the modelling described in this report was completed. The measurements in Fall 2023 are assumed to represent the low flow conditions, which ranges from 190 m^3/d to 650 m^3/d. When normalized over the watershed area of 7.5 km^2 this is equivalent to 10 mm/yr to 30 mm/yr. Given that more than half of the HF-09 watershed is in glacial outwash sands and glacial tills, the baseflow is expected to be closer to 650 m^3/d although it is difficult to determine with limited flow measurements. Like HF-08; however, there is likely a large portion of the recharge bypassing the flow station as groundwater flow to Gullrock Lake directly without discharging to the creek (i.e., underflow).

3.2.2 WATER BALANCE

The model water balance was examined to ensure accuracy of numerical computations. This is given below in Table 3-3. The water balance error for the steady-state solution was less than 0.5% which was considered acceptable.

3.2.3 CALIBRATED HYDRAULIC PARAMETERS

Table 3-4 summarizes the calibrated hydraulic parameters. Key findings of the steady state model calibration are as follows:

- Calibrated hydraulic parameters for the overburden soils agreed very well with initial estimates except for the glacial till, where the calibrated hydraulic conductivity had to be double increased to improve the overall calibration statistics.
- Recharge values were only slightly decreased by 10 mm/yr for the sand and glaciolacustrine clay.
- The baseline model has limited sensitivity to the hydraulic conductivities of the intermediate and deep bedrock, making it difficult to evaluate the appropriate selections of hydraulic conductivities through

steady state model calibration. Although packer test results are available for bedrock, in crystalline bedrock, packer tests are better suited to assessing the hydraulic conductivity of fracture networks close to the borehole than of more regional fracture networks most relevant to assessing inflows into underground workings, where larger scale fracture connectivity governs. Most of the packer test results are from the mining area with local faults and extensive exploration boreholes presented, which may create artificially high hydraulic connections and substantially influence hydraulic testing results, and more competent bedrock is observed near the proposed TMF to the northwest of the site where there are less faults and exploration boreholes. As such, hydraulic conductivity profiles developed from geometric mean packer test values are likely overestimate the transmissivity of bedrock regional fracture networks, although by how much is challenging to quantify until actual underground development begins. In addition, based on the experience with the mine site nearby which has similar geological setting, the calibrated hydraulic conductivities of the intermediate and deep bedrock 1 were both decreased by an order of magnitude.

- A low K zone (Bedrock Ridge Zone shown in Figure 3-5) had to be introduced in the shallow bedrock for the bedrock ridge areas north and west of the proposed TMF to reproduce the steep gradients and shallow depth to groundwater in this topographic high.
- A high K zone (Bedrock Valley Zone shown in Figure 3-5) had to be introduced in sand, glacial till and shallow bedrock in a bedrock valley zone to the south of the proposed TMF towards the Dixie Creek to reproduce the observed deep groundwater levels especially at MW4/22 (369.4 masl), which is much lower than the nearby Unnamed Waterbody 1 (379.2 masl), demonstrating a downward gradient beneath the pond. However, the water level observed at the Unnamed Waterbody 1 is more likely to be a perched water table that occurs above the main groundwater table (i.e., the pond is primarily surface water fed and is poorly connected to the deeper groundwater system due to low permeability substrate sediments). Thus, the introduced high K zone may potentially overestimate the groundwater inflow to Dixie Creek.
- Another zone of higher hydraulic conductivities in sand, glacial till and shallow bedrock (High K Zone around MW23-06 shown in Figure 3-5) had to be introduced in the area around MW23-06 towards the Two Island Lake. This is to reproduce the deep depth to groundwater observed at MW23-06.
- To match the interpreted baseflows to a reasonable level, the calibrated fluid transfer rate for the Unnamed Watercourse 1 and 3 were decreased to 0.003/d and 0.005/d, respectively.

3.3 MODEL LIMITATIONS

Limitations associated with the development and application of this numerical groundwater model for this Project site include:

- **Steady-state conditions:** The groundwater was simulated assuming steady-state (i.e., long-term, constant) conditions, which represents the long-term dewatering rate after the initial drawdown period. It is expected that short-term dewatering rates during the initial drawdown period and seasonal inflows following the spring freshet will be greater than the long-term rate as storage is released from the surrounding overburden.
- **Key Assumptions:** Several assumptions were made during model construction:
  - EPM: the EPM approach was implemented which is deemed sufficient for characterizing the overall groundwater flow regime at the scale of this analysis. There are several faults that pass through the proposed underground mine workings and LP Central pit that may act as a narrow conduit to groundwater flow (aquifer); however, as there is a considerable thickness of overburden sediments above the bedrock low even where these pass under the Dixie Creek, although with local bedrock / till outcrop observed in a few spots, the prospect of significant groundwater and surface water interaction appears to be low.

  - Average annual conditions: the model simulates average annual conditions, and not seasonal conditions. Seasonal variations in stream flows, which may result in small tributaries being dry during late summer and late winter conditions will not be captured by the model.
  - Limited baseflow calibration: The model only roughly calibrated to the baseflows due to the beaver activities, limited stream flow data, abnormal dry year of 2023 and measurement challenges which making it difficult to estimate baseflow conditions at the time of this report preparation (see section 2.6.1).
  - Uncertainties in hydraulic conductivities of intermediate and deep bedrock: As the baseline model is less sensitive to the hydraulic conductivities of the intermediate and deep bedrock, a similar quality calibration could have been obtained with a different selection of the hydraulic conductivities for deeper bedrock. However, better understanding on the hydraulic properties of the deeper bedrock can be gained upon the finish of AEX Program, of which the measured groundwater inflow rate to AEX workings can be applied to recalibrate the hydraulic conductivity of deeper bedrock.
  - Model constraints in the offsite area: there are few model constraints in the northern parts of the model, where groundwater level data were less abundant than in the mining area. Therefore, the model in these areas was more uncertain and generalized.
- **Exploration Borehole Grouting:** Great Bear Resources has undertaken a grouting program to seal off exploration boreholes starting in February 2024 and continuing at the time of this report preparation. Any of the remaining ungrouted boreholes in the area of the proposed underground mine has the potential to act as conduits for groundwater inflow into the eventual pit and underground mine workings. As it is Great Bear Resources' intention to grout these boreholes, they are not included in the model. In the event that a drillhole could not be grouted prior to the start of underground mining, and is intercepted by the underground mine workings, grouting can also be undertaken at that time.

The effects of these limitations on the modeling results vary depending on their degree of influence on the specific model output examined. Nevertheless, in our view, the assumptions and approach described above did not influence the fundamental conclusions of this study and were, therefore acceptable for the intended use of the model.

Table 3-1: Initial Hydraulic Parameters

Material	K_H (m/s)	K_H/K_V	Recharge (mm/yr)
Sand	1.0×10^{-5}	1	90
Glaciolacustrine Clay	4.0×10^{-7}	10	20
Glaciolacustrine Silt	4.0×10^{-6}	10	30
Glacial Till	6.8×10^{-6}	5	60
Shallow Bedrock (0 to 20 m)	1.0×10^{-6}	10	40
Intermediate Bedrock (20 to 80 m)	3.0×10^{-7}	5	-
Deep Bedrock 1 (80 to 300 m)	3.0×10^{-8}	2	-
Deep Bedrock 2 (> 300 m)	1.0×10^{-9}	1	-

Table 3-2: Comparison of Simulated Groundwater Flow versus Calibration Targets

Description	Station ID	Flow Measurement (m^3/d)		Simulated Flow (m^3/d)
		Time	Observed	
Unnamed Watercourse 3	HF-04	2022/2023 [1]	300	284
Genesse Lake Outflow	HF-08	2022/2023 [1]	120	733
Gullrock Lake Inflow	HF-09	Sep./Oct. 2023	190 ~ 605	843
Unnamed Waterbody 1 Outflow	HF-06	2022/2023 [1]	150	139
Unnamed Watercourse 6A	Station 09	June/Sep. 2023	<147 ~ 409	162
Unnamed Watercourse 4	Station 17	June/Sep. 2023	18 ~ 397	88
Unnamed Watercourse 2	Station 18	June/Sep. 2023	106 ~ 181	195
Unnamed Watercourse 13	Station 19	Sep./2023	Standing water	0
Unnamed Watercourse 5	Station 20	Sep./2023	Low water, back flow	0
Unnamed Watercourse 7A-07	Station 21	Sep./2023	Standing water	0

Note:

[1] Baseflow were determined from stream discharge hydrographs.

Table 3-3: Steady-state Water Balance and Associated Error [1]

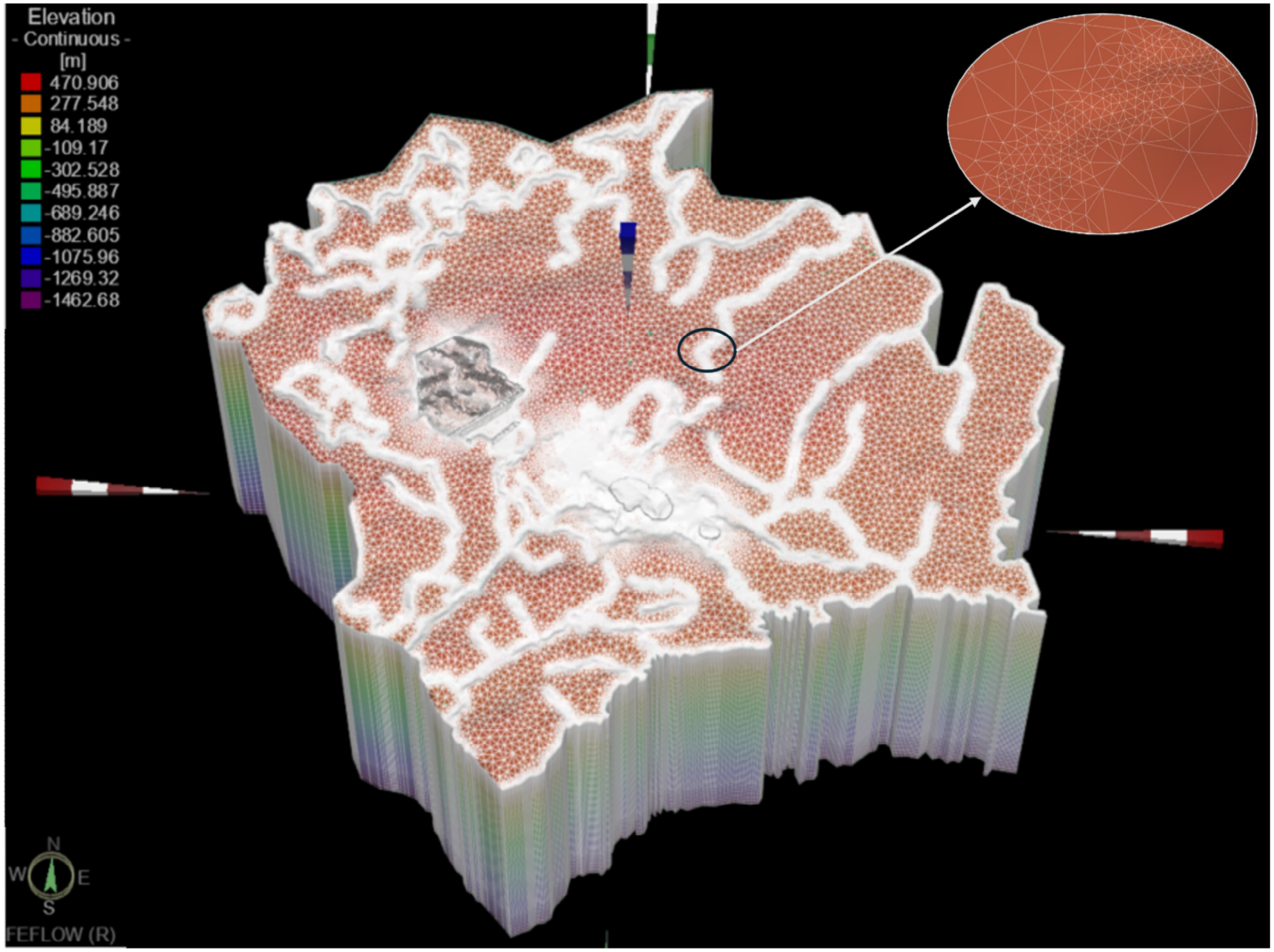
Boundary Condition	Outflow (m^3/day)	Inflow (m^3/day)
Constant Head (1st Type)	11,012	685.1
Fluid Transfer (3rd Type)	8,619.5	3,116.5
Recharge (2nd Type)	0	15,830
Total	19,631	19,631
Imbalance (m^3/d; [%])	0.1 [0.05%]	

Note:

[1] Water balance terms with respect to groundwater model. Inflow = entering model. Outflow = exiting model.

