



COMPREHENSIVE DEVELOPMENT REVIEW

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In Association With:
BCL Engineering
WSP
Thurber Engineering

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EXECUTIVE SUMMARY

102139136 Saskatchewan Ltd. (the Developer) is applying to rezone a 16.14 ha (39.8 acre) and subdivide an 8.58 ha (21.20 acre) parcel, located in LSD 13, Section 34, Township 35, Range 05, W3M from DAR-1 to DCR-1 in the Saskatoon North Partnership for Growth (P4G) Planning District. The Development is named Poplar Point.

The purpose of the subdivision and rezoning is to provide for a multiple country parcel residential development including six residential lots, one Municipal Utility (MU) and Municipal Reserve (MR) in Phase 1. An additional seven lots are proposed for Phase 2. It is the intent of the developer to apply to rezone the entire parcel and subdivide Phase 1 only, with Phase 2 identified for subdivision with a holding provision. The proposed development is situated on lands located within the RM of Corman Park No. 344 in the P4G Planning District, approximately 2.0 km south of the City of Saskatoon, immediately south of Grasswood Road and east of Clarence Avenue. There are several existing multiple parcel country residential developments located in the immediate vicinity of the proposed Poplar Point development.

A hydrogeological report was undertaken by Thurber Engineering Ltd. to determine which type of wastewater treatment system would be suitable for the proposed Poplar Point development. It was concluded in this investigation that there are several options that may be suitable for the site, including package treatment plants. Through correspondence between the RM of Corman Park, Community Planning Branch, and Saskatchewan Health Authority it was determined that it would be acceptable for the developer to use the NSF 245 standard for nitrogen reduction (example: advanced bio-barrier or comparable system). Alternatively, should the wastewater treatment facility (membrane bioreactor system) that is proposed by the English River First Nation lands at the Corner of Highway 11 and Grasswood Road, have capacity for additional development, this may be an option for treatment as well. Should this prove to be the only wastewater treatment option, the development would consider a low-pressure sewer system connecting the homes to the wastewater conveyance system (forcemain) along Grasswood Road. The low-pressure sewer design would incorporate small holding tanks for wastewater attenuation.

Water supply in the development will include a potable water connection to residences for domestic purposes. Lost River Water will be providing and installing potable water at the development. Lost River will also function as the utility managing potable water.

A preliminary grading and drainage plan were completed by BCL Engineering. All site drainage will be contained within the boundaries and directed to a basin at the southeast corner of the development site. Internal drainage throughout the site shall be directed to the road right-of-ways, where it will be conveyed using the roadside ditches and culverts. The proposed development has been designed and engineered to ensure that post-development runoff conditions do not exceed pre-development runoff conditions. Post-development runoff conditions were calculated and are based on the 1:100 year 24-hour duration storm event, with a 25% increase in accordance with the RM of Corman Park's development policy. The storage requirements to accommodate the post-development runoff conditions are expected to be in the order of 5,188 m³. The calculations provided consider the loss of three existing drainage basins. To accommodate the storage requirements identified, the developer wishes to construct a storm water management pond within



a designated municipal utility (MU) located within the south east corner of the development site. The proposed MU has an area of 4,274 m². The storage requirements of 5,118 m³ can be easily stored within the MU footprint, requiring an active storage depth of approximately 1.20 m. The pond should be excavated to extend to an elevation of 500.50 m, approximately 0.50 m above the recorded ground water elevations, for construction reasons. Within the drainage report, it is recommended that a safe building elevation of 503.0 m throughout the entire development, which would apply to any houses or permanent structures. The SBE must be applied to the lowest foundation opening. It is further recommended that basement foundation depth be limited to 1.0m above the observed groundwater table. As such, a careful review of the geotechnical investigation with respect to groundwater elevations will need to be completed by each homeowner. It is recommended that engineered foundation plans, house plans, and proposed building elevations be submitted to the RM of Corman Park prior to the issuance of a development permit.

The geotechnical investigation and follow up report determined that basements may not be feasible on every lot due to groundwater levels. It is recommended that the final building location within each lot be individually assessed to determine if a basement is feasible. The geotechnical report makes further recommendations concerning foundations. The Developer is recommending that engineered foundation plans, house plans, and proposed building elevations must be submitted to the RM of Corman Park for review and approval in conjunction with individual development permit applications.

A Traffic Impact Assessment was undertaken by WSP in Fall, 2023. A turning movement count was conducted at the Grasswood Road and Clarence Avenue S intersection on Tuesday, August 29, 2023, and Wednesday, August 30, 2023. Traffic volumes were collected during peak commuter hours including the weekday morning peak period (7:00-9:00 a.m.) and the weekday afternoon peak period (4:00-6:00 p.m.). It was concluded that the very low traffic volume that would be generated by this development would not impact the operations on Grasswood Road and at the intersection at Clarence Avenue. The TIA also concluded that the proposed driveways on Grasswood Road are projected to carry a very low volume of traffic with less than 15 peak hour trips distributed between the five proposed driveways. As a result, the number of conflicts with traffic on Grasswood Road and on Clarence Avenue is not anticipated to be significant and is not anticipated to create significant operational impacts. In addition, the proposed driveways located on Grasswood Road as well as the approach to the cul-de-sac on Clarence Avenue are located opposite existing driveways and therefore are not anticipated to impact driveway spacing on Grasswood Road or Clarence Avenue. The RM of Corman Park Public Works department reviewed the TIA, specifically the proposed four access points along Grasswood Road. The existing policies and standards were reviewed and it was determined that they do not prevent the proposed access points from being constructed, and that the TIA demonstrated minimal added traffic from these lots.

Two letters were distributed to all neighbours within one mile (1.6 km) of the proposed development informing residents of the proposed development. The first letter distributed in March 2024 was to introduce the development in general and the intent to apply for a subdivision and zoning amendment. The second letter distributed in August 2024 provided more detailed information on the development itself.



1 INTRODUCTION

1.1 PURPOSE

This document shall serve as the Comprehensive Development Review (CDR) document required for the re-zoning and subdivision application from DAR-1 to DCR-1 in the Saskatoon North Partnership for Growth (P4G) Planning District. This review provides a framework for the rezoning and subdivision of the proposed parcel of land for the purpose of developing a total of 13 country residential lots. The proposed municipal reserves (MR) and municipal utility (MU) will be established and dedicated in Phase 1.

Phase 1 of the proposed development will require a rezoning to DCR-1 and a subdivision of six residential lots, one municipal utility and the municipal reserve. The remainder of the development will require a rezoning to DCR-1 with a holding provision, as provided under subsection 71(1) of *The Planning and Development Act, 2007*. Future subdivision applications for phase 2 will be submitted to the Community Planning Branch and the RM of Corman Park concurrently with an application to amend the zoning bylaw with the intent of removing the holding provision. The shallow utilities, roads and associated drainage infrastructure, water lines and sewer lines will follow the phasing of development.

The residential subdivision is called Poplar Point. The Plan of Proposed Subdivision for the development is included in Appendix A.

Questions on the proposal or the material contained within this document should be directed to Maggie Schwab, RPP, MCIP, Planner at Schwab Planning Solutions (306-227-6617).

1.2 OVERVIEW

It is the intention of the Developer to rezone and subdivide the land to accommodate a multiple parcel country residential development. The proposed development is located approximately 2.0 km to the south of the City of Saskatoon, immediately east of Clarence Avenue and south of Grasswood Road.

The RM of Corman Park, City of Saskatoon, City of Warman, City of Martensville and Town of Osler recently adopted a new District Regional Plan entitled the Saskatoon North Partnership for Growth (P4G) Plan. The proposed development aligns with the policies of this plan.

The proposed Poplar Point Development was designed to provide for lots that accommodate the regulations in the DCR-1 zoning district. All lots in Phase 1 measure 1.0 ha (2.47 ac) in size. Within Phase 2, the smallest lot is 0.72 ha (1.79 ac) and the largest is 1.3 ha (3.21 ac). The development maintains an overall minimum density of 1.0 hectares (2.47 acres) within the registered plan area.

Policy and zoning reviews as it relates to the P4G District Official Community Plan and Zoning Bylaw are provided in Sections 5.1 and 5.2 of this report.



2 INVENTORY AND ANALYSIS

2.1 EXISTING LAND USE

Both phases of development are proposed within the 16.14 ha (39.89 acres) of land in LSD 13, Section 34, Township 35, Range 05, W3M. The site is currently characterized by relatively flat to slightly gently rolling terrain that is currently used for agricultural purposes. The parcel is bordered by Grasswood Road on the north and Clarence Avenue on the west.

Other land uses in the area consist of a mixture of multiple parcel country residential development, agricultural land (both grain farming and pastureland). The closest highways to the proposed development are Provincial Highway #11, approximately 2.7 km to the east of the east boundary and Highway #219, located approximately 1.6 km west of the west boundary of the subject parcel (see land use map on following page).

The Existing Land Use Context of the Proposed Development is as Follows:

North

- | | |
|---------------------|--|
| - Grasswood Road | Adjacent to north boundary |
| - Grasswood North | North of Grasswood Road |
| - City of Saskatoon | Approx. 1.6 km north of north boundary |

South

- | | |
|--------------------------------|--|
| - Pastureland | Adjacent to south boundary |
| - Organized Hamlet of Casa Rio | Approx. 1.2 km south of south boundary |

West

- | | |
|-------------------------|--|
| - Clarence Avenue | Adjacent to west boundary |
| - Grasswood South | Across Clarence Avenue |
| - Edgemont Park Estates | Approx. 400 m southwest of west boundary |

East

- | | |
|----------------------------|--------------------------------------|
| - Edgemont East | Adjacent to east boundary |
| - Preston Avenue | Approx. 1.2 km east of east boundary |
| - Grasswood Indian Reserve | Approx. 2.7 km east of east boundary |





Location of proposed Poplar Point Development

2.2 PROPOSED LAND USE

The proposed land use is a low-density multiple parcel country residential development (District Country Residential 1 District).

The proposed development is compatible with the existing land uses currently in the surrounding area, as this area of the RM is characterized by a variety of existing country residential development including the Organized Hamlet of Grasswood, Edgemont East, Edgemont Park Estates, Grasswood Estates, and Casa Rio Estates. This development has been specifically designed with the intent to match the density of Grasswood South and Grasswood North.

Correspondence with the RM of Corman Park planning staff indicated that there no ILOs with approvals that Corman Park is aware of within a setback distance of LSD 13-34-35-5-W3M. There are also no other land use conflicts in the vicinity of the proposed development (see correspondence attached as Appendix B).



3 TRANSPORTATION AND MUNICIPAL SERVICES

3.1 COMMUNITY ACCESS

The proposed development is located immediately east of Clarence Avenue / Range Road 3053. A Traffic Impact Assessment was undertaken by WSP in Fall, 2023 (see attached report in Appendix C).

A turning movement count was conducted at the Grasswood Road and Clarence Avenue S intersection on Tuesday, August 29, 2023, and Wednesday, August 30, 2023. Traffic volumes were collected during peak commuter hours including the weekday morning peak period (7:00-9:00 a.m.) and the weekday afternoon peak period (4:00-6:00 p.m.).

Total forecast growth volumes were assessed using Synchro 11.0 (industry-standard traffic analysis software). Level of Service (LOS) analysis was completed, which assesses the effectiveness of a transportation system, with LOS “A” equating to the best operating conditions and LOS “F” representing the failure of a movement or intersection. The proposed development is estimated to generate 11 vehicle trips (3 inbound and 8 outbound) during the morning peak hour and 14 vehicle trips are anticipated during the afternoon peak hour (9 inbound and 5 outbound).

The proposed site plan was evaluated with respect to each individual residential lot approach along Grasswood Road (Lots D-G). The Development was designed to ensure these proposed approaches are located directly opposite of the four existing driveways on the north side of Grasswood Road. The driveway spacing ranges from 70 m to 130 m. It was concluded that the proposed driveways are projected to carry a very low volume of traffic with less than 15 peak hour trips distributed between the five proposed driveways. As a result, the number of conflicts with traffic on Grasswood Road and Clarence Avenue are not anticipated to be significant, or to create significant operational impacts.

It was concluded that the very low traffic volume that would be generated by this development would not impact the operations on Grasswood Road and at the Clarence Avenue and that it is anticipated that the surrounding transportation network can adequately accommodate the proposed development.

The RM of Corman Park Public Works department reviewed the TIA, specifically the proposed four access points along Grasswood Road. The existing policies and standards were reviewed and it was determined that they do not prevent the proposed access points, and that the TIA demonstrated minimal added traffic from these lots.

3.2 INTERNAL ROADS

Only one internal road is proposed at the Poplar Point development. The cul-de-sac will feature a 30 m wide road right-of-way. The cul-de-sac measures 150 m in length.



The proposed internal road will be constructed to the RM of Corman Park road standards. The geotechnical investigation suggests that a local residential pavement structure is appropriate and offered a pavement structure accordingly.

3.3 SEWAGE COLLECTION & WASTEWATER TREATMENT

According to the hydrogeological study and associated report undertaken by Thurber Engineering in 2023, implementing an onsite wastewater treatment system is a viable strategy for the site (see Appendix D). Given the proposed low density of the site, there are several options that may be suitable for the proposed development. It is noted in the report that a qualified Onsite Wastewater Treatment System engineer who is licensed and experienced in Saskatchewan will be required to assess the installation and operating costs of the options to allow for a full life cycle evaluation.

Through correspondence between the RM of Corman Park, Community Planning Branch, and Saskatchewan Health Authority it was determined that it would be acceptable for the developer to use the NSF 245 standard for nitrogen reduction (example: advanced bio-barrier or comparable system). Community Planning indicated the following caveat within the servicing agreement would need to be registered on title: *should the system be replaced in the future it will need to meet or exceed the NSF 245 standard for nitrogen reduction and that there would be no deviation from that requirement*. The email correspondence between the RM of Corman Park and Community Planning is also attached as Appendix E.

Alternatively, should the wastewater treatment facility (membrane bioreactor system) that is proposed by the English River First Nation lands at the Corner of Highway 11 and Grasswood Road, have capacity for additional development, this may be an option for treatment as well. If the ERFN wastewater treatment facility is utilized for the Poplar Point development, the development would consider a low-pressure sewer system connecting the homes to the wastewater conveyance system (forcemain) along Grasswood Road. The low-pressure sewer design would incorporate small holding tanks for wastewater attenuation.

3.4 POTABLE WATER SUPPLY AND DISTRIBUTION

Water supply in the development includes a potable water connection to residences for domestic purposes.

Potable water will be supplied and installed by Lost River Water Co. Inc. (signed contract attached as Appendix E). Lost River will function as the utility provider for potable water at the Poplar Point subdivision.

3.5 DRAINAGE AND STORMWATER MANAGEMENT

A grading plan and associated drainage report were completed by BCL Engineering in February 2024 and revised in October 2025 (see report attached as Appendix F).



The existing topography within the development is gently sloped and well-drained. The property slopes from the north-west corner at a recorded elevation of 505.0m to the south-east corner at an elevation of 502.0 m, resulting in a surface gradient of approximately 0.5%. Standing water was not observed on the property throughout 2023 site investigations, and, in fact, historical conditions demonstrated any evidence of surface water released onto the surrounding properties, as supported by topographic information. However, in reviewing the topographic data, there are four localized areas of natural depressions (basins) that could hold water during an extreme precipitation event or during spring melt.

Site grading at the proposed development is expected within the vicinity of the proposed home, driveway and access, and any other anticipated outbuildings on the site. Little to no lot grading is expected otherwise.

Surface runoff is intended to be conveyed overland via ditches to adjacent roads, using culverts at driveways and intersections, as well as at locations of natural drainage paths which have been defined with 3m and 6m wide swale easements. The conceptual plan for site drainage is to continue the use of Basin D for collection, which is the most prominent storage area.

The Natural Resources Conservation Service (NRCS) method was used to determine runoff characteristics of the soils in the area. The subsurface soils within the study area (predominantly sandy soils) are conducive to high infiltration rates, and classified as HSG A. Pre-development conditions were determined using a runoff coefficient of 0.15. The resulting pre-development runoff potential based on the total area is in the order of 2,663 m³, based on the 1:100 year 24-hour storm duration. The runoff appears to be temporarily captured within four natural depressions measuring 12,300 m³ in size with potential for temporary ponding depths of 0.21m.

Pre-development runoff potential based on the total area of 161,420 m² is in the order of 2,663 m³, based on the 1:100 year return period, 24-hour storm duration. Currently, the runoff is captured within four natural depressions measuring 12,300 m² in size.

Post-development runoff conditions must consider hard surfacing such as roads, driveways, and outbuilding structures that are less permeable and will increase the runoff potential of the site. Further development of the yard sites will also increase runoff potential. Post-development runoff conditions were calculated and are based on the 1:100 year 24-hour duration storm event, with a 25% increase in accordance with the RM of Corman Park's development policy. These calculations are provided in the drainage study attached in Appendix F.

The storage requirements to accommodate the post-development runoff conditions are expected to be in the order of 5,188 m³. The calculations provided consider the loss of three existing drainage basins.

To accommodate the storage requirements identified, the developer wishes to construct a storm water management pond within a designated municipal utility (MU) located within the south east corner of the development site. The proposed MU has an area of 4,274 m². The storage requirements of 5,118 m³ can be easily stored within the MU footprint, requiring an active storage



depth of approximately 1.20 m. The pond should be excavated to extend to an elevation of 500.50 m, approximately 0.50 m above the recorded ground water elevations, for construction reasons.

The south east corner of the development site is the natural drainage point for the parcel of land and should be left in the natural state to ensure the pre-existing outlet is in place. It is noted that the collected water from the runoff will largely infiltrate into the underlying soils; frequent overflow conditions should be rare.

Within the drainage report, it is recommended that a safe building elevation of 503.50m throughout the entire development. The SBE would apply to the lowest foundation opening, or protective measure thereof (window well, retaining wall, etc.). It is further recommended that basement foundation depth be limited to 1.0 m above the observed groundwater table. It is proposed that engineered foundation plans, house plans, and proposed building elevations must be submitted to the RM of Corman Park for review and approval prior to the issuance of a development permit. There should not be any instances where more than 1.0 m of fill is required to grade the proposed lots, as all lots provide a suitable building location of an elevation of 502.5m or higher, and can easily achieve the SBE of 503.5m within the 1.0 m fill limitations. Additionally, the size of each of the lots (2.5 acres on average) suggest that landscaping of the entire lot would be unlikely and would only occur within the proximity of the home or outbuildings.

3.6 SHALLOW UTILITIES

The Developer has been in contact with SaskPower and SaskEnergy. To date, SaskEnergy has confirmed that the development can be easily serviced by gas utilities. Community Planning has also referred the development to all utilities and no issues were identified throughout the subdivision application process.

Loraas Disposal has confirmed they can be contracted to provide waste and recycling removal services at the proposed Poplar Point development (see email attached in Appendix G).

3.7 FIRE AND PROTECTIVE SERVICES

The RM has corresponded with Saskatoon Fire and Protective Services to review the proposed Development. It is likely that Poplar Point would be serviced from the fire truck fill located at Pump House #1 at the corner of Grasswood Road and Preston Avenue. This fill location is where the Saskatoon and Dundurn Fire Departments hook up and fill their tanker trucks. There are no capacity issues at this pump house, as it is only available for fire departments to use. This fill location is located kiddy corner to the northeast corner of the proposed development. Police services will be provided by the Corman Park Police Services and the Saskatoon Detachment of the Royal Canadian Mounted Police.



4 HERITAGE, ENVIRONMENT AND GEOTECHNICAL

4.1 HERITAGE CONSERVATION

According to the Heritage Conservation Branch at the Ministry of Parks Culture and Sport, the proposed development is not located in an area with any potential heritage sensitivity (query attached as Appendix H).

4.2 ENVIRONMENTAL CONSIDERATIONS

The proposed development is located on hayland that has been farmed for many years. A query of the HabiSask website indicated that the development may be located in an area with potential rare/endangered vertebrate animal (see Appendix I). It is noted, however that the land has been used as pasture for many years and any habitat would have been previously removed due active agricultural activities. Additionally, it is the intent of the developer to retain all trees that are located on-site.

The proposed development is also not located in the vicinity of any permanent water sources. The closest permanent water source, the South Saskatchewan River, is located approximately 4.0 km to the west.

4.3 GEOTECHNICAL ANALYSIS

A geotechnical investigation and follow up report were completed in May 2023 Thurber Engineering Ltd. (see attached report in Appendix J). The objective of the investigation was to provide geotechnical recommendations to support the detailed design of the proposed development.

Geotechnical field test drilling, piezocene penetration testing, and monitoring well installation was conducted in May 2023. Groundwater monitoring was also undertaken at that time and again on June 6, 2023. Ten (10) boreholes were drilled and extended to a depth between 4.4 and 10.7 m below existing ground surface. Soil stratification, groundwater and subsurface conditions, estimated depth of frost penetration, and groundwater seepage were all recorded (results found in Geotechnical report attached as Appendix J).

The general subsurface soil conditions encountered at the site generally comprised topsoil, underlain by fine grained sand followed by high plastic, glaciolacustrine clay. The topsoil encountered during drilling varied from about 0.28 m to 0.46 m thick and contained varying amounts of organics and rootlets. It was noted that the topsoil thickness varied between test holes and could vary from what was measured at the test hole locations. Sand was encountered below the topsoil and extended to variable depths in all of the test holes drilled for this investigation. The sand was generally fine grained and contained some silt and trace clay. The sand was generally loose to compact in density and moist to wet. The clay varied from firm to stiff in consistency. The depth the clay was encountered varied from about 5.6 m to 7.8 m. A detailed description of



subsurface conditions observed at each test hole location is presented within Appendix B of the geotechnical report.

Sloughing and groundwater seepage were observed in the test holes during and immediately after drilling. Standpipe piezometers were installed in all test holes. Groundwater level readings were taken in the standpipe piezometers at the end of the field drilling program. The groundwater table was recorded at a depth between 1.2 m to 6.5 m below existing grade immediately after drilling, and a depth between 1.7 to 3.3 m below existing grade on June 6, 2023.

Within the geotechnical report, general recommendations are made, as well as specific recommendations concerning site preparation grading and general fill placement. All recommendations can be found in Appendix J. It is noted that Section 5.9 of the geotechnical report references compacting the road subgrade to 100% proctor density, as per the RM of Corman Park's standards. The references to 98% standard proctor density elsewhere in the report relates to general site preparations, home construction, etc.

The geotechnical report concluded that overall, the site is suitable for the proposed residential development from a geotechnical perspective. It further indicates that basements may not be suitable in all areas due to the high groundwater levels encountered across the site. It is recommended that the final building location within each lot be individually assessed to determine if a basement is feasible.