Table 3-4: Calibrated Hydraulic Parameters

Zone	Material	K_H (m/s)	K_H/K_V	Recharge (mm/yr)
Regular Zone	Sand	1.7×10^{-5}	1	80
	Glaciolacustrine Clay	2.0×10^{-7}	10	10
	Glaciolacustrine Silt	2.0×10^{-6}	10	30
	Glacial Till	1.6×10^{-5}	5	60
	Shallow Bedrock (0 to 20 m)	1.0×10^{-6}	10	40
	Intermediate Bedrock (20 to 80 m)	2.0×10^{-8}	2	-
	Deep Bedrock 1 (80 to 300 m)	2.0×10^{-9}	2	-
	Deep Bedrock 2 (> 300 m)	1.0×10^{-9}	1	-
Bedrock Valley Zone	Sand	1.7×10^{-4}	1	80
	Glacial Till	8.0×10^{-5}	5	60
	Shallow Bedrock (0 to 20 m)	1.0×10^{-5}	10	40
Bedrock Ridge Zone	Shallow Bedrock (0 to 20 m)	3.0×10^{-8}	2	40
High K Zone around MW23-06	Sand	3.0×10^{-4}	1	80



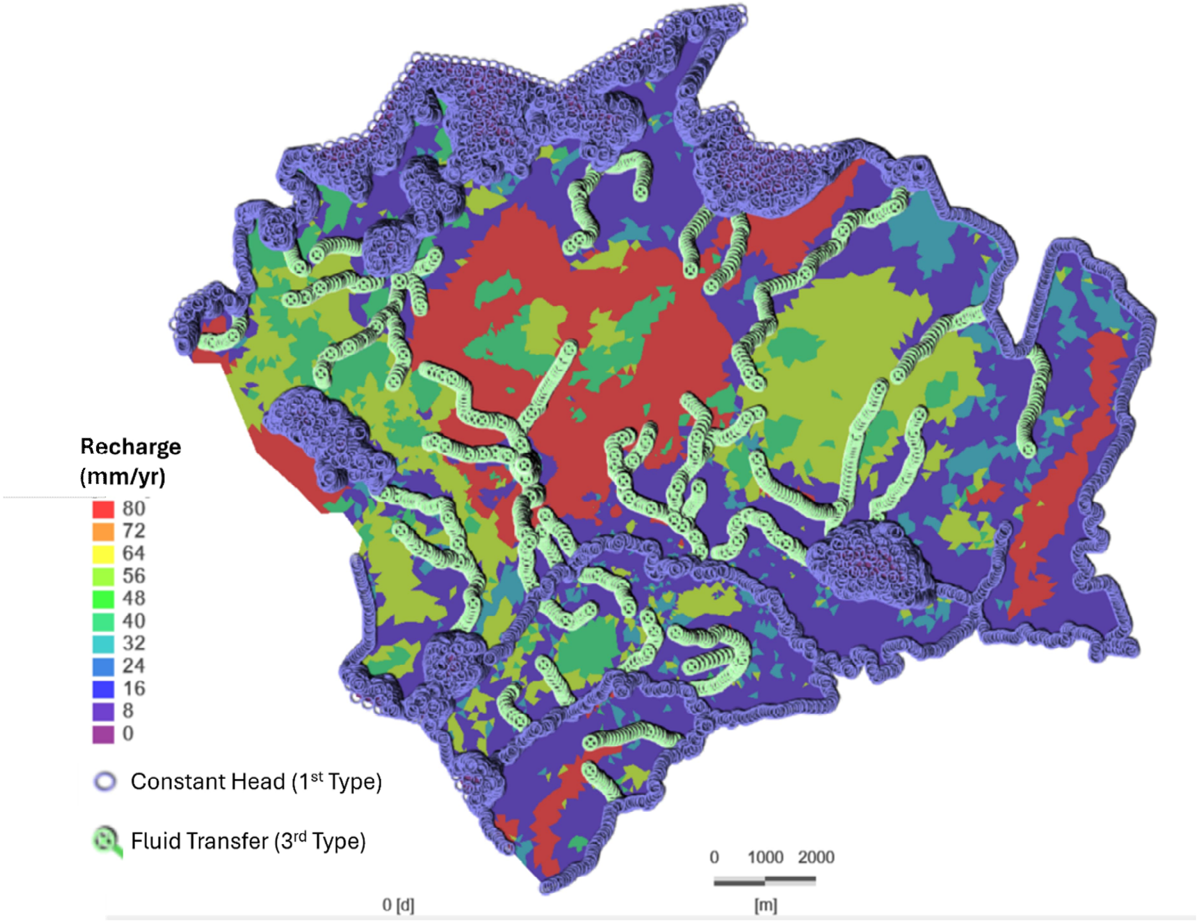
Notes

Model Domain and Discretization

Groundwater Modelling Report

Kinross Great Bear Project

Figure Number		3-1	
Project Number		OMEMA2303	
Date		August 2024	
Drawn	TY	Reviewed	SG



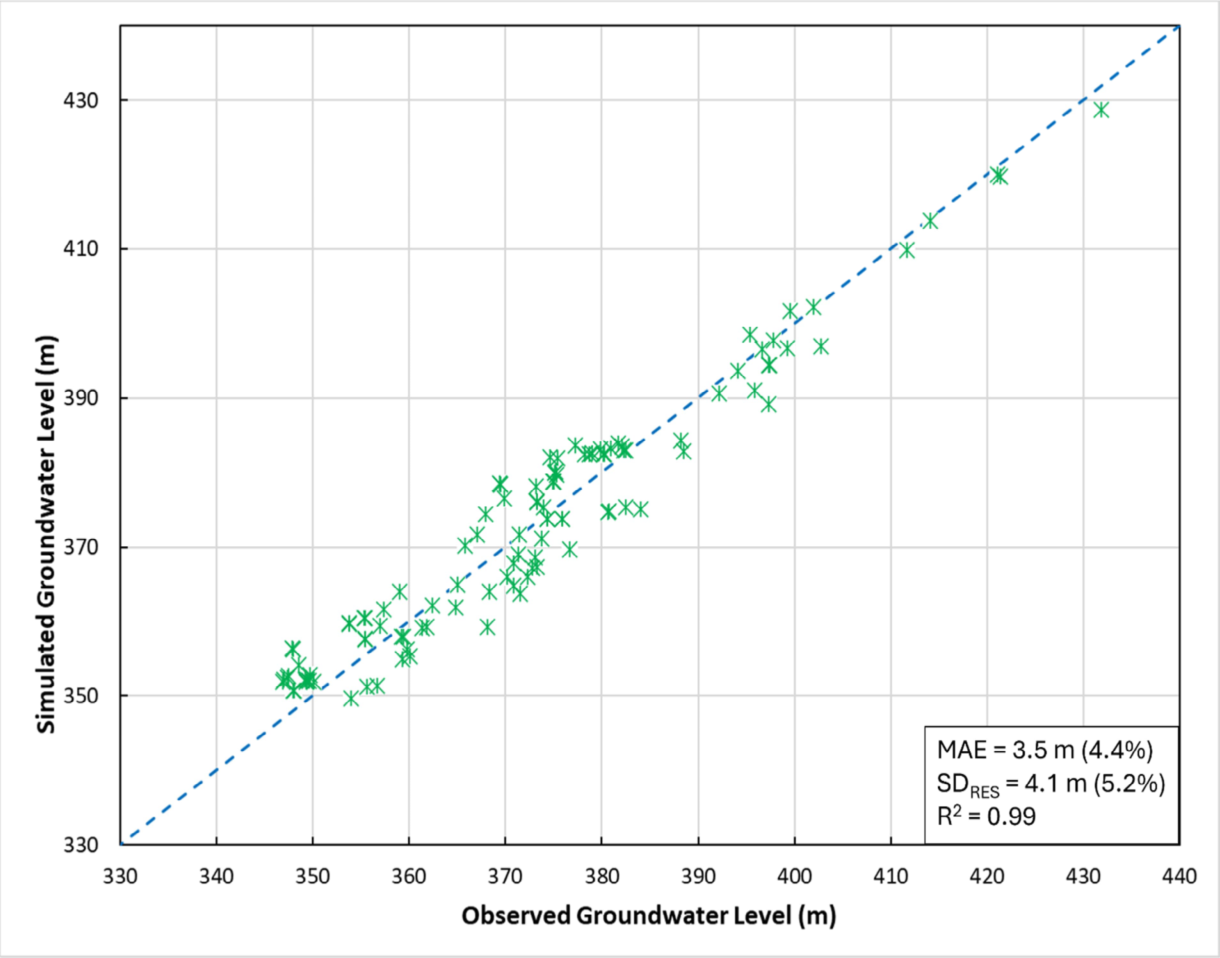
Notes

Model Boundary Conditions

Groundwater Modelling Report

Kinross Great Bear Project

Figure Number		3-2	
Project Number		OMEMA2303	
Date		August 2024	
Drawn	TY	Reviewed	SG