Discussions of the geotechnical considerations at the site and preliminary design and construction recommendations for the proposed development are presented including site preparation grading and general fill placement.

The Safe Building Elevation of 503.50 m must be applied to the lowest foundation opening. It is also recommended that basement foundation depth be limited to 1.0m above the observed groundwater table. It is recommended that engineered foundation plans, house plans, and proposed building elevations be submitted to the RM of Corman Park prior to the issuance of a development permit. There should not be any instances where more than 1.0 m of fill is required to grade the proposed lots, as all lots provide a suitable building location of an elevation of 502.5m or higher, and can easily achieve the SBE of 503.5m within the 1.0 m fill limitations. Additionally, the size of each of the lots (2.5 acres on average) suggest that landscaping of the entire lot would be unlikely and would only occur within the proximity of the home or outbuildings.



5 POLICY CONTEXT

The proposed Poplar Point residential development is located within the P4G Planning District area. The proposed development has been designed to meet the requirements of the P4G Official Community Plan and Zoning Bylaw as described in Sections 5.1 to 5.2 below.

5.1 P4G DISTRICT OFFICIAL COMMUNITY PLAN

Agricultural Objectives and Policies (Section 11) - Section 11 of the P4G District Official Community Plan identifies the following Agricultural Policies that are pertinent to the proposed Poplar Point multiple parcel country residential development.

4.2 Disruption of Agriculture Minimized

- 11.3.5: Correspondence with the RM of Corman Park planning staff indicated that there no ILOs with approvals that Corman Park is aware of within a setback distance of LSD 13-34-35-5-W3M. There are also no other land use conflicts in the vicinity of the proposed development (see correspondence attached as Appendix B).

Country Residential Policies (Section 12) – Section 12 of the P4G District Official Community Plan identifies the following Country Residential Policies that are pertinent to the proposed Poplar Point Development.

12.3 Policies

- 12.3.1: The proposed development is located on land designated as “Country Residential” as provided on Section B – District Land Use Map.
- 12.3.2: The proposed development is not located on significant wildlife habit lands. A query of the Habi-Sask database indicated that the land is in an area containing a species of “potential rare/endangered vertebrate species” (see Appendix I). It is noted that the proposed development is located on land that has been previously used as farmland and any habitat would have been previously destroyed as a result of annual farming activities. The proposed development is also not located in the vicinity of any permanent water sources. The closest permanent water source, the South Saskatchewan River, is located approximately 4.0 km to the west. It is the intent of the developer to retain all trees that are located on-site. The storm water design will incorporate native plants to function as a naturalized dry pond.
- 12.3.2(c): The proposed development is not located on hazard lands. Correspondence with the RM of Corman Park (attached as Appendix B) was undertaken to ensure the development is not located within required setbacks of hazardous lands or facilities. Although there was once an ILO located in the vicinity, it appears to be discontinued. No gravel pits or sewage lagoons are located near the proposed development.



- 12.3.3(a): The proposed Poplar Point development will minimize pressure to expand or upgrade services and infrastructure. One new internal road will be constructed to the RM of Corman Park's standards. Potable water will be provided by Lost River Water Utility (letter attached as Appendix E), who will also function as the utility responsible for the management of the potable water. Wastewater collection for the development is proposed to be undertaken individually on each lot through the installation of an advanced onsite wastewater treatment system (see Hydrogeological Report and associated correspondence attached as Appendix D). If the ERFN wastewater treatment facility is utilized for the Poplar Point development, the development would consider a low-pressure sewer system connecting the homes to the wastewater conveyance system (forcemain) along Grasswood Road. The low-pressure sewer design would incorporate small holding tanks for wastewater attenuation. The Developer has been in contact with SaskEnergy and SaskPower to confirm their ability to provide the necessary utilities at this development. To date, SaskEnergy has confirmed the availability of natural gas services (see correspondence attached as Appendix K).
- 12.3.3(b): The proposed internal road will be constructed to the RM of Corman Park road construction standards.
- 12.3.3(d): The proposed development is located on land that has been used previously for farming purposes. The proposed pond is proposed the lowest lying area to minimize the amount of disturbance to the terrain and existing drainage patterns.
- 12.3.3(e): The proposed development is not located in an environmentally sensitive or heritage sensitive area (see Appendix H and I for environmental query and heritage queries). Although the environmental query indicated that the development is situated in an area of potentially rare/endangered vertebrate animal, the land has been in a pasture state for many years and any habitat would have been previously destroyed. There are no designated wetlands within the property boundaries. As provided in the drainage study, post-development runoff conditions will remain the same as pre-development runoff conditions. It is the intent of the developer to retain all trees that are located on-site. The storm water design will incorporate native plants to function as a naturalized dry pond
- 12.3.3(g): The Developer has contacted the Prairie Spirit School Division to introduce the proposed development and inquire about future enrollment at South Corman Park School and Clavet School. The school division reviewed the location of the proposed subdivision with the attendance area boundaries and confirmed that residents will be in the South Corman Park School area for elementary school and the current high school will be Clavet Composite School. It is noted that Prairie Spirit School Division monitors capacity at all schools on an ongoing basis (see Appendix M). This process takes into consideration any new developments within the attendance areas. Any significant enrolment increases in any attendance area would impact capacity and require facility planning. The Ministry of Education sets out calculations to assess the degree to which a school is below, at, or over capacity. These calculations are used by the province to determine which school projects are funded each year. If a school is "over capacity", the provincial government may approve portable classrooms or a new project to add space to a school. It is anticipated that



South Corman Park School and Clavet School would have capacity for any additional students added by the proposed Poplar Point development but will be confirmed by the Community Planning Branch prior to subdivision approval.

- 12.3.4(a): The proposed development is located on land that has been used as pasture for many years. The P4G District Official Community Plan identifies this land to be suitable for future Country Residential Development. Consideration was given to the best use of the land as residential development. A walking/cycling path has been incorporated into the development, on the south side of proposed lots D to G. The intent of the path is to reduce pedestrian and bicycle traffic on Grasswood Road.
- 12.3.4(b): The proposed development has been designed and engineered to ensure that post-development runoff conditions do not exceed pre-development runoff conditions. Post-development runoff conditions were calculated and are based on the 1:100 year 24-hour duration storm event, with a 25% increase in accordance with the RM of Corman Park's development policy. These calculations are provided in the drainage study attached in Appendix F. The storage requirements to accommodate the post-development runoff conditions are expected to be in the order of 5,188 m³. The calculations provided consider the loss of three existing drainage basins. To accommodate the storage requirements identified, the developer wishes to construct a storm water management pond within a designated municipal utility (MU) located within the south east corner of the development site. The proposed MU has an area of 4,274 m². The storage requirements of 5,118 m³ can be easily stored within the MU footprint, requiring an active storage depth of approximately 1.20 m. The pond should be excavated to extend to an elevation of 500.50 m, approximately 0.50 m above the recorded ground water elevations, for construction reasons. This dry-bottom facility will provide for suitable recreational uses under most circumstances. Within the drainage report, it is recommended that a safe building elevation of 503.0 m throughout the entire development, which would apply to any houses or permanent structures. The SBE must be applied to the lowest foundation opening. It is further recommended that basement foundation depth be limited to 1.0m above the observed groundwater table. As such, a careful review of the geotechnical investigation with respect to groundwater elevations will need to be completed by each homeowner. It is recommended that engineered foundation plans, house plans, and proposed building elevations be submitted to the RM of Corman Park prior to the issuance of a development permit.
- 12.3.4 (c): The proposed Poplar Point development will minimize pressure to expand or upgrade services and infrastructure. Internal roads will be constructed to the RM of Corman Park's standards, at the cost of the Developer. Potable water will be installed and provided by Lost River Water Utility, who will also function as the utility for the development. Wastewater collection for the development is proposed to be provided by individual Type II mounds on each lot of the subdivision. Placement and installation will be determined by a certified onsite wastewater installer. If the ERFN wastewater treatment facility is utilized for the Poplar Point development, the development would consider a low-pressure sewer system connecting the homes to the wastewater conveyance system (forcemain) along Grasswood Road. The low-pressure sewer design would incorporate small holding tanks



for wastewater attenuation. The Developer has been in contact with SaskEnergy and SaskPower to confirm their ability to provide the necessary utilities at this development. SaskEnergy has confirmed the availability of gas services at this development to date (see correspondence attached as Appendix K).

- 12.3.4(d): The closest existing country residential development in the immediate vicinity of the proposed Poplar Point development is Grasswood North, located on the north side of Grasswood Road. The Grasswood North lots and existing approaches are in line with the proposed lot sizes at Poplar Point, as well as the proposed access points along Grasswood Road.
- 12.3.5: The proposed Poplar Point development is located on the opposite side of Grasswood Road to the existing Grasswood North development. The development has been designed to complement the site sizes of the Grasswood North development. Furthermore, the proposed access points on lots D to G mirror the existing access points into houses at the Grasswood North development. The RM of Corman Park public works department reviewed the TIA prepared by WSP, specifically the proposed four access points along Grasswood Road. Public Works reviewed the existing policies and standards and determined that they do not prevent the proposed access points, and that the TIA demonstrated minimal added traffic from these lots (see TIA and correspondence with Corman Park attached as Appendix C).
- 12.3.8(c): The proposed Poplar Point development complements existing larger lot residential communities in the immediate area, including Grasswood North. A walking/cycling path has been incorporated into the development, on the south side of proposed lots D to G.
- 12.3.8(d): The proposed development is located on two municipally maintained roadways including Grasswood Road to the north and Clarence Avenue to the west. Access to the cul-de-sac is located along Clarence Avenue (see plan of proposed subdivision attached as Appendix A).

Recreation, Parks, and Culture (Section 22) – Section 22 of the P4G District Official Community Plan identifies the following recreation, parks, and cultural opportunities pertinent to the proposed Poplar Point Development.

- 22.3.1: The Developer is proposing to dedicate 2.15 ha of land of open space to support future recreational opportunities/green space. A walking/cycling path has been incorporated into the development, on the south side of proposed lots D to G. This pathway could be utilized to remove pedestrian and bicycle traffic from Grasswood Road. As all phases of the proposed subdivision measure 16.14 ha (39.88 ac) of land, the total MR to be dedicated represents 13.32% of the total amount of land at the proposed Development. The land dedication is therefore above the minimum required 10% of the land base, which will satisfy the requirements, as per Section 181 of *The Planning and Development Act, 2007*.



Regional Servicing Policies (Section 23) – Section 23 of the P4G District Official Community Plan identifies the following Regional Servicing Policies that are pertinent to the proposed Poplar Point Development.

- 23.3.3: The Developer will be responsible for costs associated with providing the necessary infrastructure and services for the proposed Poplar Point development. It is anticipated that details of the required services and associated infrastructure will be outlined in the servicing agreement with the RM of Corman Park.

Potable Water Policies (Section 24) – Section 24 of the P4G District Official Community Plan identifies the following Potable Water Policies that are pertinent to the proposed Poplar Point Development.

- 24.3.3: Potable water will be provided and installed by Lost River Water Utility (see contract attached as Appendix E).
- 24.3.4: Connections to the municipal potable water lines will be undertaken in accordance with applicable policies and bylaws, and as specified in the servicing agreement with the RM of Corman Park.

Wastewater Policies (Section 25)– Section 25 of the P4G District Official Community Plan identifies the following Wastewater Policies that are pertinent to the proposed Poplar Point Development.

- 25.3.4: A hydrogeological report was undertaken by Thurber Engineering Ltd. to determine which type of wastewater treatment system would be suitable for the proposed Poplar Point development (see report attached as Appendix D). It was concluded in this investigation that there are several options that may be suitable for the site, including package treatment plants. Through correspondence between the RM of Corman Park, Community Planning Branch, and Saskatchewan Health Authority it was determined that it would be acceptable for the developer to use the NSF 245 standard for nitrogen reduction (example: advanced bio-barrier or comparable system). Community Planning indicated the following caveat within the servicing agreement would need to be registered on title: *should the system be replaced in the future it will need to meet or exceed the NSF 245 standard for nitrogen reduction and that there would be no deviation from that requirement.* Should the wastewater treatment facility (membrane bioreactor system) that is proposed by the English River First Nation lands at the Corner of Highway 11 and Grasswood Road, have capacity for additional development, this may be an option for treatment as well. For this to be an option, the force main would need to be extended down Grasswood Road. If the ERFN wastewater treatment facility is utilized for the Poplar Point development, the development would consider a low-pressure sewer system connecting the homes to the wastewater conveyance system (forcemain) along Grasswood Road. The low-pressure sewer design would incorporate small holding tanks for wastewater attenuation.

Stormwater and Drainage Policies (Section 26)– Section 26 of the P4G District Official Community Plan identifies the following Stormwater and Drainage Policies that are pertinent to the proposed Poplar Point Development.



- 26.3.2: The proposed Poplar Point development has been designed to avoid on and off-site impacts from alteration to drainage, as per the recommendations provided by BCL Engineering in the attached drainage report (Appendix F). The proposed development has been designed and engineered to ensure that post-development runoff conditions do not exceed pre-development runoff conditions. Post-development runoff conditions were calculated and are based on the 1:100 year 24-hour duration storm event, with a 25% increase in accordance with the RM of Corman Park's development policy. These calculations are provided in the drainage study attached in Appendix G. The storage requirements to accommodate the post-development runoff conditions are expected to be in the order of 5,188 m³. The calculations provided consider the loss of three existing drainage basins. To accommodate the storage requirements identified, the developer wishes to construct a storm water management pond within a designated municipal utility (MU) located within the south east corner of the development site. The proposed MU has an area of 4,274 m². The storage requirements of 5,118 m³ can be easily stored within the MU footprint, requiring an active storage depth of approximately 1.20 m. The pond should be excavated to extend to an elevation of 500.50 m, approximately 0.50 m above the recorded ground water elevations, for construction reasons. Within the drainage study, it is recommended that a safe building elevation of 503.50m throughout the entire development. The SBE would apply to the lowest foundation opening, or protective measure thereof (window well, retaining wall, etc.). It is further recommended that basement foundation depth be limited to 1.0 m above the observed groundwater table. It is proposed that engineered foundation plans, house plans, and proposed building elevations must be submitted to the RM of Corman Park for review and approval prior to the issuance of a development permit.
- 26.3.6: A surface model was created to determine the drainage patterns, storage and resulting water elevations. The Natural Resources Conservation Service (NRCS) method was used to determine runoff characteristics of the soils in the area (see Appendix F). The subsurface soils within the study area (predominantly sandy soils) are conducive to high infiltration rates, and classified as HSG A. Pre-development and post-development runoff conditions were calculated. Based on factors such as an increase in hard surfacing and landscaping, a storm water pond, designated as Municipal Utility (MU) will be constructed at the south east corner of the development site. The MU has an area of 4,274 m² and can easily accommodate the storage requirements of 5,118 m³ to a depth of 1.20 m at an elevation of 500.50m.

Transportation Policies (Section 27)– Section 27 of the P4G District Official Community Plan identifies the following Transportation Policies that are pertinent to the proposed Poplar Point Development.

- 27.3.3: The proposed Poplar Point development will be accessed by one internal road (cul-de-sac) and four approaches. The proposed site plan was evaluated by WSP with respect to each individual residential lot approach along Grasswood Road (Lots D-G). The Development was designed to ensure these proposed approaches are located directly opposite of the four existing driveways on the north side of Grasswood Road. It was concluded that the proposed driveways are projected to carry a very low volume of traffic with less than 15 peak hour trips distributed between the five proposed driveways. As a



result, the number of conflicts with traffic on Grasswood Road and Clarence Avenue are not anticipated to be significant, or to create significant operational impacts.

- 27.3.4: The proposed cul-de-sac will be constructed to the RM of Corman Park road construction standards. The proposed internal road will be constructed to the RM of Corman Park road standards. The geotechnical investigation suggests that a local residential pavement structure is appropriate and offered a pavement structure accordingly.
- 27.3.5: All-weather legal and physical access to the development will be provided to the proposed Poplar Point development, on a year-round basis. The access point (cul-de-sac) is located on Clarence Avenue, which is a municipally maintained roadway. The RM of Corman Park public works department reviewed the TIA, specifically the proposed four access points along Grasswood Road. The existing policies and standards were reviewed and it was determined that they do not oppose the proposed access points, and that the TIA demonstrated minimal added traffic from these lots (see correspondence attached in Appendix C).
- 27.3.6: The Developer retained WSP to undertake a Traffic Impact Assessment at the proposed development (attached as Appendix C). Total forecast growth volumes were assessed using Synchro 11.0 (industry-standard traffic analysis software). Level of Service (LOS) analysis was completed, which assesses the effectiveness of a transportation system, with LOS “A” equating to the best operating conditions and LOS “F” representing the failure of a movement or intersection. The proposed development is estimated to generate 11 vehicle trips (3 inbound and 8 outbound) during the morning peak hour and 14 vehicle trips are anticipated during the afternoon peak hour (9 inbound and 5 outbound). It was concluded that the very low traffic volume that would be generated by this development would not impact the operations on Grasswood Road and at the Clarence Avenue and that it is anticipated that the surrounding transportation network can adequately accommodate the proposed development.

Servicing Agreements Policies (Section 29)– Section 29 of the P4G District Official Community Plan identifies the following Servicing Agreements Policies that are pertinent to the proposed Poplar Point Development.

- 29.3.1: A servicing agreement between the Developer and the RM of Corman Park/P4G Planning Commission is expected to address, but is not necessarily limited to, the following:
 - Identify the proposed phasing, including the proposed construction timelines;
 - Identify roadway and approach specifications;
 - Identify off-site servicing fees, payable to the RM;
 - Identify the value of the required performance bond or letter of credit;
 - The proposed Municipal Reserve compromises 2.15 ha (5.32 ac) of land. All phases of the proposed subdivision measure 16.14 ha (39.88 ac) of land, the total MR to be dedicated represents 13.32% of the total amount of land at the proposed Development. The land dedication is therefore above the minimum required 10% of the land base,



which will satisfy the requirements, as per Section 181 of *The Planning and Development Act, 2007*.

District Zoning Bylaw Policies (Section 31)– Section 31 of the P4G District Official Community Plan identifies the following District Zoning Bylaw Policies that are pertinent to the proposed Poplar Point Development.

- 31.3.6: The proposed Poplar Point development will require a rezoning to DCR-1. This document provides information concerning how the development is consistent with the policies and intent of the P4G District Official Community Plan.
- 31.3.9: The Developer wishes to proceed with a phased rezoning of the entire 16.14 ha (39.9 acres) of land within LSD 13, Section 34, Township 35, Range 05, W3M from DAR-1 to DCR-1. Phase 1 of the development will require a rezoning to DCR-1. The remainder of the development will require a rezoning to DCR-1 with a holding provision, as provided under subsection 71(1) of *The Planning and Development Act, 2007*. A future subdivision application for Phase 2 will be submitted to the Community Planning Branch and the RM of Corman Park concurrently with an application to amend the zoning bylaw with the intent of removing the holding provision. The application to remove the holding provision will largely be determined by market conditions and demand for housing. The proposed shallow utilities, drainage infrastructure, water lines for affected lots will be installed during Phase 1. The proposed Municipal Reserve (MR) Municipal Utility (MU) will be established in Phase 1 while the remaining infrastructure, including remaining water lines, utilities, and cul-de-sac, will be installed following approval from the RM of Corman Park and Community Planning Branch.
- 31.3.16: This document shall serve as the Comprehensive Development Review (CDR) as required by the P4G Planning District Commission and the RM of Corman Park for rezoning and subdivision. This CDR addresses all matters of land use integration, environmental sustainability, public involvement and conflict mitigation, as well as to identify the provision of services to the development.
- 31.3.19: The Developer has consulted with the public utility companies, both verbally and through the Utility Declaration Form provided with the subdivision application submitted to the Community Planning Branch. At the time of this report, SaskEnergy has confirmed that they have the capacity to serve the development.
- 31.3.20: Two letters were distributed to all neighbours within 1.6 km of the proposed development. The first letter distributed in March, 2024 was intended to introduce neighbours to the project and provide an opportunity to ask questions and/or provide feedback to the developers. A total of four responses were received. The second letter, distributed in September 2024, provided more detailed information concerning the development. Only one response was received following this letter. Resident concerns included the width of Clarence Avenue and the volume of traffic on the road, as well as groundwater access and quality. School capacity was also cited as a concern, as well as the loss of a rural/semi-rural way of life. One resident indicated opposition but did not specify a reason. One resident sent an email requesting lot prices. The mail out letters and feedback



responses are provided in Appendix L of this report. The Developer's response to concerns are provided in Section 7 of this document.

5.2 P4G DISTRICT ZONING BYLAW

The proposed development within the P4G District requires rezoning from D-AR1 to D-CR1 Zoning District.

Development standards and regulations are included within the P4G Zoning Bylaw and the minimum yard setbacks will be applied at the development permit application.



6 STAGING AND IMPLEMENTATION

A Plan of Proposed Subdivision has been attached as Appendix A, which details the extent of the proposed subdivision of land at the Poplar Point Development.

This subdivision and bylaw amendment will need to be approved by the Community Planning Branch at the Ministry of Government Relations. The proposed development has been submitted for formal file review (File SUBD-000503-2022).



7 PUBLIC CONSULTATION

Two letters were circulated to all neighbours within 1.6 km of the proposed development. The first letter distributed in March 2024, was intended to introduce neighbours to the project and provide an opportunity to ask questions and/or provide feedback to the developers. The second letter, distributed in September 2024, provided more detailed information concerning the development. Only one response was received from a resident who was concerned about increased traffic along Clarence Avenue. A total of five follow-up emails were sent to the developer following the letters (six following the first letter and one following the second). Resident concerns included the width of Clarence Avenue and the volume of traffic on the road, as well as groundwater access and quality. School capacity was also cited as a concern, as well as the loss of a rural/semi-rural way of life. One resident indicated opposition but did not specify a reason. One resident sent an email requesting lot prices. The mail out letters and feedback emails are provided in Appendix L of this report.



**Table 7.1
Received Written Comments
Proposed Poplar Point Development**

Stakeholder	Written Comments	Developer Response to Concerns
Daryl Fourney	<p>Concerns:</p> <ol style="list-style-type: none"> 1. Clarence Avenue is too narrow. 2. Clarence Avenue traffic volume 3. Groundwater access and quality. 4. School capacity. 5. Loss of rural/semi-rural way of life; residential development should be 5 acres minimum. 	<p>1 and 2. With respect traffic along Clarence Avenue, a TIA was undertaken by WSP in the fall of 2023. Total forecast growth volumes were assessed using Synchro 11.0 (industry-standard traffic analysis software). Level of Service (LOS) analysis was completed, which assesses the effectiveness of a transportation system, with LOS “A” equating to the best operating conditions and LOS “F” representing the failure of a movement or intersection. The proposed development is estimated to generate 11 vehicle trips (3 inbound and 8 outbound) during the morning peak hour and 14 vehicle trips are anticipated during the afternoon peak hour (9 inbound and 5 outbound). It was concluded that the very low traffic volume that would be generated by this development would not impact the operations on Grasswood Road and at the Clarence Avenue and that it is anticipated that the surrounding transportation network can adequately accommodate the proposed development.</p> <p>3. A hydrogeological report was undertaken by Thurber Engineering Ltd. to determine which type of wastewater treatment system would be suitable for the proposed Poplar Point development (see report attached as Appendix D). It was concluded in this investigation that are several options that may be suitable for the site, including package treatment plants. Through correspondence between the RM of Corman Park, Community Planning Branch, and Saskatchewan Health Authority it was determined that it would be acceptable for the developer to use the NSF 245 standard for nitrogen reduction (example: advanced bio-barrier or comparable system). Community Planning indicated the</p>



**Table 7.1
Received Written Comments
Proposed Poplar Point Development**

Stakeholder	Written Comments	Developer Response to Concerns
		<p>following caveat within the servicing agreement would need to be registered on title: <i>should the system be replaced in the future it will need to meet or exceed the NSF 245 standard for nitrogen reduction and that there would be no deviation from that requirement.</i> Should the wastewater treatment facility (membrane bioreactor system) that is proposed by the English River First Nation lands at the Corner of Highway 11 and Grasswood Road, have capacity for additional development, this may be an option for treatment as well. For this to be an option, the force main would need to be extended down Grasswood Road. The Developer will also have potable water extended to the residential lots through Lost River Water Utility. This will negate any need to utilize wells as a source of potable water.</p> <p>4. With respect to the school capacity, the proposed development was referred to the Prairie Spirit School Division for review by both the development team and the Community Planning Branch. Based on correspondence with the school division, it is understood that Prairie Spirit School Division monitors capacity at all schools on an ongoing basis. This process takes into consideration any new developments within the attendance areas. Any significant enrolment increases in any attendance area would impact capacity and require facility planning. The Ministry of Education sets out calculations to assess the degree to which a school is below, at, or over capacity. These calculations are used by the province to determine which school projects are funded each year. If a school is “over capacity”, the provincial government may approve portable classrooms or a new project to add space to a school. It is anticipated that South Corman Park School and Clavet School</p>



**Table 7.1
Received Written Comments
Proposed Poplar Point Development**

Stakeholder	Written Comments	Developer Response to Concerns
		<p>would have capacity for any additional students added by the proposed Poplar Point development but will be confirmed by the Community Planning Branch prior to subdivision approval.</p> <p>5. The proposed development meets the minimum and maximum site sizes of the DCR-1 zoning district.</p>
Janet Rawlyk	Too much traffic on Clarence Avenue already.	<p>A TIA was undertaken by WSP in the fall of 2023. Total forecast growth volumes were assessed using Synchro 11.0 (industry-standard traffic analysis software). Level of Service (LOS) analysis was completed, which assesses the effectiveness of a transportation system, with LOS “A” equating to the best operating conditions and LOS “F” representing the failure of a movement or intersection. The proposed development is estimated to generate 11 vehicle trips (3 inbound and 8 outbound) during the morning peak hour and 14 vehicle trips are anticipated during the afternoon peak hour (9 inbound and 5 outbound). It was concluded that the very low traffic volume that would be generated by this development would not impact the operations on Grasswood Road and at the Clarence Avenue and that it is anticipated that the surrounding transportation network can adequately accommodate the proposed development.</p>
Evan Pachal	Oppose to development (no specific concern cited).	N/A



APPENDICES



LIST OF APPENDICES

APPENDIX A – PLAN OF PROPOSED SUBDIVISION

APPENDIX B – CORRESPONDENCE WITH CORMAN PARK

APPENDIX C – TRAFFIC IMPACT ASSESSMENT AND PUBLIC WORKS CORRESPONDENCE

APPENDIX D – HYDROGEOLOGICAL STUDY AND WASTEWATER TREATMENT CORRESPONDENCE

APPENDIX E – POTABLE WATER CORRESPONDENCE

APPENDIX F – DRAINAGE STUDY AND PLANS

APPENDIX G – CORRESPONDENCE WITH LORAAS DISPOSAL

APPENDIX H – HERITAGE QUERY

APPENDIX I – ENVIRONNEMENTAL QUERY

APPENDIX J – GEOTECHNICAL STUDY

APPENDIX K – CORRESPONDENCE WITH SASKENERGY

APPENDIX L – PUBLIC CONSULTATION

APPENDIX M – SCHOOL CORRESPONDENCE

APPENDIX A

PLAN OF PROPOSED SUBDIVISION

APPENDIX B

SETBACK CORRESPONDENCE WITH CORMAN PARK

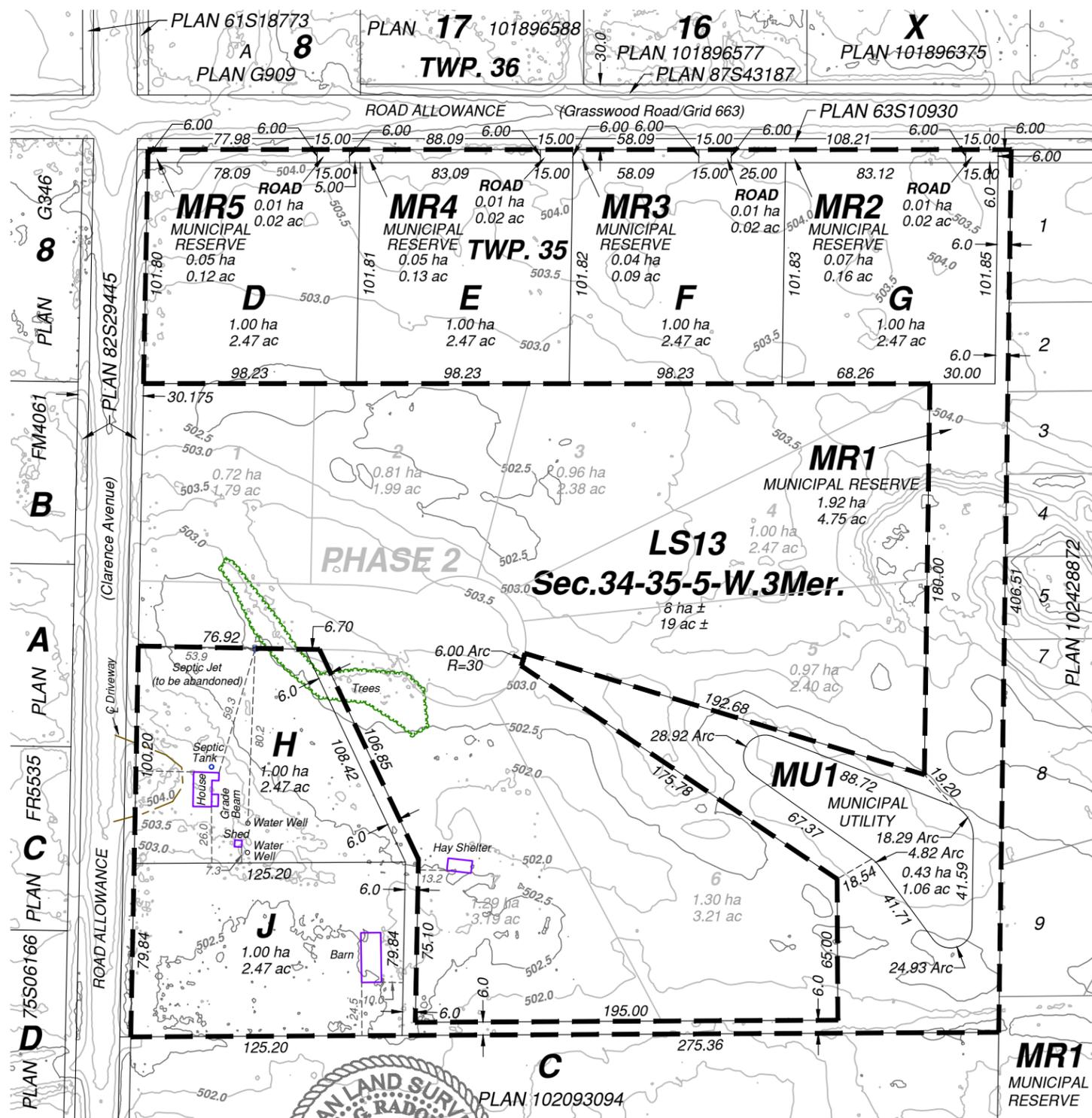
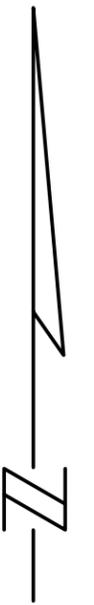
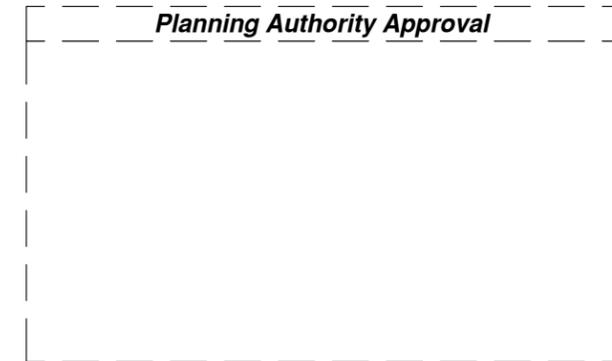
PLAN OF PROPOSED SUBDIVISION

OF PART OF
LS 13 SEC.34-TWP.35-RGE.5-W.3Mer.
R.M. of CORMAN PARK No. 344, SK

SCALE 1:2500

NOTES

PRELIMINARY SURVEY DONE ON AUGUST 11, 2022.
 PORTION TO BE SURVEYED IS OUTLINED IN A HEAVY DASHED LINE, AND CONTAINS
8.58 ha. (21.20 acres).
 MEASUREMENTS ARE IN METRES AND DECIMALS THEREOF.
 DISTANCES ARE APPROXIMATE AND MAY VARY BY ± 5 METRES.
 STANDARD ROAD ALLOWANCE SHOWN ARE 20.117m IN WIDTH.
 SOURCE PARCEL NUMBER IS 145948641.
 SOURCE PARCEL DIMENSIONS AND AREAS ARE DERIVED FROM ISC PARCEL MAPPING.
 TITLE TO THE DEDICATED LANDS SHOWN HEREON IS TO ISSUE TO
 THE: R.M. of CORMAN PARK
 111 PINEHOUSE DRIVE
 SASKATOON, SK
 S7K 5W1
 CONTOUR ELEVATIONS SHOWN ARE DERIVED FROM OTHERS.
 CONTOUR INTERVAL = 0.5m



Murray G. Radoux
 Murray G. Radoux
 Saskatchewan Land Surveyor



Representative of 102139536 Saskatchewan Ltd.
 Approval: Owner LS 13 SEC.34-TWP.35-RGE.5-W.3Mer.

No.	REVISIONS	DATE	DR.	CH.
6	Adjust Parcel D-G, Add MR2-MR5 and ROAD	March 3, 2026	kmh	mgr
7	Adjust ROAD locations	March 4, 2026	kmh	mgr
FILE: SA222943		DWG.: SA222943DEV-R7		



From: [Kristie Muzyka](#)
To: [Maggie Schwab](#)
Subject: RE: Surrounding Land Uses - Poplar Point
Date: Tuesday, January 30, 2024 2:45:03 PM
Attachments: [image004.png](#)
[image005.png](#)
[image006.png](#)
[image007.png](#)

Good afternoon Maggie,

There are no ILOs with approvals that Corman Park is aware of within a setback distance of LSD 13-34-35-5-W3. The surrounding land uses are primarily country residential developments, which is in line with the P4G OCP District Land Use Map.

Kristie Muzyka, Planner I

Phone: 306-975-1646

111 Pinehouse Drive, Saskatoon, SK S7K 5W1



From: Maggie Schwab <mschwab@crosbyhanna.ca>
Sent: Tuesday, January 30, 2024 2:27 PM
To: Kristie Muzyka <kmuzyka@rmcormanpark.ca>
Subject: Surrounding Land Uses - Poplar Point

Afternoon Kristie,

As you know, we are working with the Developers of Poplar Point at the NW-34-35-05-W3M.

I'm wondering if you could confirm that there are no land use conflicts with the proposed development? I've attached correspondence we received from the RM of Corman Park concerning the Edgemont East development, which is adjacent to Poplar Point (attached to this email). Is it safe to assume the same conclusion concerning land use conflicts is true for Poplar Point?

Thanks,

Maggie Schwab RPP MCIP

CROSBY HANNA & ASSOCIATES

407C 1st Ave N, Saskatoon, SK S7K 1X5

t : 306.665.3441

c: 306.227.6617

e : mschwab@crosbyhanna.ca

www.crosbyhanna.ca



Our office is getting ready to move in the near future! Please be patient with

us for any delays

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APPENDIX C

TRAFFIC IMPACT ASSESSMENT AND PUBLIC WORKS COMMENTS

From: [Kristie Muzyka](#)
To: [Maggie Schwab](#)
Cc: [Adam Toth](#)
Subject: Poplar Point Traffic and Approach Analysis
Date: Monday, January 22, 2024 11:05:18 AM
Attachments: [image001.png](#)

Good morning Maggie,

Our Public Works department got back to me regarding the updated information provided for the proposed approaches that will be directly off Grasswood Rd. (Twp Rd. 360). They commented that although it is not desirable to have direct access to Grasswood Rd. for these 4 lots, our existing policies and standards do not prevent it and your analysis demonstrates minimal added traffic from these lots. They further commented that they will be creating an access/approach standard in the near future that would provide more appropriate spacing requirements based on roadway classifications.

Sincerely,

Kristie Muzyka, Planner I

Phone: 306-975-1646

111 Pinehouse Drive, Saskatoon, SK S7K 5W1





2023-10-17

Riley Ness
102139536 Saskatchewan Ltd.
1814 Easthill
Saskatoon, SK S7J 3C1

Subject: Traffic Study for Residential Development at Grasswood Road and Clarence Avenue S

Dear Mr. Ness:

WSP Canada Inc. (WSP) was retained to complete a traffic and access review for the proposed residential development located in the southeast quadrant of the Clarence Avenue S and Grasswood Road intersection in the Rural Municipality (RM) of Corman Park No. 344. The proposed development includes four residential lots with driveway access from each lot to Grasswood Road as well as a cul-de-sac with eight residential lots accessed from Clarence Avenue S.

EXISTING CONDITIONS

ROAD NETWORK

Grasswood Road is a paved two-lane road with a posted speed limit of 80 km/h. Clarence Avenue S is a paved two-lane road with a posted speed limit of 80 km/h south of Grasswood Road and 60 km/h north of Grasswood Road. The intersection of Grasswood Road and Clarence Avenue S is all-way stop-controlled. East of the intersection, Grasswood Road connects to Highway 11 and north of the intersection, Clarence Avenue S connects to the City of Saskatoon.

ADJACENT DEVELOPMENT

There is existing residential development in the northeast and southwest quadrants of the Grasswood Road and Clarence Avenue S intersection. On both Grasswood Road and Clarence Avenue S, there are existing residential driveways. The existing driveway spacing on Grasswood Road, east of Clarence Avenue S, and on Clarence Avenue S, south of Grasswood Road is illustrated in **Figure 1**.

203 Wellman Crescent
Saskatoon, SK
Canada S7T 0J1

T: +1 306 665-6223
F: +1 306 665-8589
wsp.com



Figure 1: Grasswood Rd Driveway Spacing

TRAFFIC VOLUMES

A turning movement count was conducted at the Grasswood Road and Clarence Avenue S intersection on Tuesday, August 29, 2023 and Wednesday, August 30, 2023. Traffic volumes were collected during peak commuter hours including the weekday morning peak period (7:00-9:00 a.m.) and the weekday afternoon peak period (4:00-6:00 p.m.). The weekday morning and afternoon peak hour traffic volumes are illustrated in **Figure 2**.

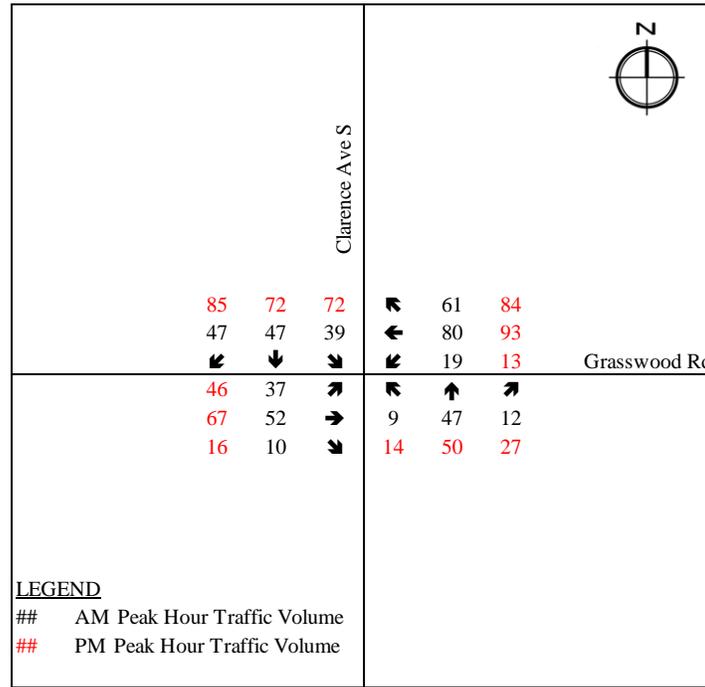


Figure 2: Weekday Peak Hour Traffic Volumes

TRAFFIC OPERATIONS

Traffic operations analysis was conducted for the existing condition at the Clarence Avenue S and Grasswood Road intersection in Synchro and SimTraffic 11. The Synchro results for level-of-service (LOS), vehicular delay, and volume-to-capacity (v/c) ratio and SimTraffic results for 95th percentile queues are shown in **Table 1**.

Table 1: Existing Traffic Operations

	EB L	EB T	EB R	WB L	WB T	WB R	NB L	NB T	NB R	SB L	SB T	SB R	Overall
AM Peak													
LOS	A	A	A	A	A	A	A	A	A	A	A	A	A
Delay (s)	9.1	9.1	9.1	9.2	9.2	9.2	8.8	8.8	8.8	9.4	9.4	9.4	9.2
v/c	0.19	0.19	0.19	0.25	0.25	0.25	0.12	0.12	0.12	0.25	0.25	0.25	0.25
95th % Q (m)	15.0			18.0			15.7			17.0			--
PM Peak													
LOS	B	B	B	B	B	B	A	A	A	B	B	B	B
Delay (s)	10.2	10.2	10.2	11.0	11.0	11.0	9.7	9.7	9.7	11.4	11.4	11.4	10.8
v/c	0.25	0.25	0.25	0.37	0.37	0.37	0.18	0.18	0.18	0.39	0.39	0.39	0.39
95th % Q (m)	15.9			20.0			16.7			19.9			--

The traffic operations analysis results show that under existing conditions, the study intersection operates very well, with limited short delays for stopped traffic and no significant queuing. The westbound 95th percentile queue is anticipated to reach 20 m during the afternoon peak hour, which leaves 80 m between the back of the queue and the nearest existing driveway on Grasswood Road.

PROPOSED DEVELOPMENT

SITE PLAN

The proposed site plan for the development is illustrated below in **Figure 3**. The lots labeled as D, E, F and G and Lots 1-8 in Figure 3 would be developed with one single-family home per lot. One access to each Lot D, E, F and G is being proposed to Grasswood Road, opposite the four existing driveways to the properties on the north side of Grasswood Road, previously illustrated in Figure 1. The access to Lots 1-8 would be provided from Clarence Avenue S via a cul-de-sac. The cul-de-sac is located approximately 175 m south of Grasswood Road, across from an existing driveway (i.e., the second driveway south of Grasswood Road).

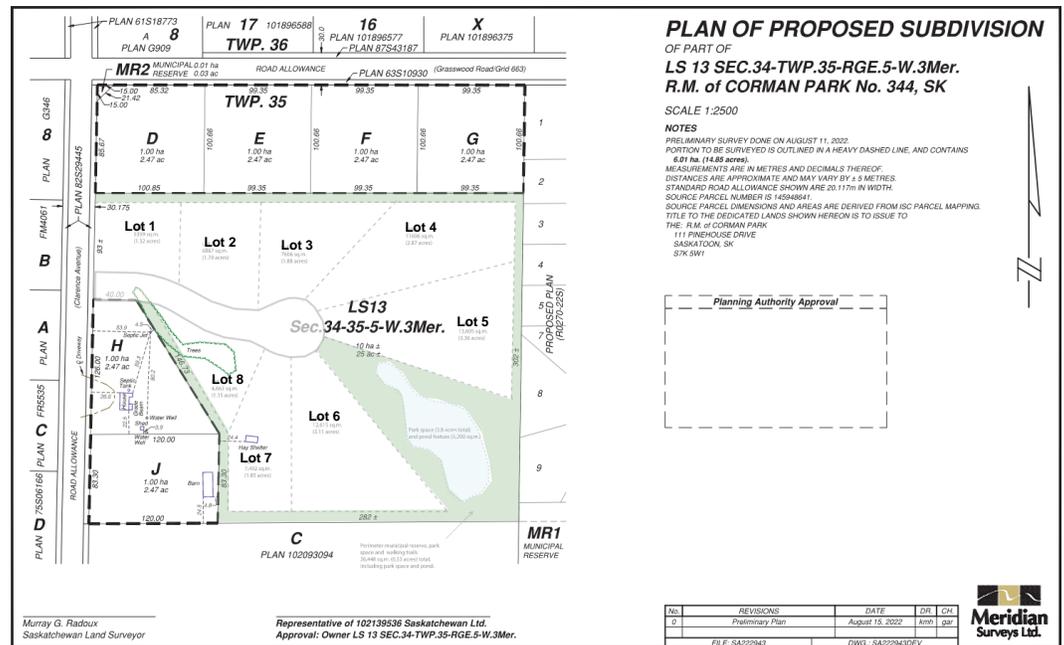


Figure 3: Proposed Site Plan

TRIP GENERATION

Institute of Transportation Engineers (ITE) *Trip Generation Manual (11th Edition)* was used to estimate development traffic for the proposed residential lots, shown in **Table 2**.