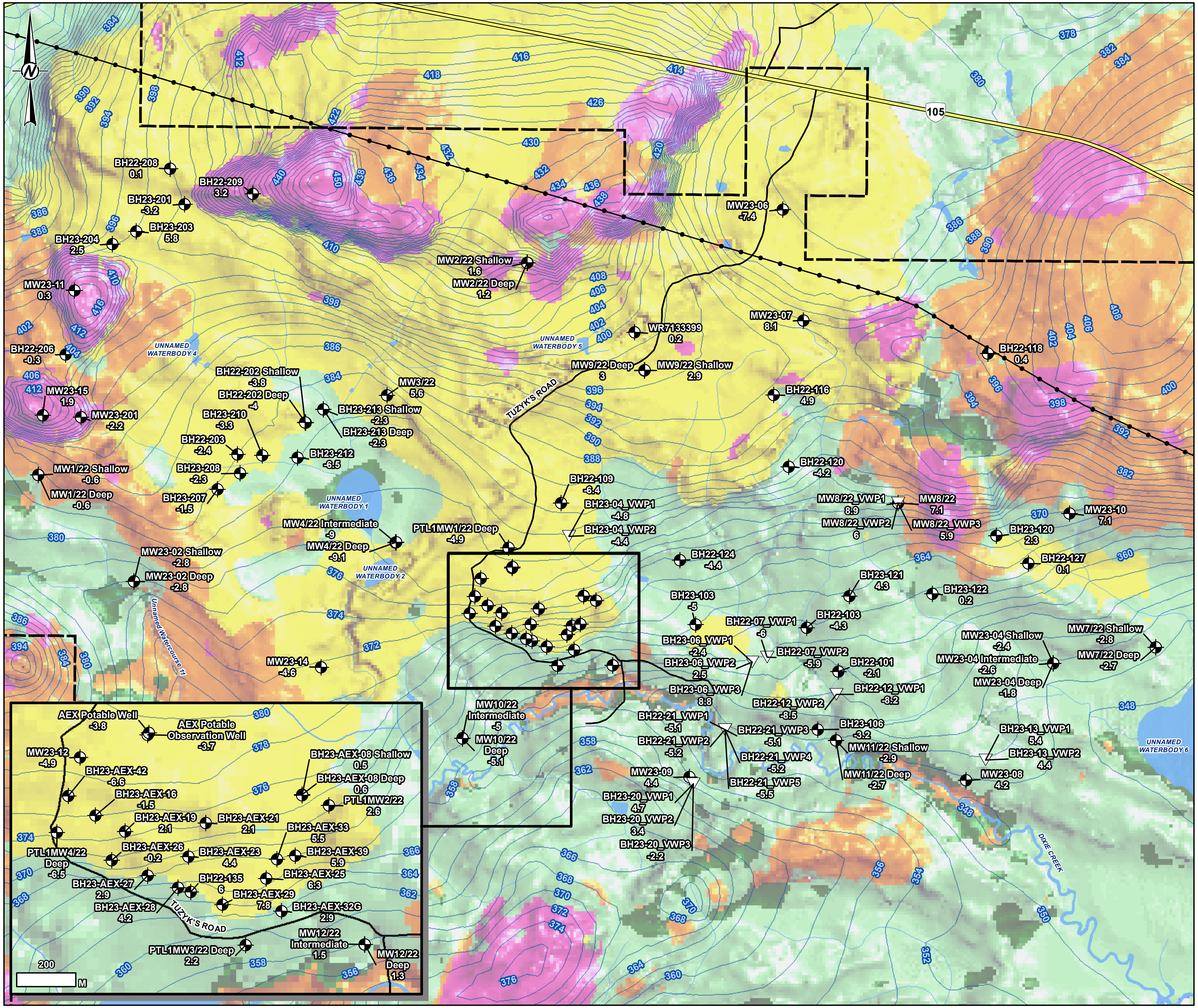
Notes

Model Calibration Scattergram

Great Bear Project – Groundwater Modelling Report for Environmental Assessment

Kinross Great Bear Project

Figure Number		3-3	
Project Number		OMEMA2303	
Date		August 2024	
Drawn	TY	Reviewed	SG



LEGEND

⬚	PROPERTY BOUNDARY
═	HIGHWAY
—	LOCAL ROAD
•—•	EXISTING TRANSMISSION LINE
—	WATERCOURSE
🟦	WATERBODY
—	SIMULATED GROUNDWATER LEVEL CONTOURS (LABELLED WITH WITH ELEVATION (MASL)

GROUNDWATER ELEVATION RESIDUALS (LABELLED IN M)

POSITIVE RESIDUALS INDICATE OBSERVED HEAD LARGER THAN SIMULATED HEAD

⊕	MONITORING WELL
▽	VWP

QUATERNARY GEOLOGY SIMULATED IN LEAPFROG

🟩	GLACIOLACUSTRINE DEPOSITES (CLAY)
🟩	GLACIOLACUSTRINE DEPOSITES (SILT)
🟨	OUTWASH DEPOSITS (SAND AND GRAVEL)
🟧	GLACIAL TILL
🟪	BEDROCK

0 0.25 0.5 1
1:28,000 KILOMETRES

NOTE(S)
1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)
1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
3. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
4. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
RESIDUALS BETWEEN SIMULATED AND MEASURED GROUNDWATER LEVEL

CONSULTANT

wsp

YYYY-MM-DD	2025-02-19
DESIGNED	----
PREPARED	MD
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	3-4

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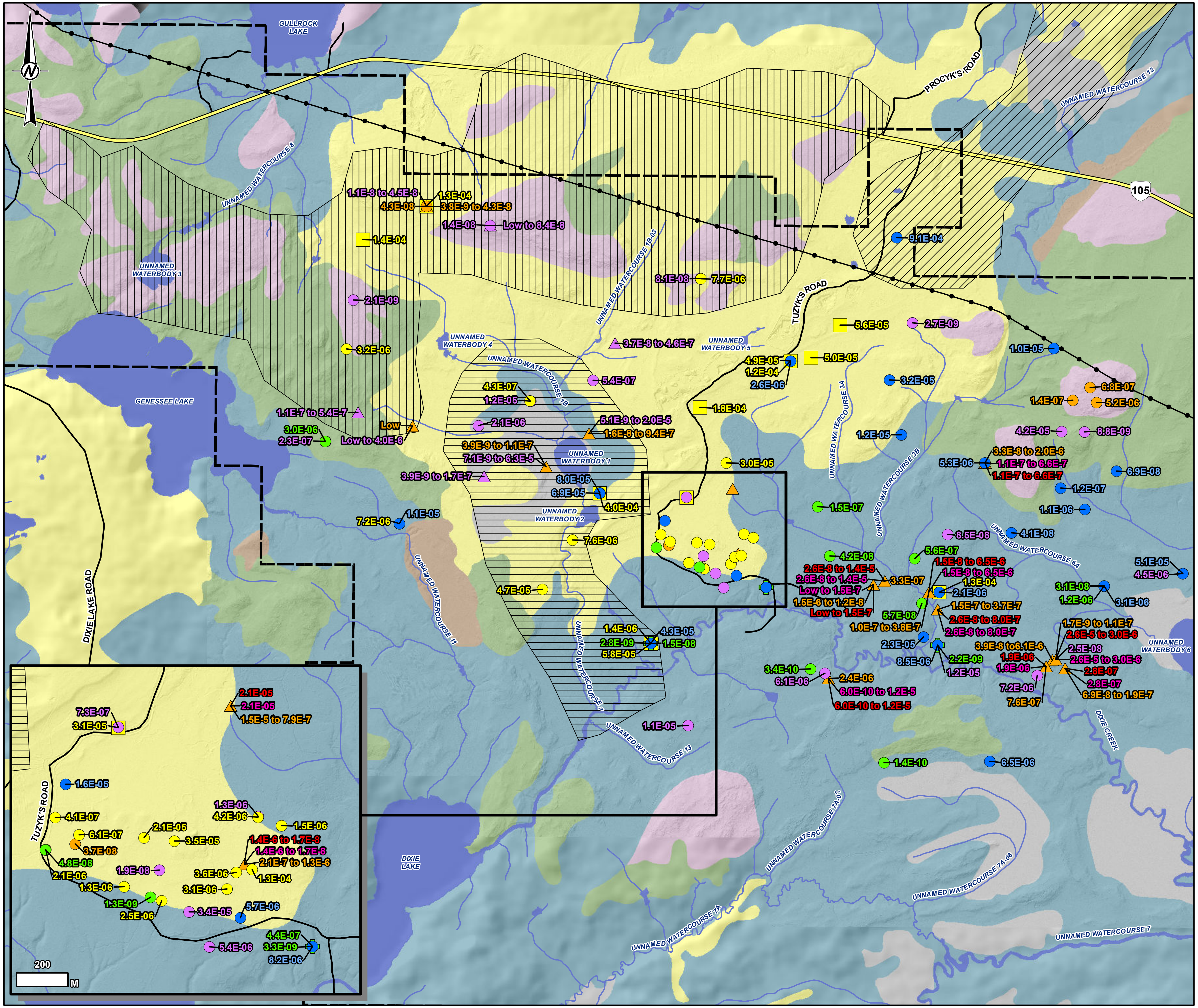

LEGEND

▭	PROPERTY BOUNDARY
▬	HIGHWAY
▬	LOCAL ROAD
●─●	EXISTING TRANSMISSION LINE
─	WATERCOURSE
■	WATERBODY

QUATERNARY GEOLOGY

■	ORGANIC DEPOSITS
■	GLACIOLACUSTRINE DEPOSITES (DEEP WATER DEPOSITS)
■	GLACIOLACUSTRINE DEPOSITES (SHORELINE AND SHALLOW WATER DEPOSITS)
■	OUTWASH DEPOSITS (SAND AND GRAVEL)
■	TILL
■	BEDROCK

SPECIFIC K ZONE SIMULATED IN THE MODEL

▨	HIGH K ZONE AROUND MW23-06
▤	BEDROCK VALLEY ZONE
▥	BEDROCK RIDGE ZONE

SITE HYDRAULIC CONDUCTIVITY MEASUREMENT LOCATIONS (LABELLED WITH HYDRAULIC CONDUCTIVITY (M/SEC))

TEST TYPE

✚	FLEXIWALL PERMEAMEATER
□	HAZEN FORMULA
△	PACKER TEST
○	SINGLE WELL RESPONSE TEST

STRATIGRAPHIC UNIT

●	GLACIAL TILL
●	GLACIOLACUSTRINE
●	SAND
●	SHALLOW BEDROCK (0 TO 20 M)
●	INTERMEDIATE BEDROCK (20 TO 80 M)
●	DEEP BEDROCK (80 TO 300 M)
●	DEEP BEDROCK (> 300 M)

0 0.5 1 2

1:36,500 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. QUATERNARY GEOLOGY BASE MAPPING IS EXTRACTED FROM QUATERNARY GEOLOGY OF RED LAKE-CONFEDERATION LAKE AREA; SHARPE, D R; RUSSELL, H A J. GEOLOGY SURVEYS OF CANADA, OPEN FILE 2876, 1996.
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
SPECIFIC K ZONE SIMULATED IN THE MODEL

CONSULTANT

wsp

YYYY-MM-DD	2025-02-19
DESIGNED	----
PREPARED	MD
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
CA0031271	0001	A	3-5

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4 PREDICTION OF GROUNDWATER RESPONSE TO PROPOSED MINING

4.1 NUMERICAL METHODS

Once calibrated, the pre-mining model (Model ID: GB_Base) described in Section 3 was modified and used to predict the effects of project development (open pits and underground mine workings excavation, operation of a TMF, MRS and LGO on local groundwater and/or surface water.

4.1.1 MODELLING APPROACH

To evaluate the key activities discussed in Section 1.2, which potentially impact local groundwater and/or surface water at different stages of mine development, six scenarios were developed to simulate mining activities at different stages under steady state conditions. Descriptions for each scenario are summarised in Table 4-1 and are discussed below:

- Scenario 1 simulated the AEX Program before the start of full scale mining at the site. In this phase, only the AEX workings were dewatered for the purpose of estimating groundwater inflow to the AEX workings only and zone of influence.
- Scenario 2 simulated the fully dewatered state of the ultimate open pits and underground mine workings. This doesn’t represent any real phase of the Project, and is only for the purpose of estimating the potential dewatering effects under the worst-case scenario.
- Scenario 3 corresponds to approximately 10 years after Viggo pit development is complete. Flotation concentrate (PAG) from the process plant will be stored in the mined out Viggo pit (the VMF) beginning in Year 9 and will accumulate to an estimated elevation of 285 masl in the east VMF. The west VMF is simulated with an assumed water surface elevation of 345 masl, representing an assumed maximum operating level. Concentrate tailings within the east VMF will be managed with a water cover during operations. All desulphurized tailings will be stored in the TMF and the TMF pond is operational at an elevation of approximately 385 masl. This scenario was developed to predict seepage from TMF, TMF pond, MRS and LGO to nearby surface water receivers as well as evaluating the effectiveness of proposed seepage mitigation options (ditches, pump stations and water management pond) in reducing long term seepage from the TMF to nearby surface water receivers during mine operations.
- Scenario 4 is similar to Scenario 3 with the only difference being the increased storage of concentrate tailings in the east VMF to an estimated elevation of 300 masl (west VMF unchanged), which represents 21 years after Viggo pit development is complete.
- Scenario 5 simulated the stage when the MWP was built. This scenario was used to estimate the seepage from the MWP.
- Scenarios 6a and 6b simulated the closure conditions when both the LP Central pit, VMF and underground mine workings are filled with water. The LGOs will be depleted before closure and is, as such, not included in this simulation. Water management pond dams will be breached. Pumping stations and tailings ditches will be deactivated. Seepage from TMF, MRS and VMF to nearby surface water receivers will be predicted as well as the overflow from the underground mine workings which are planned to be directed to the LP Central pit.

4.1.2 NUMERICAL REPRESENTATION OF MINING FEATURES

4.1.2.1 UNDERGROUND MINE WORKINGS

To simulate the fully dewatered conditions for underground mine workings (Scenarios 1 to 5), outflow-only 1st type boundary conditions were assigned to the centre lines of the proposed underground mine workings.

Under closure condition (Scenario 6), a constant head of 355 masl was applied to the centre lines of the underground mine workings for the sections that were below or equal to the 355 masl elevation, while for the portions that above the elevation 355 masl, outflow-only 1st type boundary conditions were applied. This would simulate the underground mine workings in fully re-filled conditions with water level at 355 masl. Overflow from underground mine workings at 355 masl are anticipated to be directed to the LP Central pit from the exhaust vent raise located northeast of the LP Central pit.

In all scenarios except Scenario 1, the head boundaries used to simulate Unnamed Watercourse 1 and 3, and Unnamed Waterbody 1 and 4 were removed, as these water features will be drained during the mine development.

4.1.2.2 OPEN PITS / VMF

To simulate the fully dewatered conditions for open pits (Scenarios 2 to 5 for LP Central pit and Scenario 2 for Viggo pit), outflow-only 1st type boundary conditions were applied to the open pit outer boundaries with inner pit cells deactivated.

To simulate the partially re-filled conditions for VMF, the hydraulic conductivity for tailings concentrate of 2.4×10^{-6} m/s[1] were assigned to the pit cells from the pit bottom to the estimated elevation for concentrate tailings (285 masl in Scenario 3 and 300 masl in Scenarios 4 and 5 for the east VMF). A constant head was assigned above the concentrate elevation to the top of concentrate (289 masl in Scenario 3 and 304 masl in Scenarios 4 and 5) for the east VMF. The pit cells above the concentrate tailings in the east VMF were deactivated. The west VMF was simulated as having a constant water surface elevation of 345 masl for Scenarios 3 to 5.

Under closure conditions (Scenario 6), a constant head of 353 masl was applied to the outer boundaries of the LP Central pit with cells have elevations higher than 353 masl, outflow-only 1st type boundary conditions were applied. This will simulate LP Central pit filled at level of 353 masl, which is a little bit higher than the nearby Dixie Creek level but lower than the water levels of the Unnamed Watercourse 6A for the portions that close to LP Central pit to the east. In this case, LP Central pit was expected to act as a discharge zone to capture potential seepage from stockpiles (MRS and LGO) as much as possible before them entering the Dixie Creek or the small tributaries. A high hydraulic conductivity of 0.1 m/s, which is several orders higher than the hydraulic conductivity of adjacent aquifers, was assigned to combined east and west VMF to simulate a post-mining filled pit lake with surface water level calculated by the model.

4.1.2.3 TAILINGS MANAGEMENT FACILITY

Tailings and dams were simulated from Layers 1 to 12 above ground surface (Layer 13) based on the ultimate configuration. Hydraulic properties for tailings and dams are summarized in Table 4-2. Recharge for tailings and dams were estimated using Hydrologic Evaluation of Landfill Performance model (HELPv4), developed by the U.S. EPA (EPA 1995a,b). A cross section though the numerical model from northeast to southeast through tailings and TMF pond is presented in Figure 4-1, which depicts how the tailings features were simulated in the model.

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[1] Estimate based on laboratory testing of trial tailings (email from Stephen McGarth of Minefill, dated 18/1/2024). More recent laboratory testing has indicated a lower K value.

A constant head of 385 masl was applied for the TMF pond which is higher than the anticipated normal operating water level of 384.5 masl (WSP, 2025d). A 2 m thick clay blanket was assumed below the TMF pond. Sheet piles, which are located downstream of the pond, were simulated as inactive cells extending to the top of the glacial till layers.

The MWP was only simulated in Scenario 5 with the same settings applied as the TMF pond. (i.e., a constant head boundary condition). This is highly conservative, given that the pond is only expected to hold water from a small watershed to the north of the pond, following an extraordinary storm or rain in snow event which presently has not permanent outlet (all the runoff in the watershed presently infiltrates into the ground, with whatever excess flow there is being absorbed into an existing gravel pit). Since the model is unconstrained to potential outflows from the MWP (due to the application of the constant head), it is expected that real conditions / seepages from the MWP will be substantially less due to the limited inflows.

Seepage face boundaries (i.e. outflow-only fluid transfer) were applied to the TMF seepage collection ditches, which can remove water from the system at a rate proportional to the difference between the groundwater head and a fixed pre-defined drain elevation.

Three seepage collection pumping wells or wet wells with proposed diameter of 6 feet were simulated with locations shown in Figure 1-2 (Pump 1, Pump 2, and Pump 3). Outflow-only 1st type boundary conditions were applied to the bottom of the pumping wells with well inner cells deactivated. Pump 1 that located downstream of the water management pond was simulated as extending halfway through the glacial till layers till an elevation of approximately 359 masl. Pump 2 and Pump 3, located along the northwest and southwest dams, are relatively shallow and were simulated to top of bedrock till elevations of approximately 392 masl and 391.5 masl, respectively.

4.1.2.4 STOCKPILES

The MRS and LGO were simulated as areas of enhanced recharge. The recharge rate on the footprint of stockpile was increased from 10 to 80 mm/yr (for pre-existing conditions) to 200 mm/yr, which represents 29% of the mean annual precipitation.

For the MRS, additional separate simulations were conducted to estimate the distribution of seepage pathways from the stockpile. These separate simulations included recent drilling and testing data from the area immediately north of the MRS. Additionally, the MRS stockpile was simulated with a 10 m thickness of mine rock (with an assigned isotropic K value of 10^{-4} m/s) within its footprint to allow for the accumulation of flows within the facility. The perimeter collection system surrounding the MRS was simulated as an outflow-only constant head applied at the toe / perimeter of the stockpile.

Under closure conditions (Scenario 6), the remaining part of tailings and mine rock stockpile are planned to be re-vegetated with placement of final cover on the surface top. Recharge rates were estimated with HELP model based on different soil profiles of the final covers. The recharge rate for PAG section of mine rock stockpiles which has a cover of 1 m uncompacted silt clay and 0.5 m compacted silt clay for the PAG section of the MRS was set at 76 mm/yr. The recharge rate for the NPAG section of the MRS which has a 0.5 m compacted silt clay was set at 33 mm/yr. The uncompacted clay silt clay layer over the PAG section of the stockpile results less runoff and higher water retention.

4.2 PREDICTION RESULTS

4.2.1 GROUNDWATER INFLOW RATES

According to the modified model under post-mine conditions, the simulated long-term groundwater inflow rate into open pits, underground mine workings and onsite seepage mitigation features are summarized in Table 4-3. These estimations of groundwater inflow do not consider uncertainty, seasonal variations or any loss from aquifer storage. Key findings are discussed as follows:

- For the AEX Program (Scenario 1), the simulated groundwater inflow rate into AEX workings is 405 $m^{3/}$d.
- Under the maximum estimated dewatering impacts (Scenario 2), the simulated groundwater inflow rates into underground mine workings (including AEX Program), LP Central pit and Viggo pit (combined east and west lobes) are 2485 m^3/d, 685 m^3/d, and 112 m^3/d respectively.
- During mine operations, groundwater inflow to underground mine workings and open pits don't vary significantly at different mining stages.
- Under closure conditions, an estimated overflow of 434 m^3/d from underground mine workings can be expected with a filled water level assumed at 355 masl. The simulated groundwater inflow rate into LP Central pit is 530 m^3/d with a filled water level assumed at 353 masl.
- Both TMF pond and MWP with water levels assumed at 385 masl are estimated to be responsible for a substantial proportion of seepage from the TMF area into the groundwater model (aquifer). The proposed Pump 1 that is located downstream of the TMF pond but upstream of the MWP (Scenario 5 only) is estimated to capture most of the seepage from the ponds.

4.2.2 ZONE OF INFLUENCE

The model-predicted Zone Of Influence (ZOI), defined here as 1-m drawdown of head in the glacial till/shallow bedrock unit, is shown in Figure 4-2 for Scenario 1 and Figure 4-3 for Scenario 2. With only the AEX workings dewatered, the ZOI is predicted to extend within 1.3 km from the centre of the AEX site to surrounding environs. For Scenario 2, the ZOI is predicted to extend about less than 1 km to 3 km from the centre of the mining area to surrounding environs. A few isolated areas of apparent groundwater drawdown observed further to the northwest of the Site are caused by the local pumps and tailings ditches. The ZOI estimated in Scenario 2 assumes long term, simultaneous full dewatering of both open pits and the underground, a condition that are not expected to happen during mine operations.

4.2.3 SEEPAGE ANALYSIS

To perform seepage analysis, particle tracking was used to estimate the potential impact of seepage water from the TMF, MWP, stockpiles and VMF.

4.2.3.1 TAILINGS MANAGEMENT FACILITY

Seepage analysis for TMF was performed for Scenario 3 (mining operational phase) and Scenario 6 (closure conditions). Simulated results are summarized in Table 4-4.

For the purpose of initial modelling the TMF, during mine operations, with a 150 mm/yr recharge boundary applied to the surface of the tailings, the total simulated seepage generated by the TMF is 1,290 m^3/d. The distribution of seepage from the TMF at this infiltration rate is presented in Table 4-4 as Scenario 6a. Subsequent to modelling, a revised cover design was provided that consisted of a 30 cm vegetive soil cover. Additional soil-water balance simulations were subsequently conducted in HELPv4 to assess changes of infiltration at the TMF during closure due to construction of the proposed cover. Simulation of this cover yielded an average annual infiltration rate of 74 mm/year. To estimate the rates of seepage from the TMF to receivers with the lower infiltration of 75 mm/year, the simulated seepage rates with 150 mm/year infiltration were simply halved. The estimated reduced infiltration rate, and corresponding seepage rates to receivers, are carried through to subsequent water quality analyses with estimated distribution of seepage provided in Table 4-4 as Scenario 6b. Of this, approximately 1,130 m^3/d is captured by the simulated seepage control structures, resulting in a capture efficiency of 87%. More than 70% of the total seepage is captured by Pump 1. The total amount of seepage bypass into the external environment, therefore, is about 160 m^3/d. Most of the seepage bypassing the seepage collection system reports to Dixie Creek and its tributaries. Small quantities of seepage also report to Unnamed Watercourses 8 and 11.

Following final closure, with no TMF seepage control structures simulated in the model, more than 78% is captured by Dixie Creek and its tributaries of Unnamed Watercourse 1, 2 and 4. At this time the water quality of the seepage is anticipated to have improved.