Table 2: Development Trip Generation

Lots	ITE LAND USE	AM Peak Hour			PM Peak Hour		
		Total Trips	Inbound Trips	Outbound Trips	Total Trips	Inbound Trips	Outbound Trips
Lots D-G	Single-Family Detached Housing (Land Use Code 210)	4	1	3	5	3	2
Lots 1-8	Single-Family Detached Housing (Land Use Code 210)	7	2	5	9	6	3
Total		11	3	8	14	9	5

The proposed development is estimated to generate 11 vehicle trips (3 inbound and 8 outbound) during the morning peak hour and 14 vehicle trips during the afternoon peak hour (9 inbound and 5 outbound). Based on existing traffic on Grasswood Road, the distribution of traffic is 61% westbound vs. 39% eastbound during the morning peak hour and 53% westbound vs. 47% eastbound during the afternoon peak hour. On Clarence Avenue S, the distribution of traffic is 47% northbound and 53% southbound in both peak hours. As such, it is estimated that an additional 4 vehicle trips will be added to the Grasswood Road and Clarence Avenue S intersection during the morning peak hour and 6 trips will be added to the intersection during the afternoon peak hour. As this is a very low volume, the impacts on traffic operations on Grasswood Road and at the Clarence Avenue S and Grasswood Road intersection are expected to be minimal.

ACCESS SPACING

The proposed site plan shows that the driveway for each residential lot along Grasswood Road (i.e., Lots D-G) is directly opposite of the four existing driveways on Grasswood Road without offset, so the driveway spacing will be the same as existing conditions. The driveway spacing ranges from 70 m to 130 m with the first driveway 105 m away from the Clarence Avenue S and Grasswood Road intersection. Lots 1-8 are proposed to be accessed via a cul-de-sac that intersects with Clarence Avenue S approximately 175 m south of Grasswood Road.

The Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (TAC Manual) addresses access spacing on rural roads in Chapter 8. Based on the characteristics of Grasswood Road and Clarence Avenue S (i.e., traffic volume, speed, etc.) they are assumed to be of a rural collector classification. Section 8.3.4 of the TAC Manual specifies that a private access to a collector road should be located a minimum of 400 m from an intersection and that the distance between accesses should be a minimum of 150 m. However, Section 8.3.4 indicates that rural collectors “represent a network of roads providing access to important market areas serving agricultural, commercial, industrial and recreational needs.” As the surrounding area is largely residential in nature and the proposed driveways are providing access to single-family homes, a reduced access spacing could be considered.

The proposed driveways are projected to carry a very low volume of traffic with less than 15 peak hour trips distributed between the five proposed driveways. As a result, the number of conflicts with traffic on Grasswood Road and on Clarence Avenue S is not anticipated to be significant and is not anticipated to create significant operational impacts.

In addition, the proposed driveways located on Grasswood Road as well as the cul-de-sac on Clarence Avenue S are located opposite existing driveways and therefore do not impact existing driveway spacing on Grasswood Road or Clarence Avenue S.



STUDY FINDINGS

The study demonstrated that the Clarence Avenue S and Grasswood Road intersection operates well under the existing condition and trip generation from the proposed residential development is very low. The proposed driveways and accesses for the development are located opposite existing driveways; therefore, access spacing along Grasswood Road and Clarence Avenue S is not altered. Based on these findings it is anticipated that the surrounding transportation network can adequately accommodate the proposed development.

Yours sincerely,

Kristen Faber, P.Eng.
Transportation Planning Engineer

WSP ref.: CA0007380.7204

APPENDIX D

HYDROGEOLOGICAL STUDY AND WWT CORRESPONDENCE

From: [Currie, Katherine GR](#)
To: [Kristie Muzyka](#); [Maggie Schwab](#)
Cc: [Kevin Traves](#); [Adam Toth](#)
Subject: RE: Additional Information Required RE: SUBD-000503-2022 - current PPS dated Nov 27, 2023
Date: Thursday, July 11, 2024 8:06:12 AM
Attachments: [image001.png](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)
[image005.png](#)

Kristie,

Per the information below, Upon consulting with SHA, they indicated it would be acceptable for the developer's proposal to use the NSF 245 standard for nitrogen reduction (example: advanced bio-barrier or comparable system) as discussed with the following caveat to be addressed specifically within the servicing agreement with the RM of Corman Park – **should the system be replaced in the future *it will need to meet or exceed the NSF 245 standard for nitrogen reduction and that there would be no deviation from that requirement.*** By registering this requirement on title within the servicing agreement, the RM ensure all future property owners are aware of the system requirements now and if any system changes are made in the future.

Since these systems are under the jurisdiction of the RM to ensure permitting takes place at the time development on the parcels occurs, this email was provided to the RM of Corman Park such that it could be included within any servicing agreement registered on title for the subdivision development. To reiterate, SHA indicated the acceptable onsite sewage disposal systems are required “to meet or exceed the NSF 245 standard for nitrogen reduction” at initial install and in the case of any required future system upgrades. A lesser system would not be accepted by SHA.

I hope this clarifies the previously provided information. Please call me if you have any further questions, or if you would like the contact information for the supervisor at SHA I discussed this with, I would be happy to provide his contact information to you.

Thank you.

Sincerely,

Katherine M. Currie, RPP MCIP
Government of Saskatchewan
Senior Planning Consultant
Community Planning, Ministry of Government Relations

978 – 122 3rd Avenue North
Saskatoon Saskatchewan S7K 2H6

Phone: 306-933-5380
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From: Kristie Muzyka <kmzyka@rmcormanpark.ca>
Sent: Monday, June 24, 2024 9:05 AM
To: Currie, Katherine GR <katherine.currie@gov.sk.ca>; Maggie Schwab <mschwab@crosbyhanna.ca>
Cc: Kevin Traves <ktraves@bcl-eng.ca>; Adam Toth <atoth@rmcormanpark.ca>
Subject: RE: Additional Information Required RE: SUBD-000503-2022 - current PPS dated Nov 27, 2023

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Good morning Katherine,

I apologize for the delayed response to this, our Public Works department is quite busy right now and I had to forward this question to them for review.

Can you please clarify, is SHA acceptable to the proposed options? It's not clear with the information below whether this is a fully acceptable option by SHA. Corman Park does not have any septic experts on staff, and SHA approves permits for septic within Corman Park, so in the end whatever system is acceptable and Approved by SHA is what Corman Park would be comfortable with.

Sincerely,
Kristie Muzyka, RPP, MCIP
Planner 1
Ph: 306-975-1646, 111 Pinehouse Dr., Saskatoon, SK



From: Currie, Katherine GR <katherine.currie@gov.sk.ca>
Sent: Friday, May 31, 2024 2:59 PM
To: Maggie Schwab <mschwab@crosbyhanna.ca>
Cc: Kevin Traves <ktraves@bcl-eng.ca>; Kristie Muzyka <kmzyka@rmcormanpark.ca>; Adam Toth

<atoth@rmcormanpark.ca>

Subject: RE: Additional Information Required RE: SUBD-000503-2022 - current PPS dated Nov 27, 2023

Hi Maggie

Great seeing you too.

I will double check as I was going off the review information – it may not have reflected rezoning from DAR1. If that's the case then, yes you are absolutely correct on the setbacks.

With respect to the sewage systems and the Thurber report, Eric and I did review and discuss options. I also did a follow up with the SHA supervisor who did the review to discuss options and future concerns if the system would need replacement. Part of our concern would be for “future replacement systems” and the standard that would have to be maintained in order for future landowners to not be required to have to do a site level assessment on individual properties at that time, versus doing a site level assessment on the entire development now.

It appears we may be able to accept the developer proposal to use the NSF 245 standard for nitrogen reduction (advanced bio-barrier) as discussed with the following caveat, that would need to be addressed specifically within the agreement with the RM of Corman Park – should the system be replaced in the future it will need to meet or exceed the NSF 245 standard for nitrogen reduction and that there would be no deviation from that requirement. The RM could register this on title under S. 235 of the PDA. We would require a copy of the agreement(s) from the RM indicating the above has been addressed.

If you have any questions feel free to contact me. I have kept the RM copied on this so they are aware of this option for the onsite sewage disposal.

Sincerely,

Katherine M. Currie, RPP MCIP
Government of Saskatchewan
Senior Planning Consultant
Community Planning, Ministry of Government Relations

978 – 122 3rd Avenue North
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Saskatchewan 

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From: Maggie Schwab <mschwab@crosbyhanna.ca>

Sent: Friday, May 31, 2024 2:32 PM

To: Currie, Katherine GR <katherine.currie@gov.sk.ca>

Cc: Kevin Traves <ktraves@bcl-eng.ca>; Kristie Muzyka <kmuzyka@rmcormanpark.ca>; Adam Toth <atoth@rmcormanpark.ca>

Subject: RE: Additional Information Required RE: SUBD-000503-2022 - current PPS dated Nov 27, 2023

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Hi Katherine,

In the DCR-1 zoning district, the setbacks as it relates to the barn are as follows:

- Minimum side yard setback is 3 m
- Minimum rear yard setback is 10 m.

Given the above, I believe the barn meets the required setbacks, correct?

The existing septic treatment system on Parcel H will be replaced with whatever system is required, as a part of this subdivision application. The proponent has not applied for a new system, as he is waiting on review by CPB (and previously by SHA, but it depends on your decision about supporting an advanced wastewater treatment system without having to do another hydrogeological report). In any case, it is the intent to replace the existing system.

The Developer (Kevin Traves) does have written confirmation on potable water supply. He can provide you with the necessary documentation.

Thanks and it was great to see you today!

Maggie

Maggie Schwab RPP MCIP

CROSBY HANNA & ASSOCIATES

407C 1st Ave N, Saskatoon, SK S7K 1X5

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From: Currie, Katherine GR <katherine.currie@gov.sk.ca>

Sent: Thursday, May 30, 2024 4:52 PM

To: Maggie Schwab <mschwab@crosbyhanna.ca>

Cc: Kevin Traves <ktraves@bcl-eng.ca>; Kristie Muzyka <kmuzyka@rmcormanpark.ca>; Adam Toth <atoth@rmcormanpark.ca>

Subject: Additional Information Required RE: SUBD-000503-2022 - current PPS dated Nov 27, 2023

Hi Maggie,

Just a few comments on the revised PPS dated November 27, 2023 provided this morning:

1. Our office will require a copy that is signed and stamped by the SLS.
2. The datum reference (CGVD) is required in the notes section of the PPS for reference.
3. Items noted in the Acknowledgement Letter that have not been addressed in Rev 3 of the PPS:
 - a. Proposed Parcel H – the existing septic jet setback distance does not meet the Onsite Sewage Disposal requirement of 60 metres to property lines. The options to address this would be to (i) relocate the property boundaries or (ii) to upgrade the sewage system that appropriately meets the setback requirements. If the system will be (or has been since the application was submitted) upgraded, our office requires a copy of the approved SHA permit and the PPS should be amended with the location of the new system.
 - b. Proposed Parcel J – the barn does not meet the minimum setback requirement to the new east parcel boundary. It appears a minimum of 15 metres is required. Please confirm the setback with the RM and have the PPS amended accordingly to ensure the site is conforming to municipal zoning requirements.

Additionally, has the developer obtain written confirmation that connection to the water utility is available for the proposed development? We will require confirmation that there is capacity from SaskWater to provide the connection allocations to the water utility which services this area or that an alternate water supply is available for the development.

Let me know if you have any questions regarding the above.

Sincerely,

Katherine M. Currie, RPP MCIP
Government of Saskatchewan
Senior Planning Consultant
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978 – 122 3rd Avenue North
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From: Maggie Schwab <mschwab@crobyhanna.ca>
Sent: Thursday, May 30, 2024 9:15 AM
To: Currie, Katherine GR <katherine.currie@gov.sk.ca>
Cc: Kevin Traves <ktraves@bcl-eng.ca>
Subject: RE: SUBD-000503-2022 - current PPS

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Morning Katherine,

I have attached the most recent PPS. Let me know if you need anything further. Thank you for checking into our question about the septic system/hydrogeological report.

Thanks,

Maggie Schwab RPP MCIP
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From: Currie, Katherine GR <katherine.currie@gov.sk.ca>
Sent: Thursday, May 30, 2024 8:58 AM
To: Maggie Schwab <mschwab@crobyhanna.ca>
Subject: SUBD-000503-2022 - current PPS

Hi Maggie,

While I'm looking into the file and discussion we had yesterday, what is the recent PPS you

have for this subdivision? That last on I see on file is dated August 22, 2022 Revision 1

Sincerely,

Katherine M. Currie, RPP MCIP
Government of Saskatchewan
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THURBER ENGINEERING LTD.

Desktop Hydrogeological Investigation

Proposed Residential Subdivision LS13 34-35-5 W3M RM of Corman Park

Client Name: 102139536 Saskatchewan Ltd.

Date: July 5, 2023

File: 37139-20



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THURBER ENGINEERING LTD.

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Geological Cross Section

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WSA water wells within 0.8 km

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Groundwater Results

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Borehole Logs



1. INTRODUCTION

At the request of 102139536 Saskatchewan Ltd., Thurber Engineering Ltd. (Thurber) has conducted a desktop hydrogeological investigation for a proposed residential subdivision (the Site) located at LS 13 Section 34-035-05 W3M in the rural municipality (RM) of Corman Park, Saskatchewan.

The project was conducted in general accordance with The Groundwater Regulations, Ground Water Approval Process, and Groundwater Under the Direct Influence of Surface Water Acts issued by the Saskatchewan Government. The hydrogeological investigation was carried out in general accordance with our proposal to Mr. Riley Ness and Mr. Kevin Traves dated April 6, 2023, and was completed in conjunction with a geotechnical investigation of the Site which is reported under separate cover. Thurber received notice to proceed on May 9, 2023.

It is a condition of this report that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

1.1 Objectives

The objectives of the report are:

- to address whether the development of water wells at the Site is feasible or if alternative water supply measures are more appropriate (i.e., water delivery from a licensed water hauler and on-Site storage in cisterns / water holding tanks).
- to address whether the development of onsite wastewater treatment systems (OWTS) at the Site is feasible or if other wastewater treatment measures are more appropriate (i.e., connection to municipal wastewater treatment systems).
- to provide recommendations for further investigation, if required.

1.2 Scope of Work / Methodology

The desktop investigation will comprise of the following:

- Review of existing published information and data (i.e., soil and aggregate reports, Saskatchewan water well database, topographic, hydrogeological, and geological reports/maps) for the area
- Review of Septic Suitability reports for adjacent subdivision developments (if available)



- Review of the groundwater quality in the area
- Review of available reports for nearby developments
- Review of existing water wells within a 3.5 km radius of the Site.

The results of the geotechnical investigation (Thurber, 2023) were incorporated into the assessment where appropriate. A field well verification was not conducted as part of this project.

2. SITE DESCRIPTION AND HYDROGEOLOGICAL SETTING

The Site consists of about 29.8 acres (12.1 hectares) and is located south of Saskatoon, Saskatchewan, at the southeast corner of the intersection of Grasswood Road and Clarence Avenue, as shown on Drawing 37139-1 in Appendix A. The Site is currently under agricultural development and the subdivision is proposed to consist of 14 to 16 country residential lots and one lot dedicated to park space as shown on Drawing 37139-2 in Appendix A.

2.1 Site Topography

The topography of the Site is relatively flat with a slight slope (~2%) to the south/southeast with surface elevations ranging from 505 m asl at the northern property boundary to 502 m asl at the southern property boundary. The site is located within the south Saskatchewan River basin.

The nearest permanent surface water body is the south Saskatchewan River, approximately 4.8 km west of the Site. A seasonal slough is located in the southeast corner of the site and more permanent sloughs are located 0.5 km south of the site.

2.2 Site Geology

The regional stratigraphy was developed from a review of published literature, and from regional borehole logs from the Saskatchewan Watershed Authority water well database.

The surficial geology in the area consists of approximately 5 to 20 m of silts, sands, and gravels identified as the upper section (or part thereof) of the Haultain unit; which rests on 10 to 30 m of clays, silts, and sands of a lower portion of the Haultain unit (MDH 2011). The Surficial Stratified Deposits rest upon till of the Battleford Formation, whose thickness in the area varies considerably ranging between approximately 4 m and over 100 m.

Data from the Saskatchewan Geological Atlas (Saskatchewan Energy & Resources, 2014) indicates the surficial deposits to be of deltaic origin with hummocky eolian landforms

indicating subsequent modification by wind. Alternatively, prior mapping for the Lands Branch (Christiansen 1979) as part of their Regional Studies Program, indicate a predominantly lacustrine deltaic depositional environment, albeit with subordinate eolian areas or characteristics.

The bedrock in the area consists of units of the Grey Marine claystone, shale and siltstone of the Montana group of the Bearpaw Formation (MDH 2011) that are overlain by the till of the Battleford Formation. A cross section (Cross Section H-H' MDH 2011) showing the stratigraphy in the area around Site is included in Appendix B. From west to east, boreholes nearest the site are: 32257, 32112, 210619 (E side of river), 31902, 31757 and 31756. Borehole 31902 lies approximately 3 km southwest of the proposed development area.

2.3 Hydrogeology

2.3.1 Regional Hydrogeology

The aquifers in the area primarily consist of Surficial Stratified Deposits. These deposits are composed of sediments that were deposited after the retreat of glaciers, collectively referred to as Surficial Stratified Deposits. On average, these deposits have a thickness of 11 meters. The depth, thickness, and distribution of individual gravel, sand, silt, and clay layers within these deposits varies, and the hydraulic connectivity between these units varies.

Based on available groundwater investigations, the following hydraulic properties have been summarized for the Surficial Stratified Deposits aquifers in the Saskatoon 73B area:

- Transmissivity ranging from 0.0015 square meters second day to 0.46 square meters per second.
- Storativity varying between 0.003 and 0.20.
- Hydraulic conductivity ranging from 2.6×10^{-4} meters per second to 2.2×10^{-3} meters per second.

Groundwater flow within the Surficial Stratified Deposits will be strongly topographically influenced. The groundwater flow pattern within this unit will be generally focused towards sloughs and depressions on a local and toward the river valleys on a regional scale. The infiltration of meteoric water predominantly recharges this aquifer in the study area (MD 2011).

Surficial Stratified Deposits in the majority of the Saskatoon 73B area are susceptible to contamination from a surface source. The vulnerability of surficial aquifers will be dependent on

the lithologies and thickness of any aquitard sediments near surface within the Surficial Stratified Deposits (MDH 2011).

Beneath the Surficial Stratified Deposits, the Judith River Aquifer is the most extensive aquifer in the region. The Judith River Formation consists of clays, silts, and sands that were deposited during the Upper Cretaceous period in a non-marine shoreline environment, typical of deltaic deposits (McLean 1971). This formation is primarily found in the southern half of the Saskatoon 73B area. In Saskatchewan, the sediments of the Judith River Formation create a significant aquifer known as the Judith River Aquifer. However, this aquifer is not commonly utilized as a source of freshwater due to its highly mineralized water and the presence of shallower aquifers. The Judith River Aquifer in the Saskatoon 73B area is laterally discontinuous, mainly due to extensive faulting, making it suitable for only low volume usage. Additionally, there are shallower aquifers in the study area that are more easily accessible.

Although there is limited data on the hydraulic conductivity of the Judith River Aquifer in the Saskatoon 73B area, it is known that third-party measurements exist. Kewen and Schneider (1979) reported hydraulic conductivities ranging from 1.9×10^{-6} m/s to 1.7×10^{-5} m/s, with an average of 7.1×10^{-6} m/s. These values can be considered representative of the overall hydraulic conductivities within this unit (MDH 2011).

2.3.2 Site Hydrogeology

Consistent with the regional hydrogeology information, two main aquifers are expected beneath the Site: the Surficial Stratified Deposits and the Judith River Aquifer.

The Surficial Stratified Deposits were encountered during the geotechnical investigation (Thurber, 2023) extending to greater than 11 m below ground surface (bgs). The one documented well (WWDR#: 233937) located on the Site is installed within the Surficial Stratified Deposits. The well was drilled in 2014 for domestic use and has a recommended pumping rate of 15.1 L/minute (4 igpm). The well is 30 inches in diameter and is screened from 3.0 to 16.1 m (10 to 53 feet). The well is installed in silty sands and silty clays. Groundwater in the Surficial Stratified Deposits in the site area is expected to follow local topography and flow to the southeast. Onsite monitoring wells indicate groundwater is encountered between 1.5 and 3 m below ground surface (bgs).

Till of the Battleford Formation forms an aquitard between the Surficial Stratified Deposits and the Judith River Aquifer. The geotechnical investigation (Thurber 2023) did not encounter the Battleford Till on Site, the maximum depth of investigation was 11 m.



The Judith River Aquifer is expected to be present beneath the Site at depths of 100 to 140 m bgs; however, no deeper boreholes or wells are present within the Site to confirm the depth. The Judith River Aquifer is rarely used due to its highly mineralized water. Water movement in the Judith River Aquifer is not well studied or understood and has a complex surface in the area due to regional faulting and discontinuities (MDH 2011),.

2.4 Hydrogeological Cross Sections

The Regional hydrogeological cross section (Drawing 37319-3 in Appendix A) depicts a surficial aquifer characterized by a relatively flat potentiometric surface, with water levels following local topography. The diagram shows a shallow unconfined aquifer, also known as a surficial aquifer, composed of permeable sand with some less permeable clay layers extending up to 40 m bgs, beneath the Surficial Stratified Deposits lies approximately 100 m of Battleford till with some small sand and gravel layers which lies on top of bedrock of the Bearpaw formation/Judith River Aquifer.

In May 2023 Thurber conducted a Geotechnical investigation of the site which included drilling nine boreholes and completing seven boreholes as monitoring wells (Drawing 37319-4 in Appendix A), borehole logs are shown in Appendix E. The local hydrogeological cross section (Drawing 37319-5 in Appendix A) depicts a surficial aquifer characterized by a relatively flat potentiometric surface, with a mild gradient to the southeast. The diagram shows a shallow unconfined aquifer composed of permeable sand with some less permeable clay layers. The surficial deposits are part of the Surficial Stratified Deposits geologic/hydrogeologic layer. The aquifer is influenced by both direct infiltration from precipitation and lateral recharge from adjacent water bodies.

2.5 Well Survey

A well survey was compiled using the Water Security Agency (WSA) water wells database of Saskatchewan Water Well reports. There are 336 recorded wells within 3.5 km of the subject site. An image of the study area with water wells within a 3.5 km radius of the site is shown on Drawing 37139-5 in Appendix A. The water wells are classed by recorded usage as follows:

- 324 domestic
- 4 Research
- 8 Unclassified



From these 336 well records: the average installed depth is 16.1 m (53') bgs, and the average recommended pumping rate for the 115 wells that have data was 42.4 liters per minute (11.2 igpm).