4.2.3.2 TMF POND AND MINE WATER POND

Seepage analysis from TMF pond and MWP were performed for operations phases with results presented in Table 4-5 and Table 4-6.

Before the construction of the MWP downstream of the TMF pond, with a constant head boundary of 385 masl applied to the TMF pond (Scenario 3), the total simulated seepage generated by TMF pond is 2,470 m^3/d. Of this, approximately 2,070 m^3/d is captured by Pump 1, which is 61.2% of the total seepage. About 150 m^3/d (4.4%) eventually reports to underground mine workings and open pits. The amount of seepage into the natural receivers is approximately 250 m^3/d (7.4%), which mainly discharges to Dixie Creek and tributaries (Unnamed Watercourse 1, 2 and 4).

With the MWP simulated downstream of TMF pond (Scenario 5), the total simulated seepage generated by TMF pond is reduced to 1,245 m^3/d. Of this, approximately 1,125 m^3/d is captured by Pump 1, which is 90.4% of the total seepage. About 30 m^3/d (2.4%) reports to underground mine workings and open pits. The amount of seepage into the natural receivers are approximately 90 m^3/d (7.2%), which mainly discharges to Dixie Creek and tributaries (Unnamed Watercourse 1, 2 and 4). The total simulated seepage generated by MWP with a constant head boundary of 385 masl applied is 3,380 m^3/d.

The MWP is intended to hold runoff from a small watershed located to the north following an extraordinary storm or snow on rain event, and as such, is not expected to have water within it except on rare occasions. In the groundwater model, the MWP was simulated as containing several metres of water with a constant elevation of 385 masl under all conditions, meaning the pond is simulated as being able to provide an infinite amount of water when there will be not enough water in the pond to provide the simulated seepage. Given the intended operation of the pond, this simulation is highly conservative and provides an unrealistically high seepage loss from the MWP. If the pond is only assumed to contain water at 385 masl for less than ten percent of its operational life, the average seepage rate from the MWP for its operational life could be estimated to be 90% less than provided in Table 4-6.

As simulated, the MWP also affects the seepage rates and seepage capture rates from the pump stations located along the TMF pond dam. When the MWP does not contain water, the seepage rates from the TMF Pond are expected to be better represented by Scenario 3, with no seepage occurring from the MWP.

4.2.3.3 STOCKPILES

Seepage analysis for stockpiles was performed for the MRS and LGO during mining operational phase (Scenario 3) and for the MRS only under closure conditions (Scenario 6), as LGO will be depleted before closure (Table 4-7). Note that separate / specific simulations were conducted for the assessment of MRS seepage distributions (Section 4.1.2).

During mine operations, with a 200 mm/yr recharge boundary applied to the stockpiles, the total simulated seepages generated by the MRS and LGO are 890 m^3/d and 130 m^3/d, respectively. Seepage from the MRS discharges to the perimeter collection system and LP Central pit during operations, Flows accumulate at the base of the MRS and flow parallel to / along the pre-existing Unnamed Watercourse 3 sub-catchment, generally corresponding to a southward flow direction.

Under closure conditions, with a 76/33 mm/yr recharge boundary applied to PAG / NPAG, the total simulated seepage generated by the MRS is 315 m^3/d. Similar to operating conditions, seepage from the MRS is directed to the nearby LP Central pit (which is now re-filled in this scenario) and to the surrounding perimeter collection system.

4.2.3.4 VMF

Seepage analysis for VMF was performed under closure conditions (Scenario 6) when the pit is fully filled with water (above the deposited tailings; Table 4-8). The total simulated seepage generated by the VMF is 173 m^3/d. Of this, approximately 21 m^3/d reports to Unnamed Waterbody 6 and Unnamed Watercourse 6 while the remainder reports to Dixie Creek.

4.2.4 TMF SEEPAGE PREDICTIONS AND CONTINGENCY OPTIONS FOR ADDITIONAL TMF SEEPAGE REDUCTIONS

The numerical model has used some conservative assumptions with regards to the TMF and predicts that there will be some fugitive seepage from the TMF that bypasses the three pumping stations that would be placed prior to the deposition of tailings (Table 4-4). Some of this seepage is a result of uncertainty in the characterization in downgradient areas, pro-rating of the infiltration estimates in response to cover design changes, and the use of conservative parameters, particularly for the tailings which have been modelled with a much higher hydraulic conductivity than is likely reasonable (Table 4-2). These factors are the subject of ongoing investigations. Depending on the results of further investigations, some refinement of the numerical model may be expected. While it is anticipated that further resolution of these uncertainties will largely result in a reduction of seepage, there are options for contingencies measures should additional mitigation be required. Such contingency measures are expected to include the addition of additional pumping stations, seepage collection wells, or improvements to the cover designs, which can be determined in detail after operation of the facilities has begun as part of an adaptive management measures. To assist in the planning of treatment of this additionally captured seepage, an initial estimate of a capture of 70% of the fugitive seepage from the TMF and TMF pond during the operational phase of the mine is considered reasonable.

4.3 CHANGES IN GROUNDWATER – SURFACE WATER INTERACTION

Changes in the interaction between groundwater and surface water were assessed in the model by analyzing computed flow budgets at surface water features (i.e., boundary conditions) in the model. The computed flow budgets from the pre-mining calibration model (GB_Base) were compared to the mining phase models (six prediction scenarios) to estimate the effects of the mining activities on the groundwater budget for each feature.

The results of the flow budget analysis are summarized in Table 4-9 with key findings discussed below:

- All waterbodies are predicted with a positive water balance (i.e., net inflow from groundwater system to lakes) and located outside the drawdown cone of mine dewatering. Changes of net groundwater fluxes into lakes are less than 2% and are considered as marginal except for Unnamed Waterbody 6, where groundwater contributions are predicted to decline by a maximum of 15% (49 m^3/d). This is mainly due to a portion of the lake watershed (i.e., Unnamed Watercourse 6A) being within the drawdown cone of mine dewatering. The net groundwater flux into Unnamed Watercourse 6A is predicted to decline by 108% during mine dewatering. Groundwater discharge conditions at Unnamed Waterbody 6 and Unnamed Watercourse 6A are predicted to generally recover once final closure conditions are reached.
- The net groundwater flux into Dixie Creek excluding tributaries is predicted to decline as a result of mine dewatering. When the baseflow reduction for the Dixie Creek at HF-01 is compared to the estimated 7Q20 (18,144 m^3/d.) and the average annual flow (216,864 m^3/d) for the Dixie Creek, the predicted flow reductions are less than 7.7% and 0.6%, respectively, which is unlikely to change the nature of the flow regime in the creeks. Groundwater discharge conditions at Dixie Creek are predicted to recover once final closure conditions are reached.
- Unnamed Watercourse 5 and Unnamed Watercourse 7A-07 are predicted with a negative water balance (i.e., net outflow from tributaries to groundwater system) under pre-mining conditions, which match the 2023 flow observations at the related monitoring locations (stations 20 and 21). Both tributaries are located south of the pit and are within the drawdown cone of mine dewatering.

- Unnamed Watercourse 7A-8&9, which is located on the south margin of the drawdown cone, is predicted with a positive water balance. The water balance status is predicted to change from positive to negative during mine dewatering but is predicted to recover once final closure conditions are reached.
- Unnamed Watercourse 4, which is located on the margin of the drawdown cone, is predicted to have up to approximately a 74% reduction in simulated baseflow contribution when compared to the pre-mining conditions. However, given that the 2023 low-flow measurement at station 17 that intersects along Unnamed Watercourse 4 is only about 18 m^3/d, groundwater-surface interactions at this tributary maybe significantly less than simulated in the current model, which would suggest that groundwater is a smaller component of overall flow within this tributary than assessed in this model. Groundwater discharge conditions at Unnamed Watercourse 4 are predicted to recover once final closure conditions are reached.
- Apart from those discussed above, other creeks or tributaries are located outside the predicted drawdown cone with maximum net groundwater flux reductions of less than 13%.
- Under closure conditions (Scenario 6), net groundwater flux increases are predicted for multiple lakes and creeks. These increases are due to the rise in the local groundwater table caused by the TMF and MRS acting as sources of recharge.

4.4 SENSITIVITY ANALYSIS

Sensitivity analyses were conducted for the variants listed in Table 4-10 with the most representative mining operation phase of Scenario 3 as a Base Case. The sensitivity of groundwater inflow rates to the applied recharge and hydraulic conductivities of the hydrostratigraphic units as well as tailings recharge were analyzed with results shown in Table 4-11. The following observations can be made with respect to the sensitivity analyses:

- **Sensitivity Run 1a:** Recharge was increased by 30% for the entire model with the exception of TMF, dams and stockpiles. As expected, an increase in recharge to the model resulted in a general increase in all groundwater fluxes. However, the UGM inflow is predicted to only increase marginally by 3%.
- **Sensitivity Run 1b:** Recharge was decreased by 30% for the entire model with the exception of TMF, dams and stockpiles. As expected, a decrease in recharge to the model resulted in a general decrease in all groundwater fluxes and generally lower water levels. However, the UGM inflow is predicted to only decrease marginally by 4% and there is no notable change in VMF inflow.
- **Sensitivity Run 2a:** The K value of Glacial Till unit was increased by a factor of 3 with anisotropy ratio unchanged. Inflow to UGM and open pits are all predicted to increase due to higher fluxes through shallow Glacial Till. Unnamed Watercourse 6A, which is located adjacent to the pit wall and within the dewatering drawdown cone, is predicted to have a net gain increased by from -8 to 103 m^3/day compared to the base case. While Unnamed Watercourse 6B and 6C are predicted to have a net gain decreased by 221 m^3/day and 121 m^3/day, respectively. It is interpreted that the presence of underlying glaciolacustrine deposits at Unnamed Watercourse 6A restricts the simulation of groundwater leakage out of the base of creek while Unnamed Watercourse 6B and 6C, which are partially underlain by glacial till, are expected to be dewatered with more leakage from the creeks through glacial till.
- **Sensitivity Run 3a:** The K value of shallow bedrock was increased by a factor of 5 with the anisotropy ratio unchanged. The inflows to the pits are predicted to increase substantially (by 100% for LP Central pit and 294% for the VMF east section) compared to the base case. This is because the majority of the groundwater inflow to the pits is through the shallow bedrock with higher hydraulic conductivity. The inflow to UGM is predicted to increase by 24%.

  The net groundwater flux to Dixie Creek is predicted to decrease by 30%, presumably because of higher seepage via shallow bedrock towards open pits. Several other creeks, which are located within or at the margin of the drawdown cone, are predicted to have reductions on net groundwater inflows to Unnamed Watercourse 6A, 6B, and 6C, and increases on net leakage from Unnamed Watercourse 5, 7A-07, and 7A-8&9 due to increased seepage to open pits via shallow bedrock.

- **Sensitivity Run 3b:** The K value of shallow bedrock was decreased by a factor of 5 with the anisotropy ratio unchanged. As expected, a decrease in K of the shallow bedrock has the opposite effect on groundwater fluxes as calculated for Sensitivity Run 3a. It is predicted that the inflows to LP Central pit and VMF east will be reduced by 35% and 48% respectively. The inflow to UGM is predicted to decrease by 11%.
- **Sensitivity Run 4a:** The K value of intermediate bedrock was increased by an order with anisotropy ratio unchanged. Inflows to VMF east and UGM are predicted to increase by 307% and 55%, respectively. However, inflow to LP Central pit is predicted to decrease marginally by 1%.