There are 46 recorded wells within 0.8 km of the subject site (within the quarter section of the site or within the adjacent quarter sections). The water wells are classed by recorded usage as follows:

- 43 domestic
- One research
- Two unclassified

From these 46 well records, the installed depths ranged from 5.2 m (17') to 23.2 m (76') with an average depth of 12.8 m (42'), primarily installed within the Surficial Stratified Deposits. Of these, 16 wells included recommended pumping rates, which ranged from 4.5 L/min (1 igpm) to 113.7 L/min (25 igpm), with an average of 35.5 L/min (7.8 igpm). The well installation data for the wells within 0.8 km of the Site is summarized in Table 2.1.

One well (WWDR#: 233937) is recorded in the same quarter section as the Site. The well is associated with the existing residence in proposed Lot H within the western portion of the Site. Well 233937 has pumping test results indicating a pump test of 1 hour that ran at a pumping rate of 15.1 L/minute (4 igpm) and indicated a recommended pumping rate of 15.1 L/minute (4 igpm).

Table 2.1: Summary of Groundwater Records

Well ID	Location	Date Installed	Depth (m)	Diameter (m)	Recommended Pumping Rate (lpm)	Screen Length (m)	Screen Bottom (m)	Water Level (m)
31936	SW-03-36-05-3	1972.09.05	8.5	0.9	ND	ND	ND	ND
231830	NE-33-35-05-3	2020.09.14	18.3	1.1	27.28	14.63	18.29	3.66
56426	NE-33-35-05-3	1978.05.12	12.8	1.1	ND	ND	ND	ND
47555	NE-33-35-05-3	1976.05.03	8.2	0.04	27.28	0.91	8.23	1.83
49728	SW-03-36-05-3	1977.05.16	17.1	0.99	45.46	ND	ND	ND
81450	SW-34-35-05-3	1985.07.23	23.2	1.07	45.46	16.15	23.16	ND
80732	SE-04-36-05-3	1985.05.07	12.8	0.91	ND	ND	ND	ND
88799	SW-03-36-05-3	1988.07.08	15.9	1.12	ND	ND	ND	4.27
63466	SW-03-36-05-3	1980.09.03	13.7	1.02	ND	ND	ND	4.27
55468	SE-33-35-05-3	1978.08.03	14.0	0.76	45.46	14.02	14.02	ND
43819	NE-33-35-05-3	1975.04.23	6.71	0.038	27.28	0.91	6.71	2.13
31915	NE-33-35-05-3	1963.09.11	8.2	0.051	18.18	0.91	8.23	4.88
126585	NE-33-35-05-3	1984.08.30	12.2	0.91	27.28	7.62	12.19	3.96
62408	NE-33-35-05-3	1980.07.24	15.9	1.02	ND	ND	ND	4.27
108331	SE-34-35-05-3	1997.08.14	19.2	1.07	ND	10.67	18.29	7.32
60567	SW-03-36-05-3	1978.07.13	15.2	1.07	ND	ND	ND	2.74
31920	SW-34-35-05-3	1969.07.02	11.0	0.91	4.55	ND	ND	ND
120156	SE-34-35-05-3	2003.05.12	18.3	1.07	90.92	9.14	17.37	7.92
85610	SW-34-35-05-3	1987.07.23	15.9	0.91	ND	ND	ND	ND

Well ID	Location	Date Installed	Depth (m)	Diameter (m)	Recommended Pumping Rate (lpm)	Screen Length (m)	Screen Bottom (m)	Water Level (m)
104121	SE-33-35-05-3	1994.05.05	14.6	1.07	45.46	7.62	13.72	5.49
103289	NE-33-35-05-3	1993.07.05	19.2	1.07	ND	10.67	18.29	ND
233937	NW-34-35-05-3	2014.05.27	16.2	1.07	18.18	13.11	16.15	3.05
94229	SE-04-36-05-3	1988.11.25	9.5	0.91	ND	ND	ND	ND
108671	SE-03-36-05-3	1997.09.08	12.5	1.07	ND	8.23	11.58	3.05
225555	SE-33-35-05-3	2017.02.10	5.2	0.15	ND	3.05	5.18	ND
83332	SE-04-36-05-3	1986.09.05	7.9	0.91	ND	ND	ND	ND
239770	NE-33-35-05-3	2018.06.26	12.2	0.15	ND	ND	ND	3.66
9546	SW-03-36-05-3	1973.04.12	7.0	0.038	13.64	0.91	7.01	3.96
91778	NE-33-35-05-3	1988.10.17	10.7	1.22	ND	ND	ND	4.88
77248	NE-33-35-05-3	1983.05.30	12.2	1.22	ND	ND	ND	ND
31935	SW-03-36-05-3	1972.09.05	18.9	0.91	ND	ND	ND	ND
66369	NE-33-35-05-3	1981.04.29	10.7	0.91	ND	ND	ND	ND
239768	NE-33-35-05-3	2018.06.26	16.8	0.15	ND	ND	ND	3.05
95644	SW-03-36-05-3	1989.07.14	8.5	0.91	ND	ND	ND	ND
101916	NE-33-35-05-3	1992.08.18	40	1.07	ND	6.10	12.19	6.71
214032	SW-03-36-05-3	2008.10.30	12.2	1.07	40.91	11.28	15.85	3.66
9545	SW-03-36-05-3	1973.07.09	7.0	0.038	45.46	0.91	7.01	2.44
110464	SE-34-35-05-3	1998.11.24	14.6	1.07	ND	6.71	13.72	6.10
239769	NE-33-35-05-3	2018.06.26	15.2	1.52	ND	ND	ND	3.66

Well ID	Location	Date Installed	Depth (m)	Diameter (m)	Recommended Pumping Rate (lpm)	Screen Length (m)	Screen Bottom (m)	Water Level (m)
94227	NE-33-35-05-3	1989.04.02	9.1	0.91	ND	ND	ND	ND
45913	SW-34-35-05-3	1976.04.28	8.2	0.91	ND	ND	ND	ND
109247	NE-33-35-05-3	1998.04.28	14.6	1.07	ND	9.75	13.72	3.66
49727	SW-03-36-05-3	1977.05.16	12.2	0.31	22.73	ND	ND	ND
91779	SW-03-36-05-3	1988.10.14	18.3	1.07	ND	ND	ND	4.88
83606	34-35-05-3	1986.10.02	8.2	0.97	ND	ND	ND	ND
31914	NE-33-35-05-3	1971.07.22	10.1	0.91	ND	ND	ND	ND

Notes: ND=No Data

All wells completed within Surficial Stratified Deposits

The water well records from within 0.8 km are presented in Appendix C.



3. FEASIBILITY OF DEVELOPING WATER WELLS

Detailed determination of groundwater availability (i.e., a pumping test) is beyond the scope of this study; to address whether the development of water wells at the Site appeared feasible or if alternative water supply measures are more appropriate (i.e., water delivery from a licensed water hauler and on-Site storage in cisterns / water holding tanks).

3.1 Groundwater Potential

The analysis of the preliminary hydrogeological review indicated the following estimates of the surficial aquifer characteristics:

- The uppermost aquifer underlying the Site consists of Surficial Stratified Deposits.
- The transmissivity of the aquifer, which indicates its ability to transmit water, is estimated to be 130 square meters per day to 4,000 square meters per day.
- The hydraulic conductivity, representing the ease of water movement through the aquifer, is estimated to range from 2.6×10^{-4} meters per second to 2.2×10^{-3} meters per second.
- The storage capacity of the aquifer, indicating its ability to store water, was estimated to range between 0.003 and 0.20.

The anticipated water demand for the small residential development was estimated based on a conservative estimate of each lot housing a family of four and an average family of 4 requiring 1600 L/day. Using a maximum of 16 lots for the proposed development, a conservative estimate of potable water requirements is 25,600 L/day. The nearest water well (233937) has a recommended pumping rate of 15.1 L/min or 21,744 L/day. Installation of individual wells within the proposed development lots with similar capacities would provide sufficient volume to supply the development. Alternately two to three communal wells would also provide sufficient volume. The groundwater potential is likely sufficient to meet the projected water requirements of the development.

3.2 Groundwater Quality

Groundwater quality data was not available for the existing water well within the Site in the water well records; however, water quality within the Surficial Stratified Deposits beneath the Site is likely similar to available groundwater quality data from the wells in the surrounding area, which is summarized as follows:



- Clifton Associates conducted a hydrogeological investigation for the Grasswoods Estates subdivision approximately 1.6 km southeast of the project site (Clifton 2012). The report sampled monitoring wells from the Surficial Stratified Deposits in the area. The groundwater sampling results are presented in Appendix D. Drinking water quality guidelines (Saskatchewan Drinking Water Standards and Objectives) are presented for comparison purposes only. Geochemistry indicates that exceedances occur, most notably E.Coli., total coliforms, arsenic, barium, iron, lead, manganese, and uranium which exceeded the drinking water guidelines in some or all monitoring wells. Additionally one well exceeded the drinking water guidelines for alkalinity, magnesium, sodium, sulfur, hardness and TDS parameters.
- Clifton Associates conducted a hydrogeological investigation for the Bernhard subdivision approximately 1 km northwest of the project site (Clifton 2014). The report sampled monitoring wells from the Surficial Stratified Deposits in the area. Laboratory results indicated that exceedances occurred for Heterotrophic Plate Count (HPC), coliforms, iron, and manganese in all monitoring wells.
- SNC Lavalin conducted a cumulative nitrate impact assessment for the Edgemont Park Estates development located directly west of the site (SNC 2019). The report sampled monitoring wells from the Surficial Stratified Deposits in the area. The groundwater sampling results are presented in Appendix D. Drinking water quality guidelines (Saskatchewan Drinking Water Standards and Objectives) are presented for comparison purposes only. Geochemistry indicates that exceedances occur, most notably total dissolved solids, fluoride, sulphate, and coliforms which exceeded the SEQS residential water guidelines in some or all monitoring wells.

If site groundwater conditions are consistent with the hydrogeological reports from nearby properties treatment and monitoring of the groundwater will be required to achieve potability. Based on the local geologic and hydrogeologic conditions groundwater wells from this area are likely to fall under groundwater under direct influence of surface water guidelines (GUDI).

3.3 Water Supply Options

The following options for water supply to the site are available.

3.3.1 Groundwater

Groundwater underneath the site consists of two aquifers: the Surficial Stratified Deposits and the Judith River Formation.



The Surficial Stratified Deposits have the potential to supply sufficient volume of water to the Site; however, based on the shallow nature of the aquifer the use of groundwater would need to follow GUDI guidelines and require WSA approval. Hydrogeological investigations from nearby residential developments have reported drinking water quality guideline exceedances of metals, salinity, and biological parameters. As such, the water derived from the Surficial Stratified Deposits are not considered potable and would require treatment prior to use.

The deeper Judith River Formation is highly mineralized and would be prohibitively expensive to bring to potable water standards.

3.3.2 Reservoir Storage and Distribution

In the R.M. of Corman Park the nearby residential developments of Grasswood, Riverside Estates, Casa Rio & Casa Rio East have reservoir storage and distribution system for delivery of potable water to residents. Connection to this type of system is a feasible option to supply safe potable water.

3.3.3 Water Utility

The Dundurn Rural Water utility also supplies water to residences in the area of the proposed development and is a feasible option to supply safe potable water.

3.3.4 Water Delivery

Bulk water deliveries are available in Corman Park and a system of cisterns/water holding tanks could be developed for the site.

4. FEASIBILITY OF DEVELOPING ONSITE WASTEWATER TREATMENT SYSTEMS

Based on preliminary design plans available to Thurber the Site is anticipated to be classified as a medium density area (between 5 and 40 lots per quarter section) in a sensitive location (due to shallow groundwater conditions) according to the Saskatchewan onsite wastewater disposal guide (Government of Saskatchewan, November 2018). Medium density sites in a sensitive location have the following acceptable onsite wastewater treatment systems:

- Holding Tanks are acceptable in any area and can be installed by non-certified contractors.



- Pressure/Gravity absorption field systems: Geotechnical results indicate the required restrictive/limiting layers may not be present and absorption field systems may require installation of artificial restrictive/limiting layers.
- Type II Mounds: May be suitable for the site, possibly with the addition of a restrictive layer.
- Lagoons: unsuitable for the proposed development due to the setback requirements and site size requirements of being greater than 4 hectares (~10 acres).
- Package treatment plants with disposal: a conservative option and can be used at site.
- LFH at grade: not an option for the Site as it is not located in a forested area.

Factors such as favorable soil conditions, regulatory compliance, and environmental considerations need to be thoroughly assessed. Additionally, availability of infrastructure, long-term maintenance requirements, and a comprehensive cost analysis are crucial elements in determining the overall feasibility of implementing a OWTS and choosing which OWTS to use. Further investigations and assessments are recommended to make a final determination.

5. RECOMMENDATIONS

The findings indicate that the volume of groundwater supply may be sufficient to meet the needs of the Site. However, it is important to note that utilizing this groundwater would require on-going treatment including significant investment in infrastructure and maintenance to ensure its long-term sustainability.

Considering the financial implications and the potential challenges associated with managing an independent groundwater system, it is recommended that connection to local utilities be prioritized. Connecting to the existing water supply would provide a reliable and regulated source of water. Thurber recommends contacting the R.M. of Corman Park and the Dundurn Rural Water utility to assess the costs of both options and selecting the most cost effective option for water supply.

Implementing an onsite wastewater treatment system is a viable strategy for the site. There are several options that may be suitable for the site. A qualified OWTS engineer who is licensed and experienced in Saskatchewan will be required to assess the installation and operating costs of the options to allow for a full life cycle evaluation.



6. REFERENCES

Clifton Associates Bernhard Subdivision Investigation August 7, 2014

Christiansen, E.A., 1979: Geology of the Saskatoon Region, Saskatchewan; Report for Saskatchewan Municipal Affairs, 62p.

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Kewen, T.J. and Schnieder, A.T., 1979. Hydrogeologic Evaluation of the Judith River Formation in West Central Saskatchewan. Saskatchewan Research Council G 79-2.

March 1979.MDH Engineered Solutions, 2011: Hydrogeology Mapping of NTS Mapsheet Saskatoon 73B; Saskatchewan Watershed Authority, 81p, plus maps and sections. McLean, J.R., 1971.

Stratigraphy of the Upper Cretaceous Judith River Formation in the Canadian Great Plains. Saskatchewan Research Council, Geology Division, Report No. 11.

SNC Lavalin 2019. Updated Cumulative Nitrate Impact Assessment for SE-33-35-05W3M. Edgemont Park Estates. August 13, 2019.

Saskatchewan Ministry of Health. 2018. Saskatchewan Onsite Wastewater Disposal Guide. Third Edition, November 2018.

Saskatchewan Watershed Authority, May 24, 2013. Water Well database search well GIS Data Portal .<https://gis.swa.ca>.

Thurber Engineering Ltd. 2023.



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7. SIGNATURES/CLOSURE

We trust this information meets your present needs. If you have any questions, please contact the undersigned at your convenience.

Dan McCrank, P. Geo.
Senior Environmental Scientist

Date: July 5, 2023
File: 37139-20

Craig Campbell, P. Eng.
Review Engineer



STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

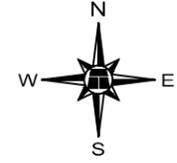
The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.



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APPENDIX A

Drawings



LEGEND

--- APPROXIMATE SITE BOUNDARY

AIR PHOTO FROM ESRI WORLD IMAGERY EXPORTED ON JUNE 9, 2023

536 SASKATCHEWAN LTD.

**DESKTOP HYDROGEOLOGICAL INVESTIGATION
PROPOSED RESIDENTIAL SUBDIVISION
LS13 34-35-5 W3M RM OF CORMAN PARK**

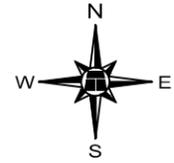
SITE LOCATION PLAN

DWG No. 37139.20-1

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DESIGNED BY	DM
APPROVED BY	CAC
SCALE	1:2500
DATE	JUNE 2023
FILE No.	37139.20

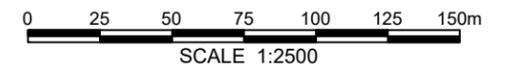


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LEGEND

- APPROXIMATE SITE BOUNDARY
- ⊕ APPROXIMATE MONITORING WELL LOCATION
- ⊕ APPROXIMATE TEST HOLE LOCATION



AIR PHOTO FROM ESRI WORLD IMAGERY EXPORTED ON JUNE 9, 2023

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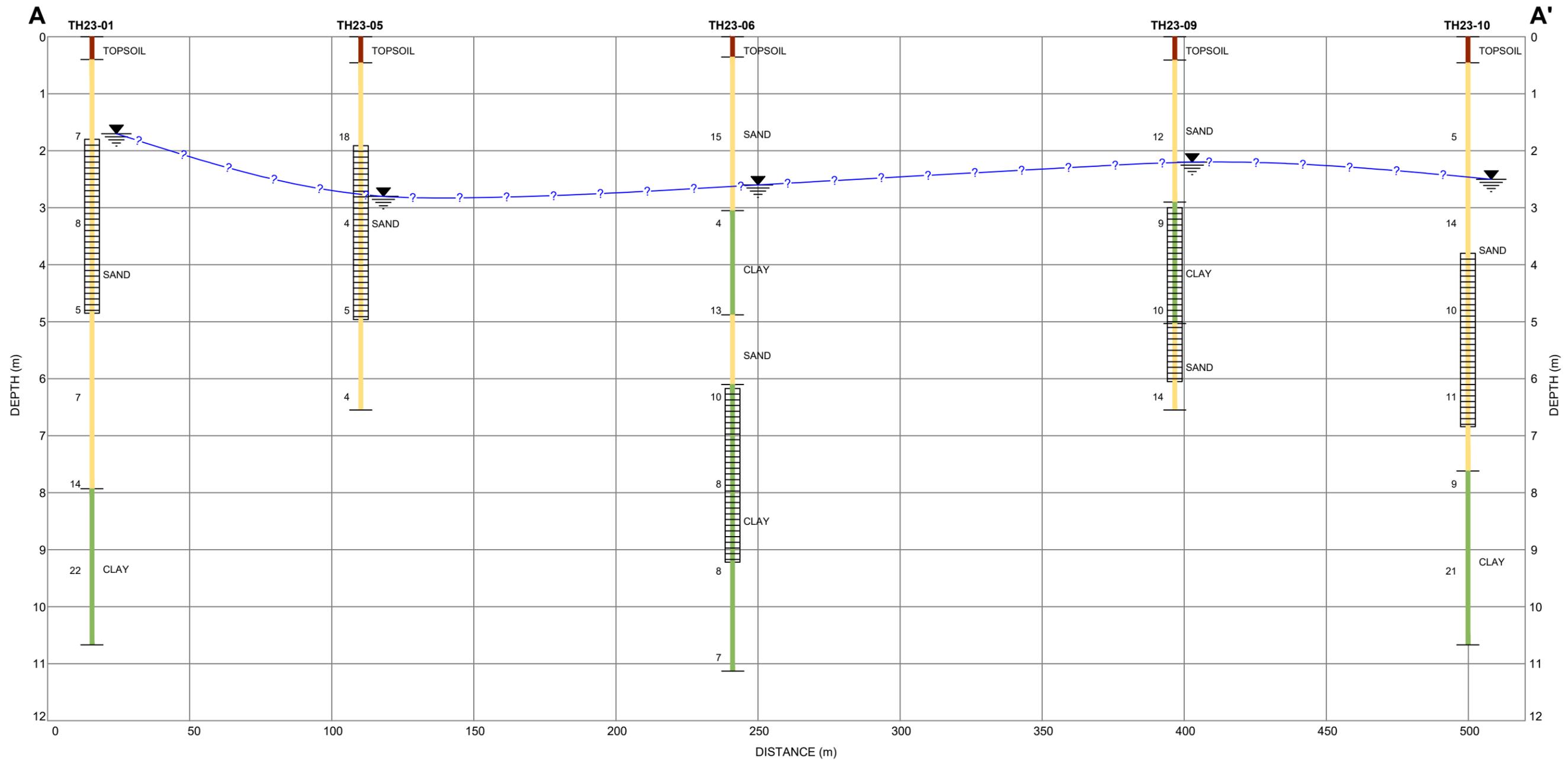
**DESKTOP HYDROGEOLOGICAL INVESTIGATION
PROPOSED RESIDENTIAL SUBDIVISION
LS13 34-35-5 W3M RM OF CORMAN PARK**

**SITE PLAN SHOWING CONCEPTUAL
SUBDIVISION LAYOUT**

DWG No. 37139.20-2

DRAWN BY	ML
DESIGNED BY	DM
APPROVED BY	CAC
SCALE	1:2500
DATE	JUNE 2023
FILE No.	37139.20





LEGEND

15 | SPT N VALUE

▼ | WATER LEVEL IN MONITORING WELL (JUNE 6, 2023)

▤ | MONITORING WELL SCREENED INTERVAL

-?- | INTERPRETED GROUND WATER LEVEL

NOTE

DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT THE TEST HOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN TEST HOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.