  The net groundwater flux to Dixie Creek is predicted to decrease by 81%, presumably because of higher seepage via shallow and intermediate bedrock towards open pits and UGM. The creeks which are located within or at the margin of the drawdown cone are predicted to have a net groundwater flux change between 16% and 400%. Changes of net groundwater flux to and from other waterbodies or creeks are small.
- **Sensitivity Run 5a:** The K values of both intermediate bedrock and deep bedrock (80 ~300 m) were increased by an order of magnitude, with the anisotropy ratio unchanged. Inflows to the UGM are simulated to increase substantially, by 118%. Inflow to LP Central pit is simulated to decrease by 60%, which is caused by higher leakage from the shallow bedrock where the pit is mainly situated.

  The net groundwater flux to Dixie Creek is predicted to change from net gain to net loss with net flow reduced by 142%. This reduction in groundwater discharge to Dixie Creek is inferred to be caused by significantly higher leakage from the creek to UGM. The creeks which are located within or at the margin of the drawdown cone are predicted to have a net groundwater flux change between 24% to 750%. Changes of net groundwater flux to and from other waterbodies or creeks are insignificant.
- **Sensitivity Run 6a:** The tailings recharge was increased by 50% from 150 mm/yr to 225 mm/yr. a recharge rate of 225 mm/yr would be equivalent to approximately 33% of the mean annual precipitation for the area. The total seepage from TMF is predicted to increase by 50%, from 1290 m^3/d to 1,935 m^3/d. There is no predicted change to the net groundwater inflows to the UGM or open pits for this variant.

  The net groundwater flux to waterbodies and creeks are predicted with no change to increase by less than 10%.

In summary, the inflows to UGM are most sensitive to the increase of K values of both intermediate and deep bedrock. The inflow to the LP Central pit is most sensitive to the increase of the K value of shallow bedrock, while the inflow to the VMF is most sensitive to the increase of K value of intermediate and deep bedrock. Inflow to Dixie Creek is most sensitive to the increase of K values of both intermediate and deep bedrock. The most sensitive parameters for the net groundwater fluxes to and from lakes and creeks can be quite variable, but typically they are more sensitive to the change of recharge and K values of glacial till and shallow bedrock but less sensitive to the change of K values of intermediate and deep bedrock. An increase of tailings recharge will increase the total seepage from the TMF.

Table 4-1: Summary of Prediction Scenarios

Scenario ID	Mining Phase	Underground Mine Workings		Open Pit			Tailings [1]	Stockpiles	MWP	TMF pond
		AEX Workings [2]	UGM	LP Central pit	Viggo pit / West VMF	Viggo pit / East VMF				
1	Advanced Exploration Program	Dewatered	N/A [2]	N/A [2]	N/A [2]	N/A [2]	N/A	N/A [3]	N/A [3]	N/A [3]
2	Maximum Dewatering Impacts Estimation (not a real phase)	Dewatered	Dewatered	Dewatered	Dewatered	Dewatered	Yes	N/A [3]	N/A [3]	Yes
3	Operational Phase (10 years after Viggo pit finished)	Dewatered	Dewatered	Dewatered	Filled at 289 m asl	Filled at 345 masl	Yes	MRS and LGO	N/A [3]	Yes
4	Operational Phase (21 years after Viggo pit finished)	Dewatered	Dewatered	Dewatered	Filled at 304 masl	Filled at 345 masl	Yes	MRS and LGO	N/A [3]	Yes
5	Operational Phase (with MWP constructed)	Dewatered	Dewatered	Dewatered	Filled at 304 masl	Filled at 345 masl	Yes	MRS and LGO	Yes	Yes
6	Closure Condition [4]	Filled at 355 masl		Filled at 353 masl	Filled	Filled	Yes	MRS	N/A [3]	N/A [3]

Notes:

[1] TMF simulated at final configuration.

[2] AEX workings are considered as part of Underground Mine workings (UGM).

[3] N/A means that this site feature was not simulated in this scenario.

[4] Under closure conditions, MWP and TMF pond will be removed, pump stations and tailings ditches will be disabled.

Table 4-2: Hydraulic Parameters for Site Features

Site Feature	K_H (m/s)	K_H/K_V	Recharge During Operations (mm/yr)	Recharge following closure (mm/yr)
Tailings	2.4×10^{-6}	10	150	150[1]
Tailings Dam (Core)	2.4×10^{-6}	1	50	50
Tailings Dam (Rockfill)	5.0×10^{-5}	3.5	100	100
Water Pond Dam (Rockfill)	5.0×10^{-5}	3.5	100	n/a
Stockpiles (MRS and LGO)	1.0×10^{-3}	10	200	76 for PAG MRS 33 for NPAG MRS

Notes:

[1] The numerical model was run with a post closure infiltration of 150 mm/year, however, the anticipated infiltration following establishment of the post closure cover is 75 mm/year, as discussed in section 4.2.3.1.

Table 4-3: Summary of Groundwater Inflow Rate [1]

Scenario ID	Groundwater Inflow (m^3/d)									Water Outflow [3] (m^3/d)		Total Water Inflow [4] (m^3/d)
	AEX	**UGM [2]**	**Central Pit**	**VMF - West**	**VMF – East**	**Pump 2**	**Pump 3**	**Tailings Ditches**	**TMF pond**	**TMF pond**	**MWP**	**Pump 1**
1	405	-	-	-	-	-	-	-	-	-	-	-
2	-	2485	685	45	67	125	30	15	175	-2470	-	3145
3	-	2485	680	-5	82	125	30	15	175	-2470	-	3145
4	-	2490	685	-12	69	125	30	15	175	-2470	-	3145
5	-	2565	660	-11	72	125	30	15	385	-1245[5]	-3380[5]	3645
6	-	435	530	-135[6]		-	-	-	-	-	-	-

Notes:

[1] Seepage rates are rounded up to 5 m^3/d.

[2] AEX workings are included as part of UGM.

[3] Water outflow means seepage from the ponds into the model (aquifer).

[4] Total Water inflow into Pump 1 includes seepage from TMF pond (TMF pond and MWP in Scenario 5), TMF and surrounding environs.

[5] In practice, the MWP will be largely empty throughout the mine life and the operational water level of the MWP will be lower than the assumed model value. As such, the resulting simulated outflow represents an upper bound value. Average conditions are likely to generate substantially less outflow (as the pond water level will be lower) and is assumed to be approximately one tenth of the simulated flow for this case. Decreasing the water outflow from the MWP by this level will also result in seepage from the TMF Pond, at rates approaching those provided for Scenarios 2 to 4, where no MWP is present.

[6] East VMF and west VMF at closure the lobes are filled and hydraulically connected (Scenario 6)

Table 4-4: Seepage Analysis Results of TMF

Features		Scenario 3		Scenario 6a[1]		Scenario 6b	
	Seepage in	Seepage out	%	Seepage out	%	Seepage out	%
	m^3/d			m^3/d		m^3/d	
Tailings	**-1,290**	-		-	-	-	-
Ditches		10	0.8	-	-	-	-
Pump Station 1		920	71.4	-	-	-	-
Pump Station 2		90	7.0	-	-	-	-
Pump Station 3		10	0.8	-	-	-	-
TMF pond		100	7.8	-	-	-	-
Underground mine work		10	0.8	-	-	-	-
Dixie Creek		40[2]	3.1	1015	78.7	508	78.7
Dixie Lake		5	0.4	65	5.0	33	5.0
Unnamed Watercourse 11		45	3.5	55	4.3	28	4.3
Unnamed Watercourse 8		60	4.7	150	11.6	75	11.6
Gullrock Lake		10	0.8	5	0.4	<3	0.4

Notes:

[1] The Scenario 6a seepage numbers were developed using a TMF infiltration rate of 150 mm/year; however, subsequent to modelling, the cover design was updated, resulting in an infiltration rate of 75 mm/year. As a result, these seepage numbers being approximately twice the expected values. Scenario 6b provides the estimated seepage values for the TMF with the improved cover.

[2] Presuming the implementation of additional seepage control measures described in Section 4.2.4, the amount of seepage captured from the TMF increases to 948 m3/d, with a corresponding decrease in fugitive seepage to Dixie Creek of 28 m3/d to 12 m3/d (i.e., a 70 % reduction of fugitive seepage), for example.

Table 4-5: Seepage Analysis Results of TMF Pond

Features	Scenario 3			Scenario 5		
	Seepage in	**Seepage out**	%	**Seepage in**	**Seepage out**	%
	m^3/d	**m^3/d**		**m^3/d**	**m^3/d**	
TMF pond	-2470	-	-	-1245	-	-
Pump 1		2070[1]	61.2		1125	90.4
Underground Mine Workings and Open Pits		150	4.4		30	2.4
Natural Seepage Receivers (Dixie Creek, Unnamed Watercourse 1, 2, 4)		250[1]	7.4		90	7.2

Notes:

[1] Presuming the implementation of additional seepage control measures described in Section 4.2.4, the amount of seepage captured from the TMF pond increased to 2,245 m^3/d, with a corresponding decrease in fugitive seepage natural receivers of 175 m^3/d to 75 m^3/d (i.e., a 70% reduction).

Table 4-6: Seepage Analysis Results of MWP

Features	Scenario 5[1]		
	Seepage in	Seepage out	%
	m^3/d	m^3/d	
MWP	-3380	-	-
Pump 1		1410	41.7
Underground Mine Workings and Open Pits		1000	29.6
Natural Seepage Receivers (Dixie Creek, Unnamed Watercourse 1, 2, 4)		970	28.7

Notes:

1 Given the MWP is anticipated to be empty throughout most of its life, this simulated seepage rates are highly conservative. Assuming the pond has water in it less than 10% of time, the average seepage rate from the MWP over its life could be 90% than listed in this table.

Table 4-7: Seepage Analysis Results of MRS

Features	Scenario 3			Scenario 6		
	Seepage in	Seepage out	%	Seepage in	Seepage out	%
	m^3/d	m^3/d		m^3/d	m^3/d	
MRS	-890	-	-	-315	-	-
Open Pits and UGM(1)	-	890	100	-	315	100

Notes:

(1 Includes component that discharges directly to collection ditch system which is directed to the VMF during operations and the central open pit lake after closure.