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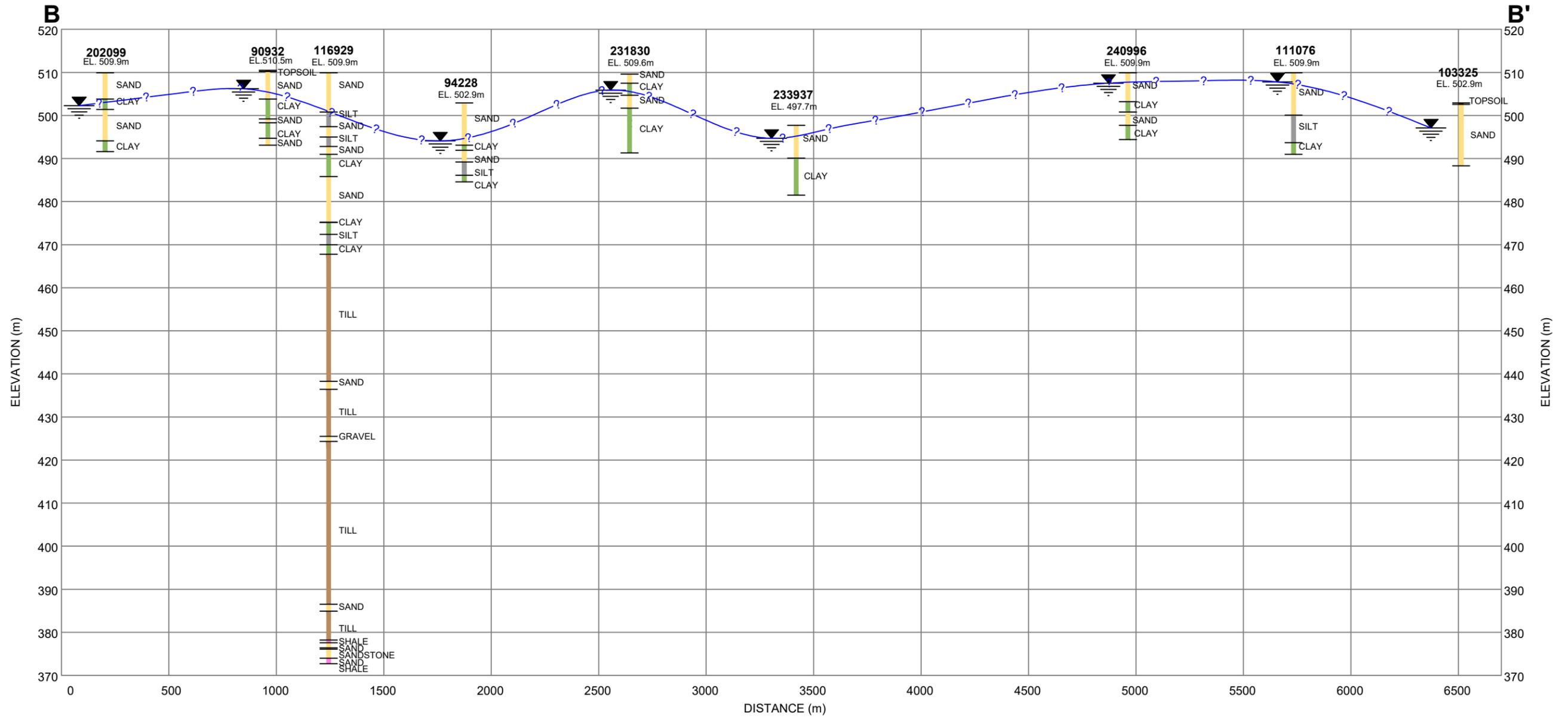
**DESKTOP HYDROGEOLOGICAL INVESTIGATION
PROPOSED RESIDENTIAL SUBDIVISION
LS13 34-35-5 W3M RM OF CORMAN PARK**

CROSS - SECTION A - A'

DWG No. 37139.20-3

DRAWN BY	ML
DESIGNED BY	DM
APPROVED BY	CAC
SCALE	H 1:1500 V 1:75
DATE	JUNE 2023
FILE No.	37139.20





LEGEND

- WATER LEVEL IN WATER WELL
- INTERPRETED GROUND WATER LEVEL

NOTE

DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT THE TEST HOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN TEST HOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.

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**DESKTOP HYDROGEOLOGICAL INVESTIGATION
PROPOSED RESIDENTIAL SUBDIVISION
LS13 34-35-5 W3M RM OF CORMAN PARK**

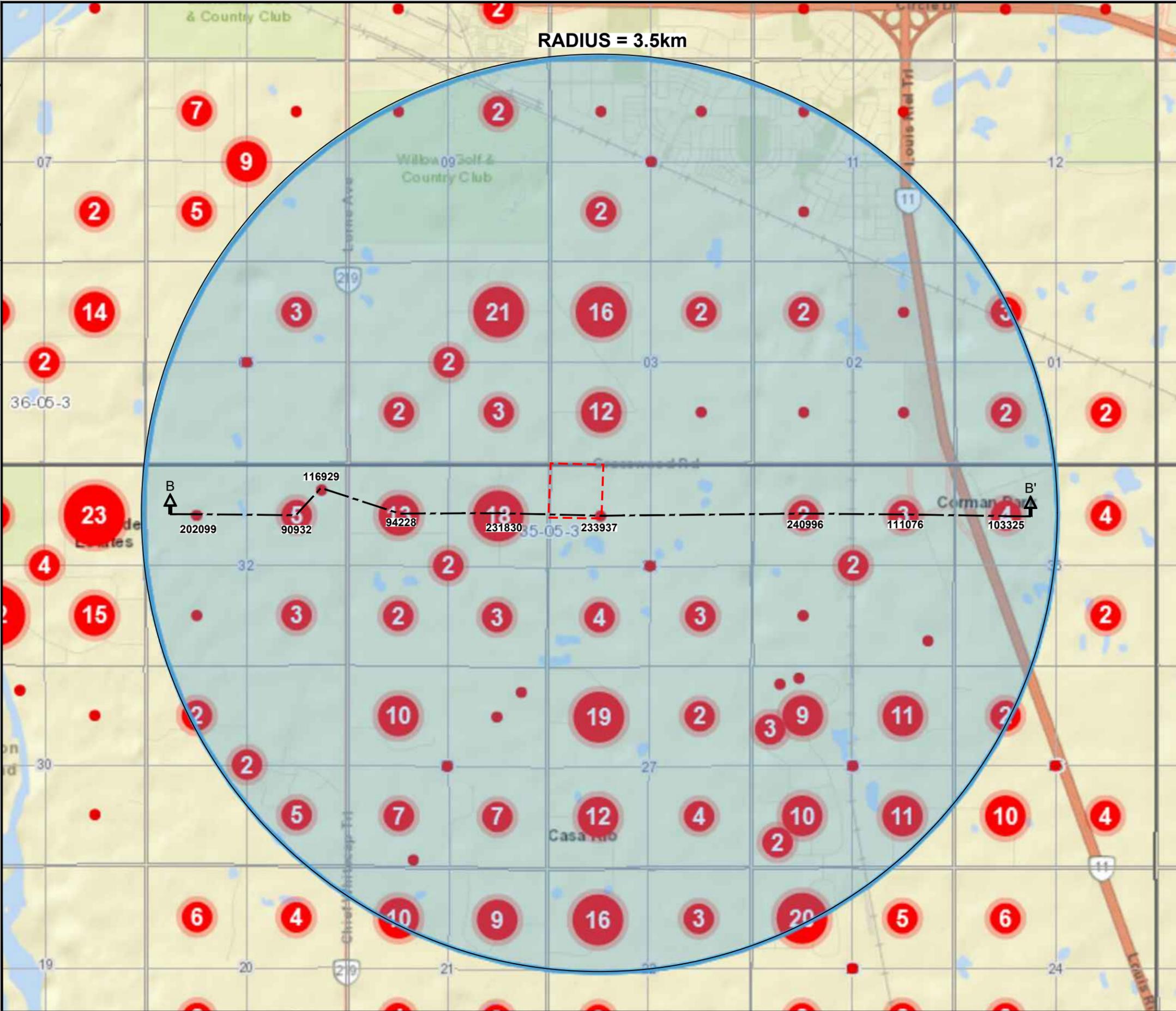
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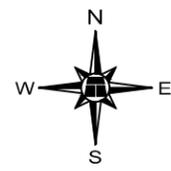
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DESIGNED BY	DM
APPROVED BY	CAC
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DATE	JUNE 2023
FILE No.	37139.20



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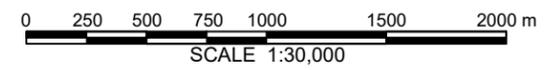


RADIUS = 3.5km



LEGEND

--- APPROXIMATE SITE BOUNDARY



AIR PHOTO FROM ESRI WORLD IMAGERY EXPORTED ON JUNE 9, 2023

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**DESKTOP HYDROGEOLOGICAL INVESTIGATION
 PROPOSED RESIDENTIAL SUBDIVISION
 LS13 34-35-5 W3M RM OF CORMAN PARK
 WSA WATER WELLS WITHIN 3.5km**

DWG No. 37139.20-5

DRAWN BY	ML
DESIGNED BY	DM
APPROVED BY	CAC
SCALE	1:30 000
DATE	JUNE 2023
FILE No.	37139.20





THURBER ENGINEERING LTD.

APPENDIX B

Geological Cross Section

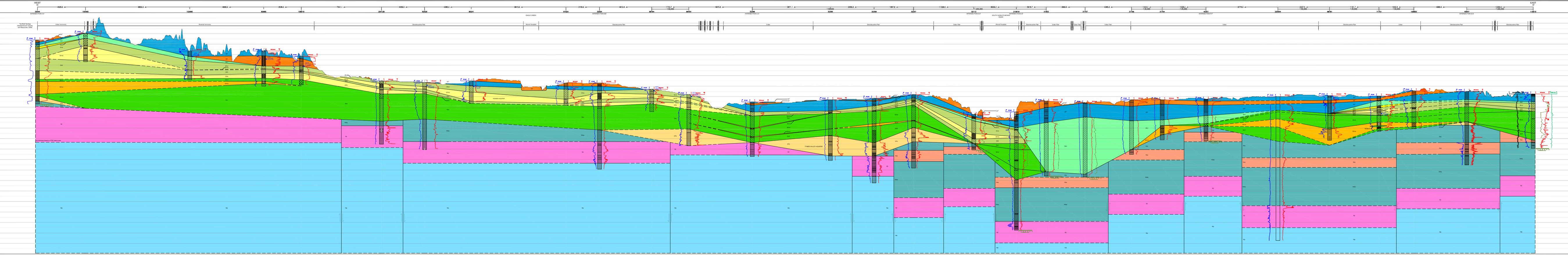
BASKATOON AREA				
TIME PERIOD	STAGE / AGE / PHASE	FORMATION	LITHOLOGY	
QUATERNARY	Alluvium	Surface Drifted Deposits	Various	
		Basal	Various	
	Loess	Loess	Various	
		Basal	Various	
	Pleistocene	Glacial	Glacial Till	Various
			Glacial Sand	Various
		Interglacial	Clay	Various
			Silt	Various
			Sand	Various
			Gravel	Various
CENOZOIC	Cretaceous	Various	Various	
		Various	Various	

Lithology

- ▨ Fill
- ▨ Topsoil
- ▨ Clay or Shale
- ▨ Silt
- ▨ Sand
- ▨ Gravel
- ▨ Oxidized Till
- ▨ Unoxidized Till

LIMITATIONS

- EXCEPT AT BORING/LOG SITES WHERE GEOLOGIC LOGS ARE AVAILABLE, GEOLOGIC CONTACTS ARE INTERPRETED AND REPRESENT GEOLOGIC MODELS THAT ARE BELIEVED TO BEST FIT THE INFORMATION.
- INTERPRETATIONS BETWEEN HOLES ARE LINEAR AND MAY NOT EXACTLY MATCH INTERPOLATING FROM OTHER WELLS, PARTICULARLY WHERE BOREHOLES DO NOT INTERSECT ENTIRE STRATIGRAPHIC PROFILE.
- RENDERING AND ENGINEERING SOLUTIONS CORRECTION OF THE BASKATOON WATERSHED AUTHORITY WILL BE LIMITED FOR ANY GEOLOGIC UNDOUBTED OR INFLUENCED BY DATA AND INTERPRETATIONS PROVIDED ON THIS CROSS-SECTION.
- NO INTERPRETATIONS OF SEDIMENTS BELOW #10 MADE UNLESS DOCUMENTED IN A BORING/LOG USED ON THE CROSS-SECTION.



DRAWING STATUS		DATE	SCALE:	H: 1:200,000 V: 1:4000	CLIENT	TITLE
PRELIMINARY	DESIGN REPORT	13-SEP-10	GEOLGY BY:	R. NORMAN / A. KARVONEN	Saskatchewan Watershed Authority	CROSS SECTION H-H'
APPROVED FOR TENDER	APPROVED FOR CONSTRUCTION	25-JAN-11	DRAWN BY:	A. COLE / E. OYVINA		
		25-OCT-10	CHECKED BY:	A. KARVONEN / G. POTTER		
		25-JAN-11	APPROVED BY:	A. KARVONEN / G. POTTER		

NO.	DATE	DESCRIPTION	GEO.	DRK.	CHK.	APP.	RECORD OF CONSTRUCTION

PROJECT No.	DRAWING No.	APPENDIX	REV.
M1890-1030010	M1890-62-8	C	



THURBER ENGINEERING LTD.

APPENDIX C

WSA water wells within 0.8 km

Well Name: Swityk	WWDR #: 101916
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Well Location

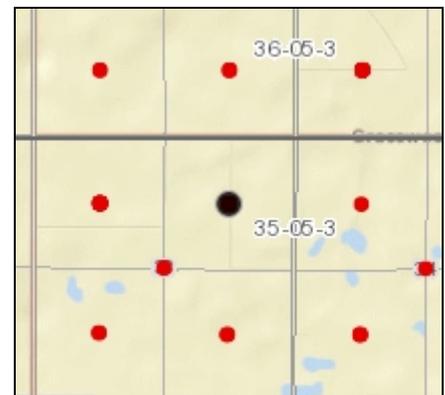
Land Location NE-33-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM:	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Btm (ft)	Dia (in)	Material
Completion Date 1992.08.18	42	40	30	Galvanized Iron
Hole # 1				
Install Method Bored				
Borehole Depth (ft) 40	Well Screens			
Bit Dia (in) 42	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
	20	40	30	70
Water Level 22				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Perforated Casing	Duration	0 hrs		
E-Log None	Pumping Rate	6 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
24	Sand	Brown	Clayey
35	Sand	Grey	Fine
40	Clay	Grey	Unknown



Well Name: McCorkell	WWDR #: 108671
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Well Location

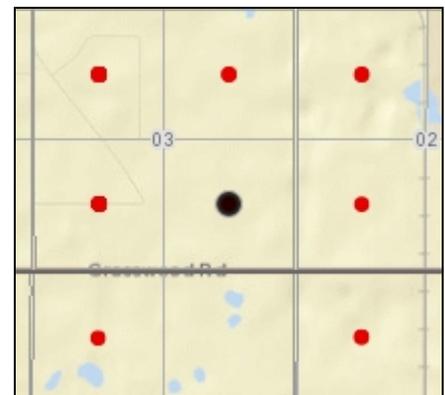
Land Location SE-03-36-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1673	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Btm (ft)	Dia (in)	Material
Completion Date 1997.09.08	43	41	30	Fiberglass
Hole # 001				
Install Method Bored				
Borehole Depth (ft) 41	Well Screens			
Bit Dia (in) 42	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 10	27	38	30	70
Flowing Head 0	Material			
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Perforated Casing	Duration	0 hrs		
E-Log None	Pumping Rate	8 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
22	Sand	Brown	Fine
25	Sand	Grey	Fine
41	Clay	Grey	Silty



Well Name: **Fairbairn**

 WWDR #: **110464**
Well Location

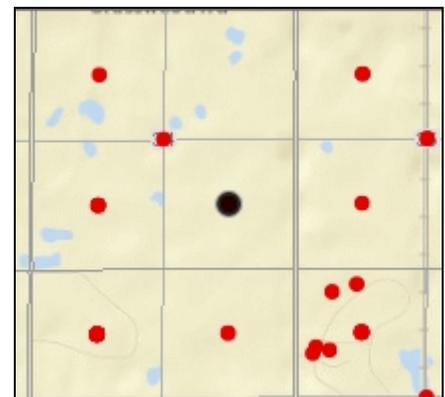
Land Location	SE-34-35-05-3	Location of Well (in Quarter)
LSD		ft from N/S Boundary
Reserve		ft from E/W Boundary
RM:	344	
NTS Map:	73B02	Major Basin:
Elevation (ft)	1673	SubBasin: 30
Aquifer		

Well Information

Driller	Wellen Boring Ltd.	Length (ft)	Well Casings	Btm (ft)	Dia (in)	Material
Completion Date	1998.11.24	50		48	30	Fiberglass
Hole #	001					
Install Method	Bored					
Borehole Depth (ft)	48		Well Screens			
Bit Dia (in)	42	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
Water Level	20	22	45	30	70	Fiberglass
Flowing Head	0					
Water Use	Domestic			Pump Test		
Well Use	Withdrawal	Draw Down				0 ft
Completion Method	Perforated Casing	Duration				0 hrs
E-Log	None	Pumping Rate				6 igpm
		Temperature				0 deg. F
		Rec. Pumping Rate				0 igpm

Lithology List

Depth (ft):	Material	Colour	Description
21	Sand	Brown	Fine
31	Sand	Grey	Fine
36	Sand	Grey	Clean
42	Sand	Grey	Fine
48	Sand	Grey	Silty



Well Name: Bellamy	WWDR #: 120156
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Well Location

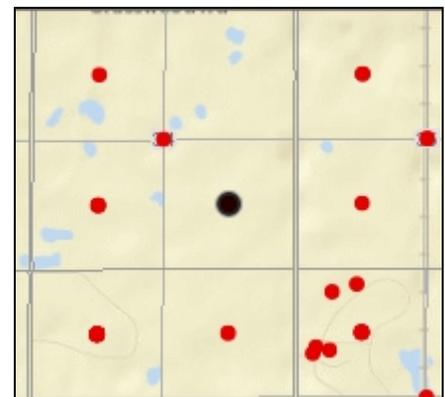
Land Location SE-34-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1683	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Btm (ft)	Dia (in)	Material
Completion Date 2003.05.12	62	60	30	Fiberglass
Hole #				
Install Method Bored				
Borehole Depth (ft) 60				
Bit Dia (in) 42	30	57	30	70
Water Level 26				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Perforated Casing	Duration	1 hrs		
E-Log None	Pumping Rate	25 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	20 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
6	Sand	Brown	Fine
17	Sand	Brown	Fine
32	Sand	Brown	Fine
53	Sand	Grey	Fine
55	Sand	Grey	Silty
60	Clay	Grey	Firm



Well Name: Wall	WWDR #: 214032
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Well Location

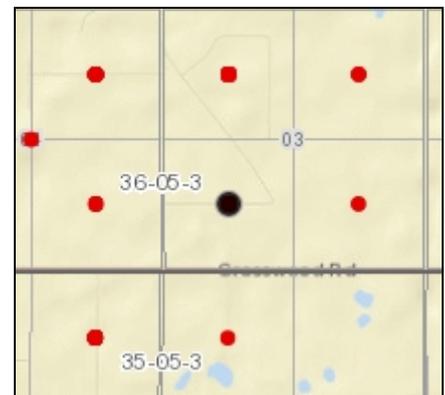
Land Location SW-03-36-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1673	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Btm (ft)	Dia (in)	Material
Completion Date 2008.10.30	54	52	30	Fiberglass
Hole # 00000001				
Install Method Bored				
Borehole Depth (ft) 52	Well Screens			
Bit Dia (in) 42	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 12	37	52	30	70
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Perforated Casing	Duration	2 hrs		
E-Log None	Pumping Rate	11 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	9 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
15	Sand	Brown	Unknown
18	Clay	Brown	Silty
23	Sand	Brown	Coarse
33	Sand	Grey	Fine
52	Sand	Grey	Silty
52	Unknown	Unknown	Clayey



Well Name: Agren	WWDR #: 233937
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Well Location

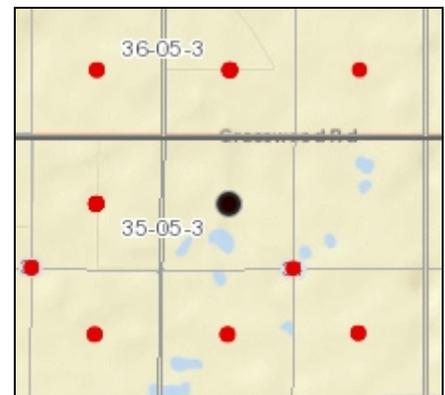
Land Location NW-34-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1633	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Btm (ft)	Dia (in)	Material
Completion Date 2014.05.27	55	53	30	Fiberglass
Hole #				
Install Method Bored				
Borehole Depth (ft) 53				
Bit Dia (in) 42	43	53	30	70
Water Level 10				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down			0 ft
Completion Method Perforated Casing	Duration			1 hrs
E-Log None	Pumping Rate			4 igpm
	Temperature			0 deg. F
	Rec. Pumping Rate			4 igpm

Lithology List

Depth (ft):	Material	Colour	Description
22	Sand	Brown	Silty
25	Sand	Grey	Silty
35	Clay	Grey	Silty
47	Clay	Grey	Silty
53	Clay	Grey	Unknown



Well Name: **Aubin**

 WWDR #: **31935**
Well Location

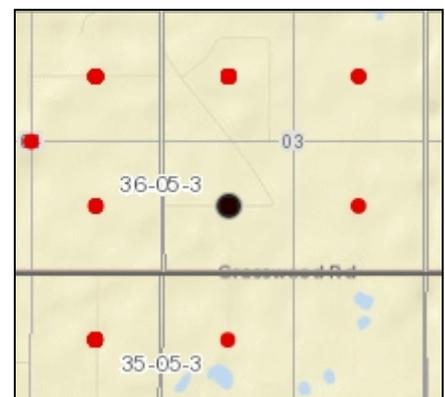
Land Location	SW-03-36-05-3	Location of Well (in Quarter)	
LSD		100 ft from N/S Boundary	N
Reserve		250 ft from E/W Boundary	W
RM:	344		
NTS Map:	73B02	Major Basin:	
Elevation (ft)	1650	SubBasin:	30
Aquifer			

Well Information

Driller	Prairie Water Ltd.	Length (ft)	Well Casings	Btm (ft)	Dia (in)	Material
Completion Date	1972.09.05					
Hole #	00000001					
Install Method	Bored					
Borehole Depth (ft)	62		Well Screens			
Bit Dia (in)	36	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
Water Level	0					
Flowing Head	0					
Water Use	Domestic		Pump Test			
Well Use	Water Test Hole	Draw Down		0	ft	
Completion Method		Duration		0	hrs	
E-Log	None	Pumping Rate		0	igpm	
		Temperature		0	deg. F	
		Rec. Pumping Rate		0	igpm	

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
15	Sandy Clay	Brown	Unknown
20	Sand	Brown	Fine
62	Till	Grey	Silty



Well Name: Aubin	WWDR #: 31936
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Well Location

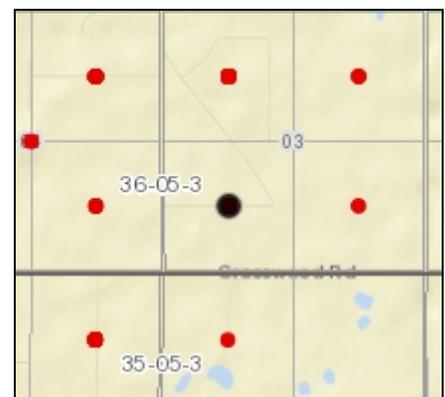
Land Location SW-03-36-05-3	Location of Well (in Quarter)
LSD	400 ft from N/S Boundary N
Reserve	400 ft from E/W Boundary W
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Prairie Water Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1972.09.05	0	28	36	Porous Concrete
Hole # 00000002				
Install Method Bored				
Borehole Depth (ft) 28	Well Screens			
Bit Dia (in) 36	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 0				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Curbed	Duration	0 hrs		
E-Log None	Pumping Rate	0 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
15	Sandy Clay	Brown	Unknown
16	Sand	Brown	Fine
17	Clay	Brown	Unknown
20	Sand	Grey	Silty
24	Till	Grey	Silty
28	Sand	Grey	Fine



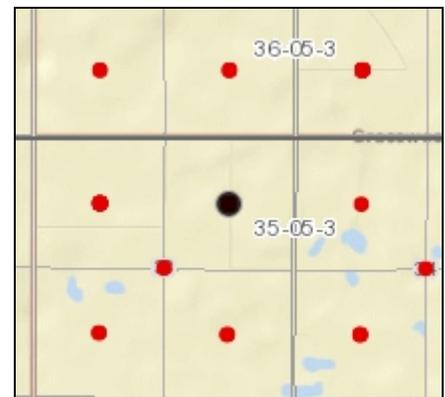
Well Name: Dunlop	WWDR #: 43819
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Well Location	
Land Location	NE-33-35-05-3
LSD	
Reserve	
RM:	344
NTS Map:	73B02
Elevation (ft)	1650
Aquifer	
Location of Well (in Quarter)	
ft from N/S Boundary	
ft from E/W Boundary	
Major Basin:	
SubBasin:	30

Well Information					
Driller	Wig's Sandpoint Drilling	Length (ft)	Well Casings		
Completion Date	1975.04.23	0	Btm (ft)	Dia (in)	Material
Hole #	00000001		19	1.5	A.B.S.
Install Method	Jetted				
Borehole Depth (ft)	22	Well Screens			
Bit Dia (in)	1.5	Length (ft)	Bottom (ft)	Dia (in)	Slot (in) Material
Water Level	7	3	22	2	10 Plastic
Flowing Head	0				
Water Use	Domestic	Pump Test			
Well Use	Withdrawal	Draw Down	0 ft		
Completion Method	Sand Point	Duration	0 hrs		
E-Log	None	Pumping Rate	0 igpm		
		Temperature	0 deg. F		
		Rec. Pumping Rate	6 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
22	Sand	Unknown	Unknown



Well Name: Sprung	WWDR #: 47555
--------------------------	----------------------

Well Location

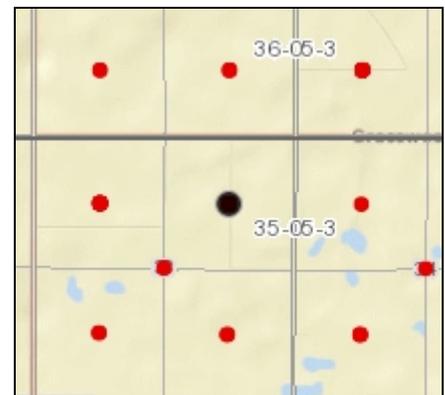
Land Location NE-33-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Wig's Sandpoint Drilling	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1976.05.03	0	24	1.5	A.B.S.
Hole # 00000001				
Install Method Jetted				
Borehole Depth (ft) 27	Well Screens			
Bit Dia (in) 1.5	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
	3	27	2	10
Water Level 6				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Sand Point	Duration	0 hrs		
E-Log None	Pumping Rate	0 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	6 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
8	Sandy Clay	Unknown	Unknown
10	Silt	Unknown	Water
27	Sand	Unknown	Coarse



Well Name: Dutton	WWDR #: 49727
--------------------------	----------------------

Well Location

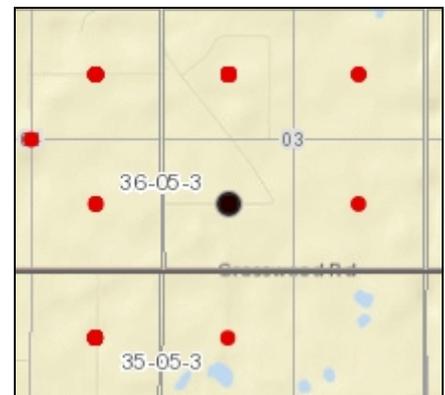
Land Location SW-03-36-05-3	Location of Well (in Quarter)
LSD	100 ft from N/S Boundary S
Reserve	150 ft from E/W Boundary W
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Wig's Sandpoint Drilling	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1977.05.16	42	40	30	Steel Curbing
Hole # 00000001				
Install Method Bored				
Borehole Depth (ft) 40	Well Screens			
Bit Dia (in) 0	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 0				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Curbed	Duration	0 hrs		
E-Log None	Pumping Rate	5 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	5 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
23	Sandy Clay	Unknown	Unknown
25	Sand	Unknown	Water
40	Clay	Blue	Unknown



Well Name: Royer	WWDR #: 49728
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Well Location

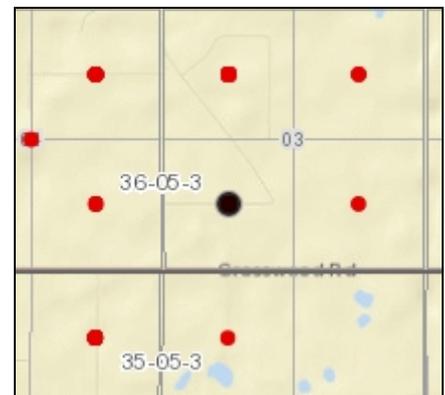
Land Location SW-03-36-05-3	Location of Well (in Quarter)
LSD	300 ft from N/S Boundary S
Reserve	150 ft from E/W Boundary E
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Wig's Sandpoint Drilling	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1977.05.16	59	56	30	Steel Curbing
Hole # 00000001				
Install Method Bored				
Borehole Depth (ft) 56	Well Screens			
Bit Dia (in) 39	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 0				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down			0 ft
Completion Method Curbed	Duration			0 hrs
E-Log None	Pumping Rate			12 igpm
	Temperature			0 deg. F
	Rec. Pumping Rate			10 igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
9	Sandy Clay	Unknown	Unknown
15	Sand	Unknown	Water
35	Clay	Blue	Unknown
53	Sandy Clay	Unknown	Unknown
56	Clay	Blue	Unknown



Well Name: Dziadyk	WWDR #: 60567
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Well Location

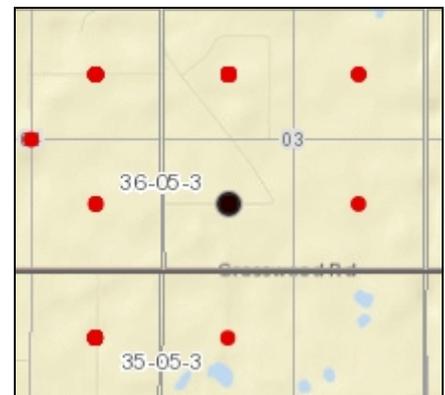
Land Location SW-03-36-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Twieidt Wellboring Servicing Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1978.07.13	52	50	30	Galvanized Iron
Hole #				
Install Method Bored				
Borehole Depth (ft) 50	Well Screens			
Bit Dia (in) 42	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 9				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down			0 ft
Completion Method Curbed	Duration			0 hrs
E-Log None	Pumping Rate			15 igpm
	Temperature			0 deg. F
	Rec. Pumping Rate			0 igpm

Lithology List

Depth (ft):	Material	Colour	Description
9	Sandy Clay	Unknown	Dry
22	Sand	Unknown	Water
33	Clay	Blue	Unknown
46	Sand	Unknown	Water
50	Clay	Blue	Unknown



Well Name: Monar	WWDR #: 66369
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Well Location

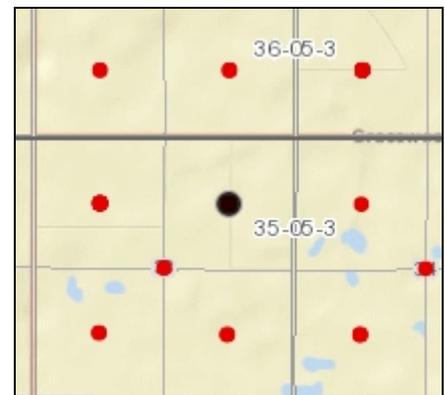
Land Location	NE-33-35-05-3	Location of Well (in Quarter)
LSD		ft from N/S Boundary
Reserve		ft from E/W Boundary
RM:		
NTS Map:		Major Basin:
Elevation (ft)	1650	SubBasin: 30
Aquifer		

Well Information

Driller	Prairie Water Ltd.	Length (ft)	Well Casings	Btm (ft)	Dia (in)	Material
Completion Date	1981.04.29	36		35	36	Porous Concrete
Hole #	001					
Install Method	Bored					
Borehole Depth (ft)	35		Well Screens			
Bit Dia (in)	36	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
Water Level	0					
Flowing Head	0					
Water Use	Domestic			Pump Test		
Well Use	Withdrawal	Draw Down				0 ft
Completion Method	Curbed	Duration				0 hrs
E-Log	None	Pumping Rate				0 igpm
		Temperature				0 deg. F
		Rec. Pumping Rate				0 igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
23	Sand	Brown	Unknown
34	Sand	Grey	Fine
35	Silt	Grey	Unknown



Well Name: Afseth	WWDR #: 77248
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Well Location

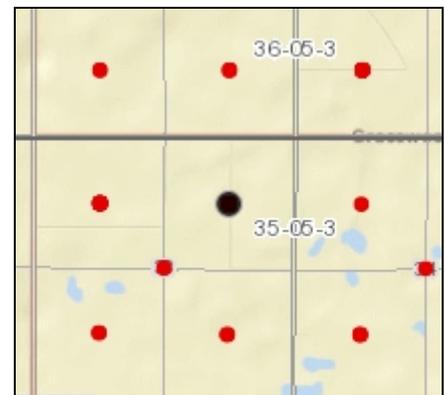
Land Location NE-33-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM:	
NTS Map:	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Twieidt Wellboring Servicing Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1983.05.30	42	40	30	Galvanized Iron
Hole #				
Install Method Bored				
Borehole Depth (ft) 40		Well Screens		
Bit Dia (in) 48	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 0				
Flowing Head 0				
Water Use Domestic		Pump Test		
Well Use Withdrawal	Draw Down			0 ft
Completion Method Curbed	Duration			0 hrs
E-Log None	Pumping Rate			12 igpm
	Temperature			0 deg. F
	Rec. Pumping Rate			0 igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
14	Sand	Yellow	Dry
17	Clay	Blue	Unknown
30	Sand	Grey	Water
39	Clay	Blue	Unknown
40	Sand	Grey	Water



Well Name: Hough	WWDR #: 80732
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Well Location

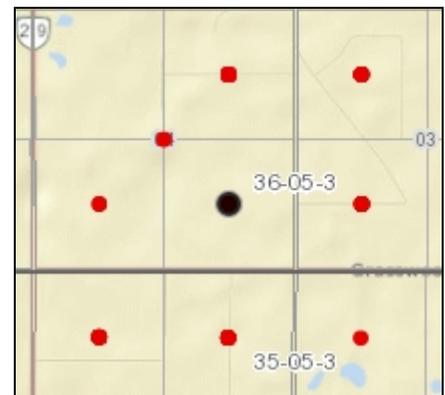
Land Location SE-04-36-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Prairie Water Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1985.05.07	44	42	36	Porous Concrete
Hole # 00000001				
Install Method Bored				
Borehole Depth (ft) 42	Well Screens			
Bit Dia (in) 36	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 0				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Curbed	Duration	0 hrs		
E-Log None	Pumping Rate	0 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
10	Sand	Brown	Unknown
25	Silt	Grey	Unknown
29	Sand	Grey	Unknown
42	Silt	Grey	Unknown



Well Name: Bernard	WWDR #: 83332
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Well Location

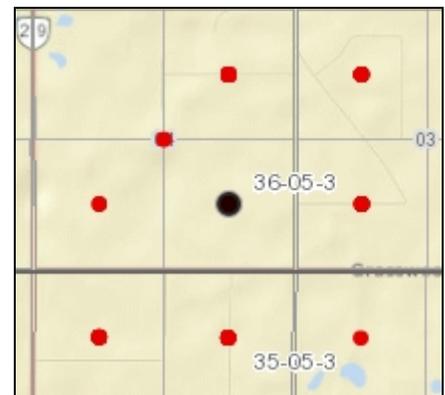
Land Location SE-04-36-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Prairie Water Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1986.09.05	28	26	36	Porous Concrete
Hole # 00000001				
Install Method Bored				
Borehole Depth (ft) 26	Well Screens			
Bit Dia (in) 36	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 0				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Curbed	Duration	0 hrs		
E-Log None	Pumping Rate	0 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
21	Sand	Brown	Unknown
26	Sand	Grey	Unknown



Well Name: Dubek	WWDR #: 83606
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Well Location

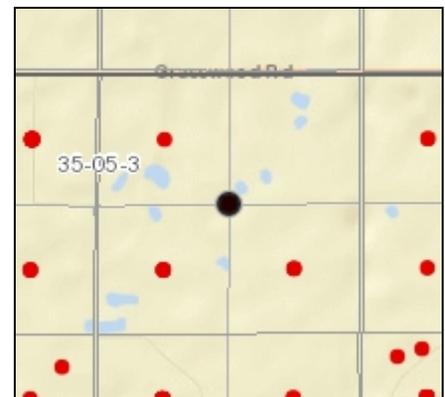
Land Location 34-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM:	
NTS Map:	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Prairie Water Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1986.10.02	30	27	36	Porous Concrete
Hole # 001				
Install Method Bored				
Borehole Depth (ft) 27	Well Screens			
Bit Dia (in) 38	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 0				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Curbed	Duration	0 hrs		
E-Log None	Pumping Rate	0 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
19	Sand	Brown	Unknown
21	Clay	Grey	Unknown
23	Sand	Grey	Unknown
27	Clay	Grey	Unknown



Well Name: Afridi	WWDR #: 85610
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Well Location

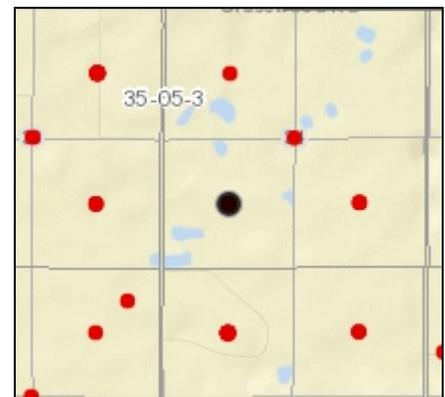
Land Location SW-34-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM:	
NTS Map:	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Prairie Water Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1987.07.23	54	52	36	Porous Concrete
Hole # 1				
Install Method Bored				
Borehole Depth (ft) 52	Well Screens			
Bit Dia (in) 36	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 0				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down			0 ft
Completion Method Curbed	Duration			0 hrs
E-Log None	Pumping Rate			2 igpm
	Temperature			0 deg. F
	Rec. Pumping Rate			0 igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
8	Clay	Brown	Sandy
27	Clay	Brown	Unknown
40	Clay	Grey	Unknown
52	Sand	Grey	Unknown



Well Name: Sanderson	WWDR #: 88799
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Well Location

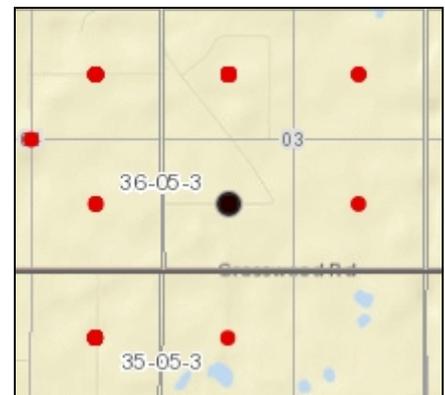
Land Location SW-03-36-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1988.07.08	53	52	30	Fiberglass
Hole # 00000001				
Install Method Bored				
Borehole Depth (ft) 52	Well Screens			
Bit Dia (in) 44	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 14				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Perforated Casing	Duration	0 hrs		
E-Log None	Pumping Rate	8 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
18	Sand	Brown	Silty
28	Clay	Grey	Silty
42	Sand	Grey	Fine
52	Clay	Grey	Hard



Well Name: **Russell**

 WWDR #: **94227**
Well Location

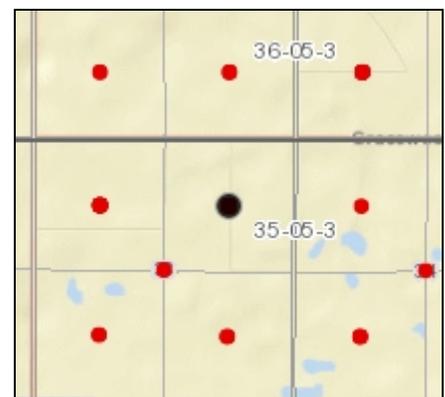
Land Location	NE-33-35-05-3	Location of Well (in Quarter)
LSD		ft from N/S Boundary
Reserve		ft from E/W Boundary
RM:		
NTS Map:		Major Basin:
Elevation (ft)	1650	SubBasin: 30
Aquifer		

Well Information

Driller	Prairie Water Ltd.	Length (ft)	Well Casings	Btm (ft)	Dia (in)	Material
Completion Date	1989.04.02	32		30	36	Porous Concrete
Hole #	1					
Install Method	Bored					
Borehole Depth (ft)	30		Well Screens			
Bit Dia (in)	36	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
Water Level	0					
Flowing Head	0					
Water Use	Domestic		Pump Test			
Well Use	Withdrawal	Draw Down				0 ft
Completion Method	Curbed	Duration				0 hrs
E-Log	None	Pumping Rate				5 igpm
		Temperature				0 deg. F
		Rec. Pumping Rate				0 igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
21	Sand	Brown	Unknown
30	Sand	Grey	Unknown



Well Name: Hough	WWDR #: 94229
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Well Location

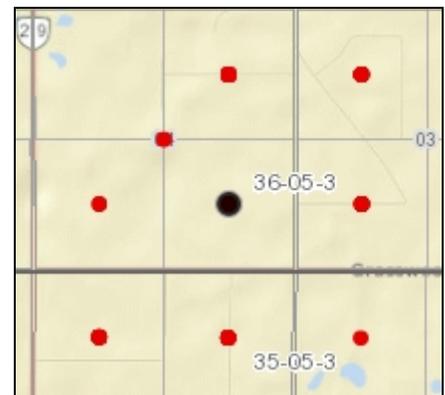
Land Location SE-04-36-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Prairie Water Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
	31	31	36	Porous Concrete
Completion Date 1988.11.25				
Hole # 00000001				
Install Method				
Borehole Depth (ft) 31	Well Screens			
Bit Dia (in) 36	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 0				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Curbed	Duration	0 hrs		
E-Log None	Pumping Rate	2 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
11	Clay	Brown	Sandy
28	Sand	Unknown	Unknown
31	Clay	Grey	Unknown



Well Name: Myers	WWDR #: 9546
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Well Location

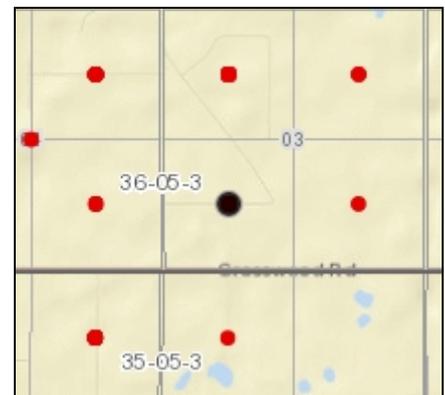
Land Location SW-03-36-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Wig's Sandpoint Drilling	Length (ft)	Btm (ft)	Dia (in)	Material
Completion Date 1973.04.12	0	20	1.5	Plastic
Hole # 00000001				
Install Method Jetted				
Borehole Depth (ft) 23	Well Screens			
Bit Dia (in) 1.5	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 13	3	23	2	12
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down			0 ft
Completion Method Sand Point	Duration			1 hrs
E-Log None	Pumping Rate			3 igpm
	Temperature			0 deg. F
	Rec. Pumping Rate			3 igpm

Lithology List

Depth (ft):	Material	Colour	Description
5	Clay	Unknown	Unknown
13	Sand	Brown	Clayey
23	Sand	Brown	Unknown



Well Name: Van Lambalgen	WWDR #: 95644
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Well Location

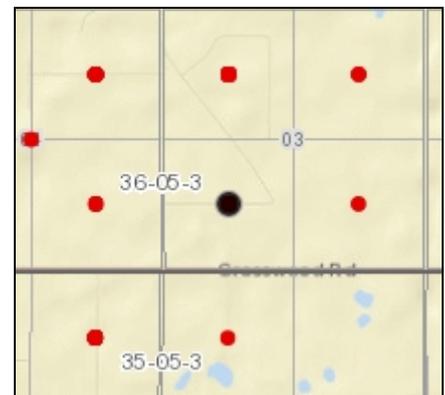
Land Location SW-03-36-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Prairie Water Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1989.07.14	30	28	36	Porous Concrete
Hole # 00000001				
Install Method Bored				
Borehole Depth (ft) 28	Well Screens			
Bit Dia (in) 36	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 0				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down			0 ft
Completion Method Curbed	Duration			0 hrs
E-Log None	Pumping Rate			2 igpm
	Temperature			0 deg. F
	Rec. Pumping Rate			0 igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
17	Sand	Brown	Unknown
20	Clay	Brown	Sandy
24	Sand	Brown	Unknown
28	Sand	Grey	Unknown



Well Name: Pebrucha	WWDR #: 31914
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Well Location

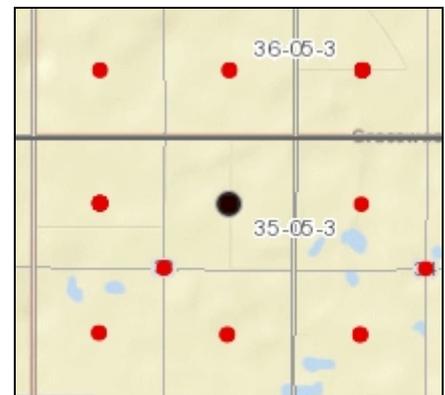
Land Location NE-33-35-05-3	Location of Well (in Quarter)
LSD	350 ft from N/S Boundary N
Reserve	700 ft from E/W Boundary W
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Prairie Water Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1971.07.22	0	33	36	Porous Concrete
Hole #				
Install Method Bored				
Borehole Depth (ft) 33	Well Screens			
Bit Dia (in) 36	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 0				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down			0 ft
Completion Method Curbed	Duration			0 hrs
E-Log None	Pumping Rate			0 igpm
	Temperature			0 deg. F
	Rec. Pumping Rate			0 igpm