Table 4-8: Seepage Analysis Results of VMF

Features	Scenario 6		
	Seepage in	Seepage out	%
	m^3/d	m^3/d	
VMF	-173	-	-
Unnamed Waterbody 6 and Unnamed Watercourse 6A	–	21	12
Dixie Creek		152	88

Table 4-9: Predicted Net Groundwater Flux

Description	Simulated Groundwater Flux [1] [2] (m^3/d)							% Change from Pre-mining (Base) Conditions					
	Base	S1	S2	S3	S4	S5	S6	S1	S2	S3	S4	S5	S6
Dixie Creek (excluding tributaries)	2487	2266	1094	1103	1105	1238	2438	-9	-56	-56	-56	-50	-2
Gullrock Lake	1420	1420	1420	1420	1420	1420	1430	0	0	0	0	0	1
Stone Lake	280	280	280	280	280	280	280	0	0	0	0	0	0
Two island Lake	1910	1910	1900	1900	1900	1900	1920	0	-1	-1	-1	-1	1
Genesse Lake	735	735	740	740	740	740	750	0	1	1	1	1	2
Dixie Lake	495	495	490	490	490	490	495	0	-1	-1	-1	-1	0
Hiewall Lake	245	245	245	245	245	245	245	0	0	0	0	0	0
Unnamed Waterbody 6	332	331	283	283	283	283	334	0	-15	-15	-15	-15	1
Unnamed Watercourse 2	325	325	300	300	305	345	345	0	-8	-8	-6	6	6
Unnamed Watercourse 4	115	95	30	30	30	130	140	-17	-74	-74	-74	13	22
Unnamed Watercourse 5	-5	-10	-80	-80	-80	-75	-5	-100	-1500	-1500	-1500	-1400	0
Unnamed Watercourse 6A	236	227	-18	-8	-7	-6	201	-4	-108	-103	-103	-103	-15
Unnamed Watercourse 6B	412	410	336	335	352	336	408	0	-18	-19	-15	-18	-1
Unnamed Watercourse 6C	160	160	152	152	167	152	160	0	-5	-5	4	-5	0
Unnamed Watercourse 7	40	40	35	35	35	35	45	0	-13	-13	-13	-13	13
Unnamed Watercourse 7A	580	580	565	565	565	565	580	0	-3	-3	-3	-3	0
Unnamed Watercourse 7A-07	-55	-60	-90	-90	-90	-90	-55	-9	-64	-64	-64	-64	0
Unnamed Watercourse 7A-8&9	60	55	-10	-10	-10	-10	60	-8	-117	-117	-117	-117	0
Unnamed Watercourse 8	220	220	220	220	220	220	220	0	0	0	0	0	0
Unnamed Watercourse 8B	420	420	435	435	435	435	500	0	4	4	4	4	19
Unnamed Watercourse 10	615	615	615	615	615	615	625	0	0	0	0	0	2
Unnamed Watercourse 11	665	660	595	595	595	615	635	-1	-11	-11	-11	-8	-5
Unnamed Watercourse 12	595	590	789	789	789	800	715	-1	33	33	33	34	20
Unnamed Watercourse 13	310	305	275	275	275	310	330	-2	-11	-11	-11	0	6

Notes:

[1] Groundwater flux rates are rounded up to 5 m^3/d.

[2] Positive flow numbers represent positive water balance (i.e.net inflow from groundwater system to surface water features) while negative flow numbers represent negative water balance (i.e.net inflow from surface water features to groundwater system)

Table 4-10: List of Sensitivity Runs

Sensitivity Run	ID	Description
Recharge	1a	Recharge increased by 30%
	1b	Recharge decreased by 30%
Glacial Till	2a	Glacial Till K increased by a factor of 3
Shallow Bedrock	3a	Shallow bedrock (< 20 m) K increased by a factor of 5
	3b	Shallow bedrock (< 20 m) K decreased by a factor of 5
Intermediate Bedrock	4a	Intermediate bedrock (20 m to 80 m) K increased by an order
Intermediate Bedrock and Deep Bedrock	5a	Both Intermediate bedrock (20 m to 80 m) and Deep bedrock K (80 m to 300 m) increased by an order
Tailings Recharge	6a	Tailings recharge increased by 50%

Table 4-11: Comparison Between Base Case and Sensitivity Runs for the LP Central pit, VMF, and UGM Inflows

Simulation ID	Net Groundwater Flux [1] (m^3/d)					% Change from Base Case (Scenario 3)				
		UGM[2]	LP Central pit	VMF West	VMF East	AEX	UGM	LP Central pit	VMF West	VMF East
Base Case (Scenario 3)		**2485**	**680**	-5	82	-	-	-	-	-
SA-1a		2565	730	-5	81	8	3	7	0	-1
SA-1b		2395	575	-7	76	-15	-4	-15	40	-7
SA-2a		2765	940	-15	134	0	11	38	200	63
SA-3a		3090	1360	-35	241	35	24	100	600	194
SA-3b		2220	440	-31	43	-38	-11	-35	520	-48
SA-4a		3845	670	-411	334	27	55	-1	8120	307
SA-5a		5405	270	-521	196	185	118	-60	10320	139
SA-6a		2490	680	-6	77	0	0	0	20	-6

Note:

[1] Groundwater flux rates are rounded up to 5 m^3/d.

Table 4-12: Comparison Between Base Case and Sensitivity Runs for the Changes In the Interaction Between Groundwater and Surface Water

Description [3]	**Simulated Net Groundwater Flux [1] [2] (m³/d)**									**% Change from Base Case (Scenario 3)**							
	(Base) S3	1a	1b	2a	3a	3b	4a	5a	6a	1a	1b	2a	3a	3b	4a	5a	6a
Dixie Creek (excluding tributaries)	**1103**	1245	993	1051	769	1252	201	-471	1105	13	-10	-5	-30	14	-82	-143	0
Gullrock Lake	**1420**	1700	1125	1855	1975	1290	1525	1560	1420	20	-21	31	39	-9	7	10	0
Stone Lake	**280**	315	245	455	365	260	295	300	280	13	-13	63	30	-7	5	7	0
Two Island Lake	**1900**	2150	1715	2080	2395	1805	1985	1995	1930	13	-10	9	26	-5	4	5	2
Genesse Lake	**740**	960	515	725	735	730	740	740	745	30	-30	-2	-1	-1	0	0	1
Dixie Lake	**490**	560	415	830	700	435	530	540	490	14	-15	69	43	-11	8	10	0
Hiewall Lake	**245**	270	215	425	395	205	270	275	245	10	-12	73	61	-16	10	12	0
Unnamed Waterbody 6	**283**	353	231	470	404	223	302	303	283	25	-18	66	43	-21	7	7	0
UW 2	**300**	315	290	280	290	310	295	290	305	5	-3	-7	-3	3	-2	-3	2
UW 4	**30**	55	5	-25	25	30	-15	-40	30	83	-83	-183	-17	0	-150	-233	0
UW 5	**-80**	-65	-95	-145	-195	-40	-150	-210	-80	19	19	81	144	-50	88	163	0
UW 6A	**-8**	22	-31	103	-36	-4	-122	-292	-8	-375	288	-1388	350	-50	1425	3550	0
UW 6B	**335**	539	187	114	108	507	291	255	336	61	-44	-66	-68	51	-13	-24	0
UW 6C	**152**	242	84	31	96	205	156	157	152	59	-45	-80	-37	35	3	3	0
UW 7	**35**	45	25	35	35	35	35	35	35	29	-29	0	0	0	0	0	0
UW 7A	**565**	625	505	910	765	510	590	595	565	11	-11	61	35	-10	4	5	0
UW 7A-07	**-90**	-65	-115	-235	-250	-55	-130	-155	-90	28	28	161	178	-39	44	72	0
UW 7A-8&9	**-10**	40	-60	-85	-85	15	-50	-85	-10	500	500	750	750	-250	400	750	0
UW 8	**220**	280	160	195	287	200	225	230	220	27	-27	-11	30	-9	2	5	0
UW 8B	**435**	540	330	410	365	455	420	415	475	24	-24	-6	-16	5	-3	-5	9
UW 10	**615**	800	425	565	510	645	590	585	615	30	-31	-8	-17	5	-4	-5	0
UW 11	**595**	705	490	860	895	520	640	650	610	18	-18	45	50	-13	8	9	3
UW 12	**789**	1105	390	650	515	900	750	680	790	40	-51	-18	-35	14	-5	-14	0

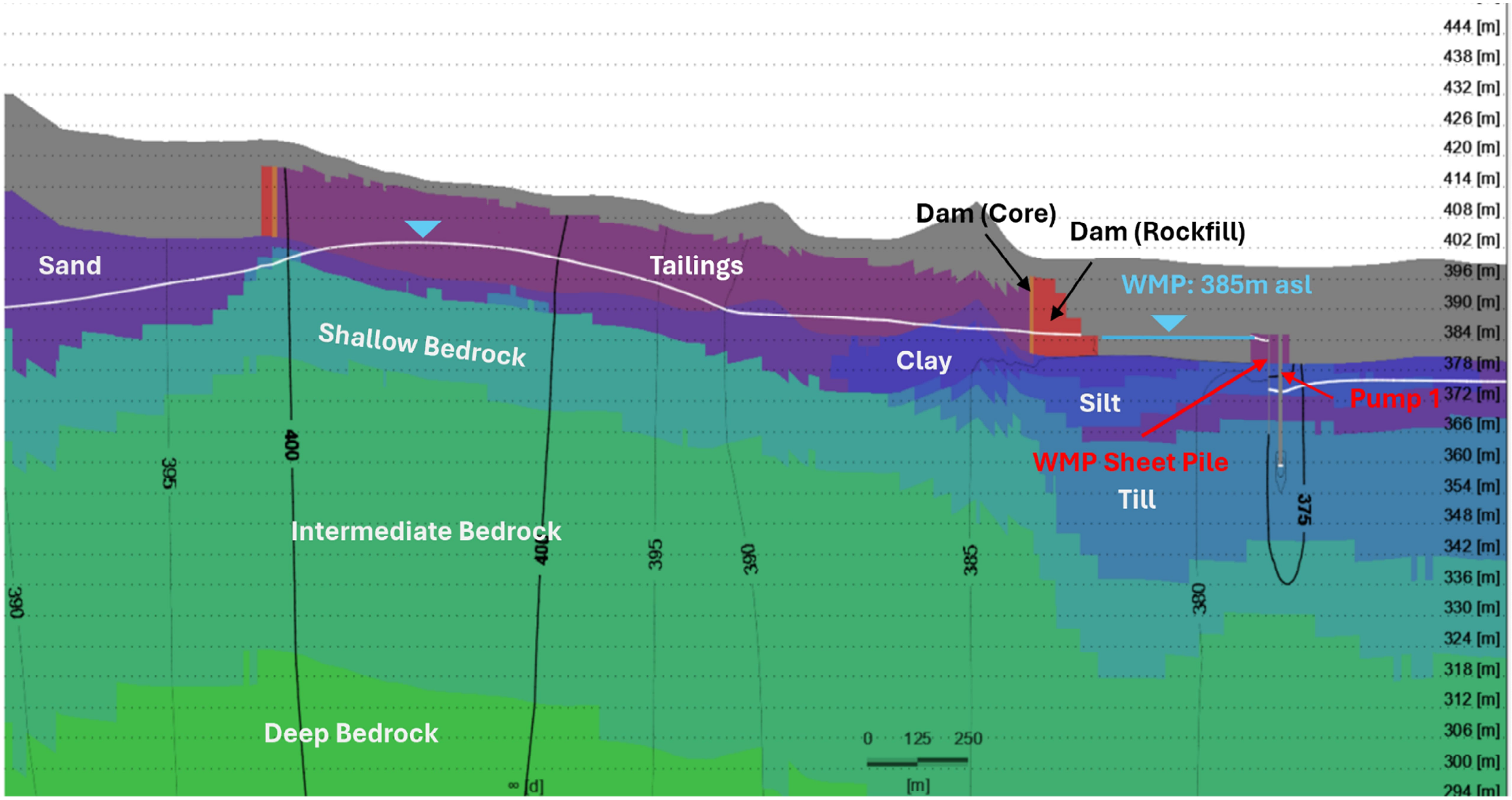
Description [3]	**Simulated Net Groundwater Flux [1] [2] (m^3/d)**									**% Change from Base Case (Scenario 3)**							
	(Base) S3	1a	1b	2a	3a	3b	4a	5a	6a	1a	1b	2a	3a	3b	4a	5a	6a
UW 13	**275**	305	240	210	185	295	245	235	275	11	-13	-24	-33	7	-11	-15	0

Notes:

[1] Groundwater flux rates are rounded up to 5 m^3/d.

[2] positive flow numbers represent positive water balance (i.e.net inflow from groundwater system to surface water features) while negative flow numbers represent negative water balance (i.e.net inflow from surface water features to groundwater system).

[3] UW is short for Unnamed Watercourse



Notes

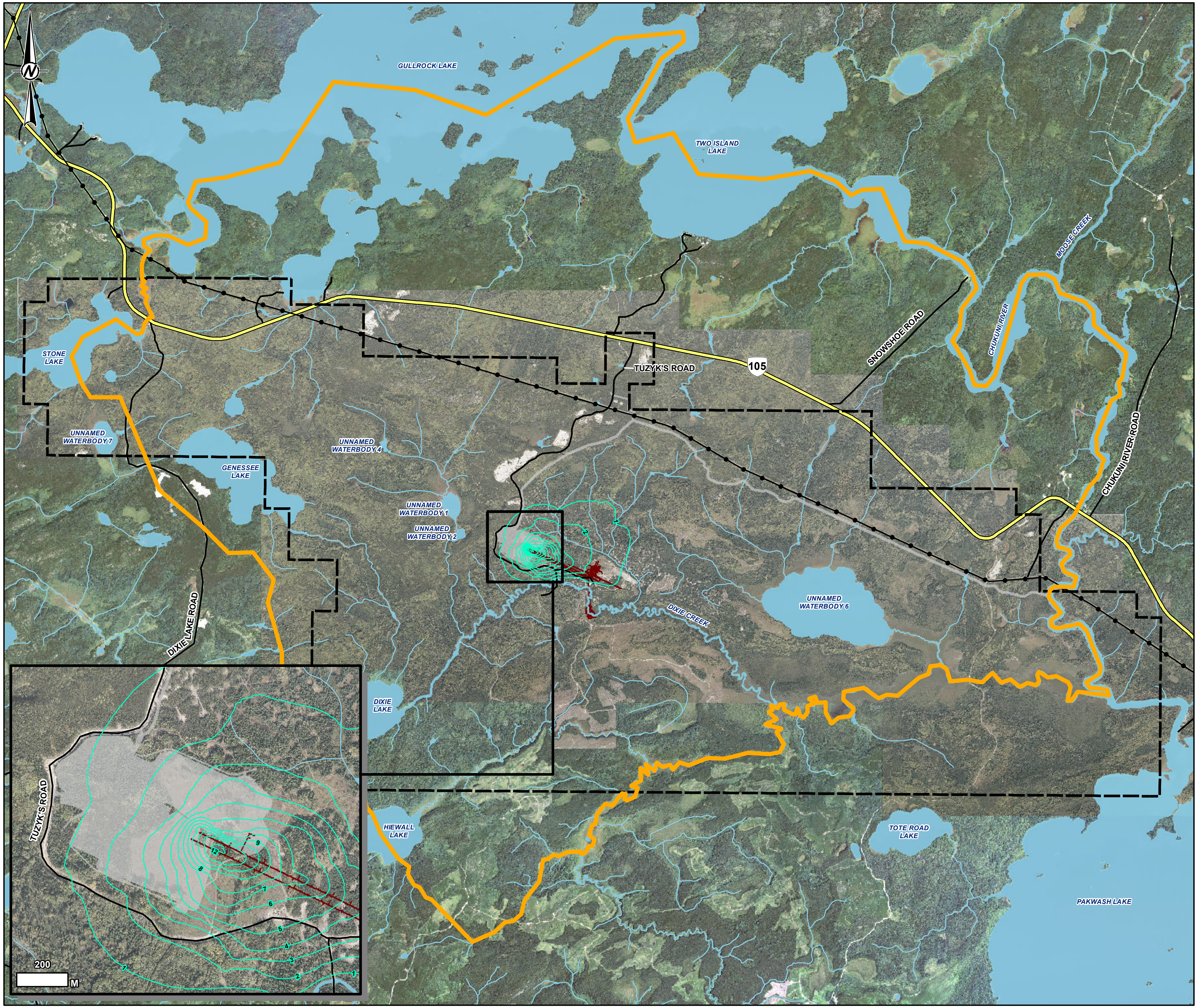
KINROSS

Numerical Model Cross Section

Groundwater Modelling Report

Kinross Great Bear Project

Figure Number		4-1	
Project Number		OMEMA2303	
Date		August 2024	
Drawn	TY	Reviewed	SG



LEGEND

🟧	DOMAIN OF CONCEPTUAL HYDROLOGICAL MODEL
⬚	PROPERTY BOUNDARY
⬜	AEX PROGRAM FOOTPRINT
—	UNDERGROUND WORKINGS
—	SIMULATED DRAWDOWN COUNTOURS
—	HIGHWAY
—	LOCAL ROAD
●—●	EXISTING TRANSMISSION LINE
—	WATERCOURSE
🟦	WATERBODY

0 1 2 4

1:70,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. AERIAL IMAGERY PROVIDED BY GREAT BEAR RESOURCES (SCENE DATE: SEPTEMBER 2022).
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. ADVANCED EXPLORATION SITE PLAN PROVIDED BY GREAT BEAR RESOURCES, FEBRUARY 2025.
6. UNDERGROUND WORKING CURRENT AS OF APRIL 2024
7. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT

GREAT BEAR RESOURCES

PROJECT

GREAT BEAR PROJECT

TITLE

SIMULATED DRAWDOWN CONTOURS IN GLACIAL TILL/SHALLOW BEDROCK (SCENARIO 1)

CONSULTANT

wsp

YYYY-MM-DD	2025-02-19
DESIGNED	----
PREPARED	MD
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
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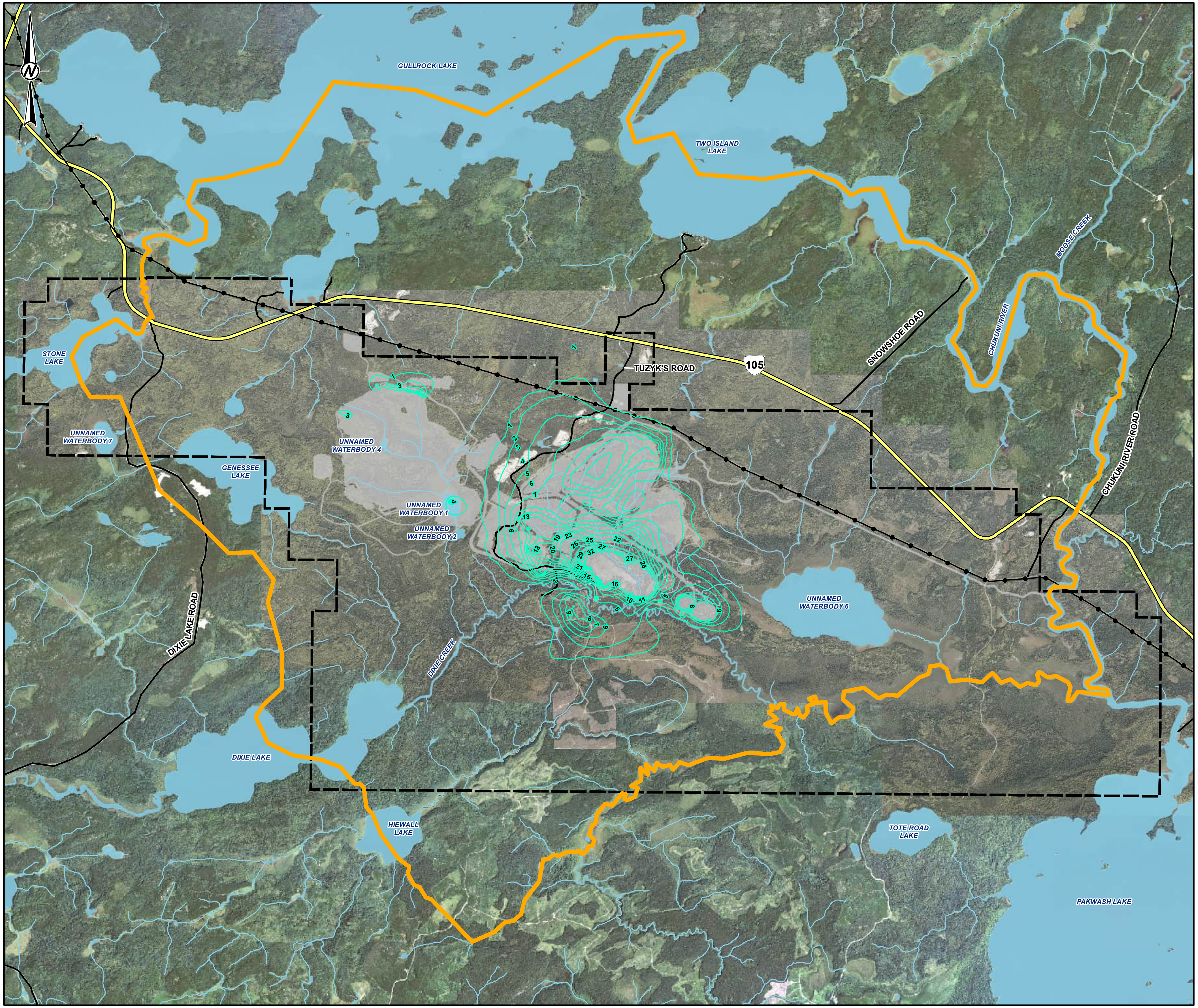
25mm



LEGEND

▭	DOMAIN OF CONCEPTUAL HYDROLOGICAL MODEL
▭	PROPERTY BOUNDARY
▨	GREAT BEAR PROJECT FOOTPRINT
—	SIMULATED DRAWDOWN COUNTOURS
—	HIGHWAY
—	LOCAL ROAD
●—●	EXISTING TRANSMISSION LINE
—	WATERCOURSE
▨	WATERBODY

0 1 2 4

1:70,000 KILOMETRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. CONTAINS INFORMATION LICENSED UNDER THE OPEN GOVERNMENT LICENCE - ONTARIO
2. AERIAL IMAGERY PROVIDED BY GREAT BEAR RESOURCES (SCENE DATE: SEPTEMBER 2022).
3. PROPERTY BOUNDARY PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2024.
4. ROADS INFORMATION PROVIDED BY GREAT BEAR RESOURCES, AUGUST 2022.
5. SITE PLAN BASED ON INFORMATION PROVIDED BY GREAT BEAR RESOURCES, DECEMBER 2024 / FEBRUARY 2025.
6. COORDINATE SYSTEM: NAD 1983 UTM ZONE 15N

CLIENT
GREAT BEAR RESOURCES

PROJECT
GREAT BEAR PROJECT

TITLE
SIMULATED DRAWDOWN CONTOURS IN GLACIAL TILL/SHALLOW BEDROCK (SCENARIO 2)

CONSULTANT

wsp

YYYY-MM-DD	2025-07-28
DESIGNED	----
PREPARED	DB
REVIEWED	----
APPROVED	----

PROJECT NO.	CONTROL	REV.	FIGURE
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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5 CLOSING

This Groundwater Modelling Report was prepared by WSP for the sole benefit of Great Bear Resources for application to the Great Bear Project and related approvals. The quality of information and conclusions contained herein are consistent with the level of effort involved in WSP's services and based on information available at the time of preparation. This report has been prepared in accordance with generally accepted industry-standards. No other warranty, expressed or implied, is made. Should you have any questions or if we can be of further assistance, please do not hesitate to contact the undersigned.

Respectfully Submitted,

PREPARED BY:

ORIGINAL SIGNED BY

Keenan Lamb., M.Sc.E., P.Eng.
Lead Hydrogeological Engineer

REVIEWED BY:

ORIGINAL SIGNED BY

Simon Gautrey, MSc., MBA, P.Geo.
Senior Technical Director, Hydrogeology

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