Lithology List

Depth (ft):	Material	Colour	Description
3	Clay	Brown	Unknown
18	Sand	Brown	Silty
27	Sand	Grey	Silty
30	Clay	Grey	Unknown
32	Sand	Grey	Silty
33	Clay	Grey	Unknown



Well Name: **Switzik**

 WWDR #: **31915**
Well Location

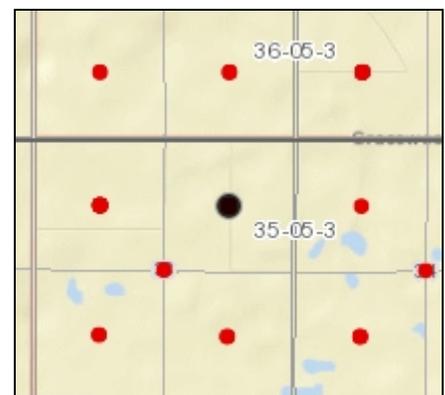
Land Location	NE-33-35-05-3	Location of Well (in Quarter)
LSD		ft from N/S Boundary
Reserve		ft from E/W Boundary
RM:	344	
NTS Map:	73B02	Major Basin:
Elevation (ft)	1650	SubBasin: 30
Aquifer		

Well Information

Driller	FFIB Dept of Agriculture	Length (ft)	Well Casings	Btm (ft)	Dia (in)	Material
Completion Date	1963.09.11	0		27	2	Steel
Hole #						
Install Method	Jetted					
Borehole Depth (ft)	27		Well Screens			
Bit Dia (in)	2	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
Water Level	16	3	27	2	8	Galvanized Iron
Flowing Head	0					
Water Use	Domestic			Pump Test		
Well Use	Withdrawal	Draw Down				0 ft
Completion Method	Sand Point	Duration				3 hrs
E-Log	None	Pumping Rate				4 igpm
		Temperature				47 deg. F
		Rec. Pumping Rate				4 igpm

Lithology List

Depth (ft):	Material	Colour	Description
7	Topsoil	Unknown	Sandy
16	Sandy Clay	Unknown	Unknown
30	Sand	Unknown	Fine



Well Name: Gaudet	WWDR #: 104121
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Well Location

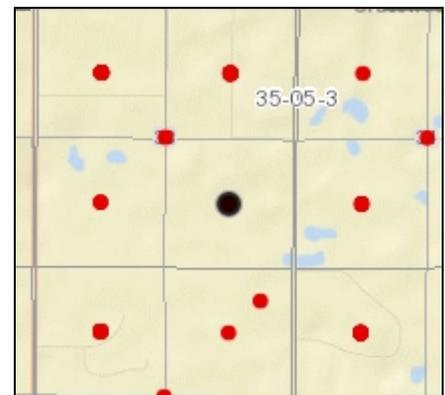
Land Location SE-33-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1994.05.05	50	48	30	Fiberglass
Hole #				
Install Method Bored				
Borehole Depth (ft) 48	Well Screens			
Bit Dia (in) 42	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
	25	45	30	70
Water Level 18				Fiberglass
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down			0 ft
Completion Method Perforated Casing	Duration			0 hrs
E-Log None	Pumping Rate			0 igpm
	Temperature			0 deg. F
	Rec. Pumping Rate			10 igpm

Lithology List

Depth (ft):	Material	Colour	Description
16	Sand	Brown	Silty
35	Sand	Grey	Fine
48	Clay	Grey	Unknown



Well Name: Koch	WWDR #: 108331
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Well Location

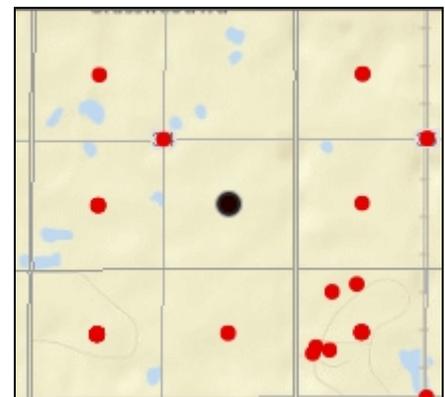
Land Location SE-34-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1673	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Btm (ft)	Dia (in)	Material
Completion Date 1997.08.14	65	63	30	Fiberglass
Hole # 001				
Install Method Bored				
Borehole Depth (ft) 63	Well Screens			
Bit Dia (in) 42	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
	35	60	30	70
Water Level 24				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Perforated Casing	Duration	0 hrs		
E-Log None	Pumping Rate	20 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
7	Sand	Brown	Fine
10	Silt	Brown	Sandy
29	Sand	Brown	Fine
49	Sand	Grey	Fine
63	Clay	Grey	Unknown



Well Name: **ISL Engineering and Land Services Ltd.**

 WWDR #: **225555**
Well Location

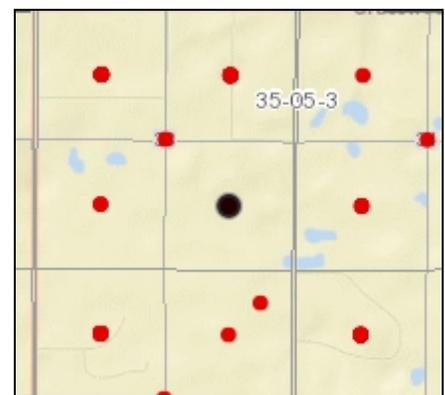
Land Location	SE-33-35-05-3	Location of Well (in Quarter)
LSD		ft from N/S Boundary
Reserve		ft from E/W Boundary
RM:	344	
NTS Map:	73B02	Major Basin:
Elevation (ft)	1673	SubBasin: 30
Aquifer		

Well Information

Driller	Mobile Augers & Research Ltd.	Length (ft)	Well Casings	Btm (ft)	Dia (in)	Material
Completion Date	2017.02.10	17		17	2	P.V.C.
Hole #	0000MW01					
Install Method	Augered					
Borehole Depth (ft)	17		Well Screens			
Bit Dia (in)	6	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
Water Level	0	10	17	2	10	P.V.C.
Flowing Head	0					
Water Use	Research			Pump Test		
Well Use	Water Test Hole	Draw Down				0 ft
Completion Method	Well Screen And Gravel	Duration				0 hrs
E-Log	Pack None	Pumping Rate				0 igpm
		Temperature				0 deg. F
		Rec. Pumping Rate				0 igpm

Lithology List

Depth (ft):	Material	Colour	Description
3	Till	Unknown	Unknown
5	Silty Clay	Unknown	Unknown
8	Silty Clay	Unknown	Unknown
17	Sand	Unknown	Unknown



Well Name: Malcolm	WWDR #: 231830
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Well Location

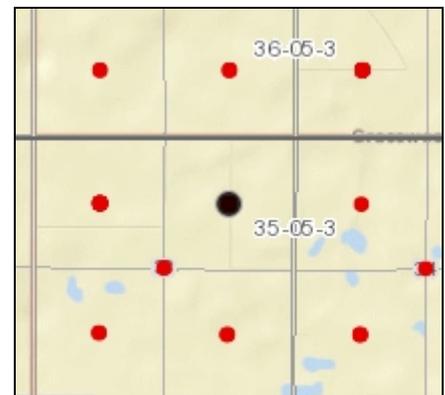
Land Location NE-33-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1672	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Btm (ft)	Dia (in)	Material
Completion Date 2020.09.14	62	60	30	Fiberglass
Hole #				
Install Method Bored				
Borehole Depth (ft) 60				
Bit Dia (in) 42	48	60	30	70
Water Level 12				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down		0 ft	
Completion Method Well Screen And Gravel	Duration		1 hrs	
E-Log Pack None	Pumping Rate		9 igpm	
	Temperature		0 deg. F	
	Rec. Pumping Rate		6 igpm	

Lithology List

Depth (ft):	Material	Colour	Description
7	Sand	Brown	Fine
16	Silty Clay	Grey	Unknown
26	Sand	Grey	Fine
35	Silty Clay	Grey	Unknown
40	Silty Clay	Grey	Fine
60	Clay	Grey	Silty



Well Name: Mogeson	WWDR #: 56426
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Well Location

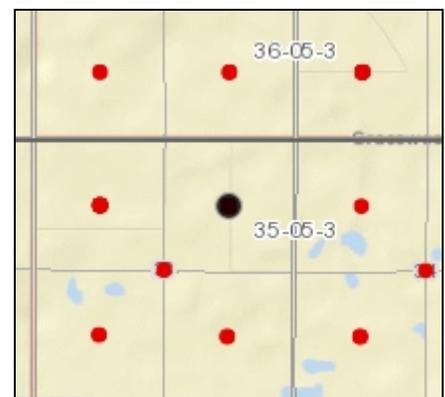
Land Location NE-33-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Twieidt Wellboring Servicing Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1978.05.12	0	42	30	Galvanized Iron
Hole # 00000001				
Install Method Bored				
Borehole Depth (ft) 42	Well Screens			
Bit Dia (in) 44	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 0				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Curbed	Duration	0 hrs		
E-Log None	Pumping Rate	8 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
8	Sand	Yellow	Dry
25	Sand	Unknown	Water
36	Clay	Blue	Unknown
42	Clay	Unknown	Sand Streaks



Well Name: Lucyshyn	WWDR #: 239768
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Well Location

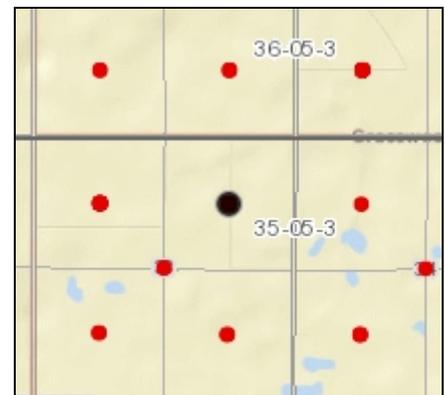
Land Location NE-33-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1673	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Well Casings	Btm (ft)	Dia (in)	Material
Completion Date 2018.06.26					
Hole # 00000001					
Install Method Augered					
Borehole Depth (ft) 55		Well Screens			
Bit Dia (in) 6	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
Water Level 10					
Flowing Head 0					
Water Use Domestic		Pump Test			
Well Use Water Test Hole	Draw Down				0 ft
Completion Method	Duration				0 hrs
E-Log None	Pumping Rate				0 igpm
	Temperature				0 deg. F
	Rec. Pumping Rate				0 igpm

Lithology List

Depth (ft):	Material	Colour	Description
10	Clay	Brown	Firm
13	Sand	Brown	Silty
27	Clay	Grey	Firm
35	Clay	Grey	Silty
55	Clay	Grey	Firm



Well Name: Lucyshyn	WWDR #: 239769
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Well Location

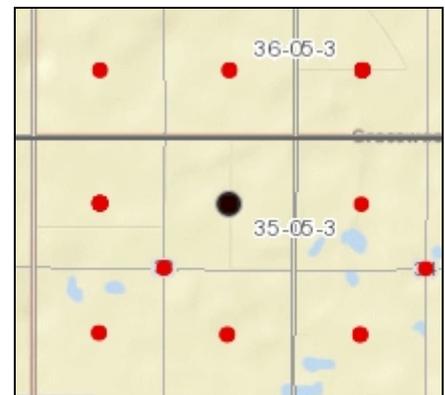
Land Location NE-33-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1673	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Well Casings		
Completion Date 2018.06.26	Btm (ft)	Dia (in)	Material	
Hole # 00000002				
Install Method Augered	Well Screens			
Borehole Depth (ft) 50	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Bit Dia (in) 60				Material
Water Level 12				
Flowing Head 0				
Water Use	Pump Test			
Well Use Water Test Hole	Draw Down	0 ft		
Completion Method	Duration	0 hrs		
E-Log None	Pumping Rate	0 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
4	Sand	Brown	Fine
9	Clay	Brown	Firm
18	Sand	Brown	Fine
35	Silty Clay	Grey	Unknown
50	Clay	Grey	Firm



Well Name: Lucyshyn	WWDR #: 239770
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Well Location

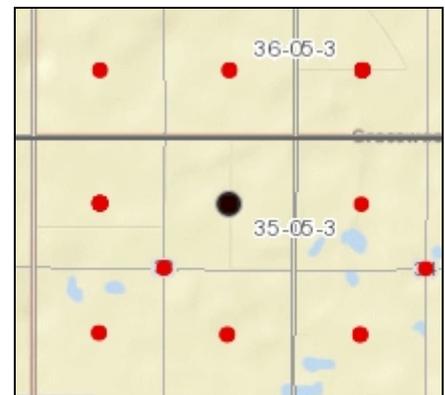
Land Location NE-33-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1673	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Well Casings		
Completion Date 2018.06.26	Btm (ft)	Dia (in)	Material	
Hole # 00000003				
Install Method Augered	Well Screens			
Borehole Depth (ft) 40	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Bit Dia (in) 6				Material
Water Level 12				
Flowing Head 0				
Water Use	Pump Test			
Well Use Water Test Hole	Draw Down	0 ft		
Completion Method	Duration	0 hrs		
E-Log None	Pumping Rate	0 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
4	Sand	Brown	Fine
10	Clay	Brown	Unknown
16	Sand	Brown	Fine
24	Silty Clay	Brown	Unknown
30	Silty Clay	Grey	Unknown
40	Clay	Grey	Firm



Well Name: Thomas	WWDR #: 126585
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Well Location

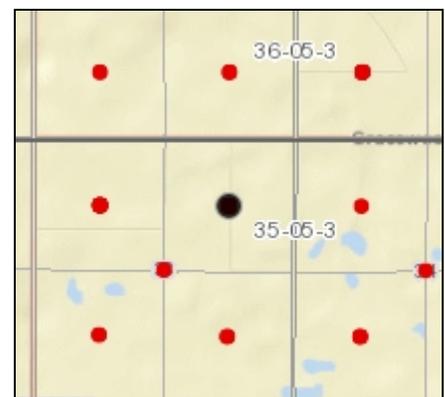
Land Location NE-33-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1653	SubBasin: 30
Aquifer	

Well Information

Driller Hayter Drilling Ltd.	Length (ft)	Btm (ft)	Dia (in)	Material
Completion Date 1984.08.30	41	40	30	Fiberglass
Hole # 00000001				
Install Method Bored				
Borehole Depth (ft) 40	Well Screens			
Bit Dia (in) 36	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 13	25	40	30	40
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Well Screen And Gravel	Duration	0 hrs		
E-Log Pack None	Pumping Rate	6 igpm		
	Temperature	42 deg. F		
	Rec. Pumping Rate	6 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
26	Silt	Brown	Unknown
40	Clay	Grey	Unknown



Well Name: Matthews	WWDR #: 91778
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Well Location

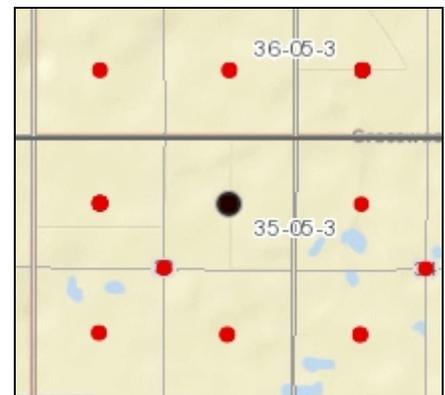
Land Location NE-33-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM:	
NTS Map:	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1988.10.17	38	36	36	Galvanized Iron
Hole # 1				
Install Method Bored				
Borehole Depth (ft) 35	Well Screens			
Bit Dia (in) 48	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 16				Material
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down			0 ft
Completion Method Perforated Casing	Duration			0 hrs
E-Log None	Pumping Rate			4 igpm
	Temperature			0 deg. F
	Rec. Pumping Rate			0 igpm

Lithology List

Depth (ft):	Material	Colour	Description
21	Sand	Brown	Fine
31	Clay	Grey	Unknown
35	Sand	Grey	Fine



Well Name: Dutton	WWDR #: 91779
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Well Location

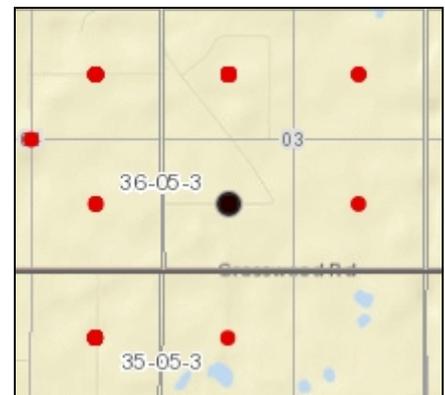
Land Location SW-03-36-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1988.10.14	62	60	30	Fiberglass
Hole # 00000001				
Install Method Bored				
Borehole Depth (ft) 60	Well Screens			
Bit Dia (in) 42	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 16				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down	0 ft		
Completion Method Perforated Casing	Duration	0 hrs		
E-Log None	Pumping Rate	5 igpm		
	Temperature	0 deg. F		
	Rec. Pumping Rate	0 igpm		

Lithology List

Depth (ft):	Material	Colour	Description
22	Sand	Brown	Fine
33	Sand	Grey	Silty
56	Silt	Grey	Unknown
60	Clay	Grey	Unknown



Well Name: Olson	WWDR #: 62408
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Well Location

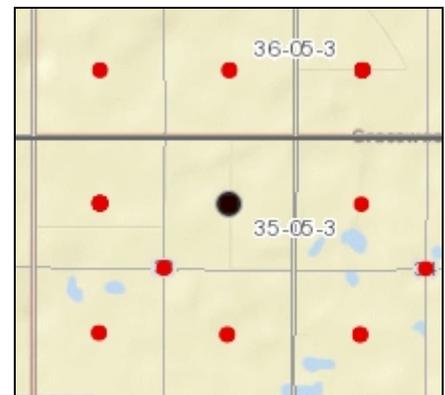
Land Location NE-33-35-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM:	
NTS Map:	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Wellen Boring Ltd.	Length (ft)	Well Casings Btm (ft)	Dia (in)	Material
Completion Date 1980.07.24	53	52	30	Galvanized Iron
Hole #				
Install Method Bored				
Borehole Depth (ft) 52	Well Screens			
Bit Dia (in) 40	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)
Water Level 14				
Flowing Head 0				
Water Use Domestic	Pump Test			
Well Use Withdrawal	Draw Down			0 ft
Completion Method Curbed	Duration			0 hrs
E-Log None	Pumping Rate			0 igpm
	Temperature			0 deg. F
	Rec. Pumping Rate			0 igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
16	Sand	Brown	Fine
24	Sand	Grey	Fine
32	Clay	Grey	Unknown
46	Sand	Grey	Fine
52	Clay	Grey	Unknown



Well Name: **Freemans**

 WWDR #: **63466**
Well Location

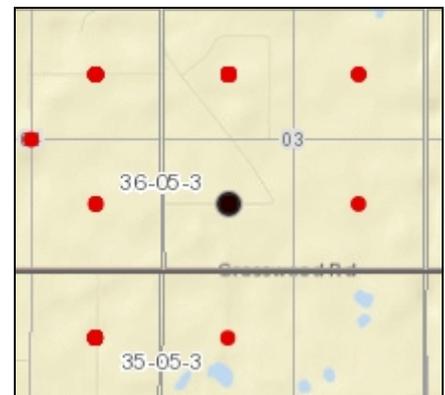
Land Location	SW-03-36-05-3	Location of Well (in Quarter)
LSD		ft from N/S Boundary
Reserve		ft from E/W Boundary
RM:	344	
NTS Map:	73B02	Major Basin:
Elevation (ft)	1650	SubBasin: 30
Aquifer		

Well Information

Driller	Wellen Boring Ltd.	Length (ft)	Well Casings	Btm (ft)	Dia (in)	Material
Completion Date	1980.09.03	47		45	30	Galvanized Iron
Hole #						
Install Method	Bored					
Borehole Depth (ft)	45		Well Screens			
Bit Dia (in)	40	Length (ft)	Bottom (ft)	Dia (in)	Slot (in)	Material
Water Level	14					
Flowing Head	0					
Water Use	Domestic		Pump Test			
Well Use	Withdrawal	Draw Down				0 ft
Completion Method	Curbed	Duration				0 hrs
E-Log	None	Pumping Rate				0 igpm
		Temperature				0 deg. F
		Rec. Pumping Rate				0 igpm

Lithology List

Depth (ft):	Material	Colour	Description
1	Topsoil	Unknown	Unknown
14	Sand	Brown	Fine
44	Sand	Grey	Fine
45	Clay	Grey	Unknown



Well Name: Meyers	WWDR #: 9545
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Well Location

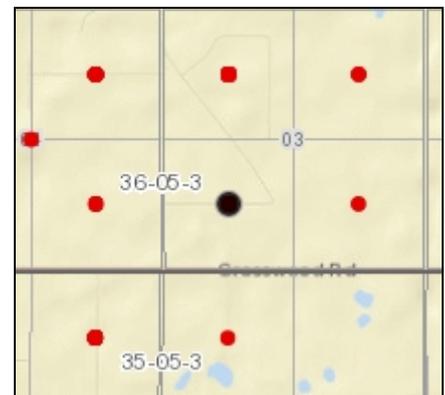
Land Location SW-03-36-05-3	Location of Well (in Quarter)
LSD	ft from N/S Boundary
Reserve	ft from E/W Boundary
RM: 344	
NTS Map: 73B02	Major Basin:
Elevation (ft) 1650	SubBasin: 30
Aquifer	

Well Information

Driller Wig's Sandpoint Drilling	Length (ft)	Btm (ft)	Dia (in)	Material
Completion Date 1973.07.09	0	20	1.5	Plastic
Hole #				
Install Method Jetted				
Borehole Depth (ft) 23				
Bit Dia (in) 1.5	3	23	2	10 Plastic
Water Level 8				
Flowing Head 0				
Water Use Domestic				
Well Use Withdrawal				
Completion Method Sand Point				
E-Log None				
	Well Casings			
	Well Screens			
	Pump Test			
	Draw Down		0 ft	
	Duration		18 hrs	
	Pumping Rate		10 igpm	
	Temperature		0 deg. F	
	Rec. Pumping Rate		10 igpm	

Lithology List

Depth (ft):	Material	Colour	Description
7	Sand	Unknown	Unknown
23	Sand	Unknown	Unknown





THURBER ENGINEERING LTD.

APPENDIX D

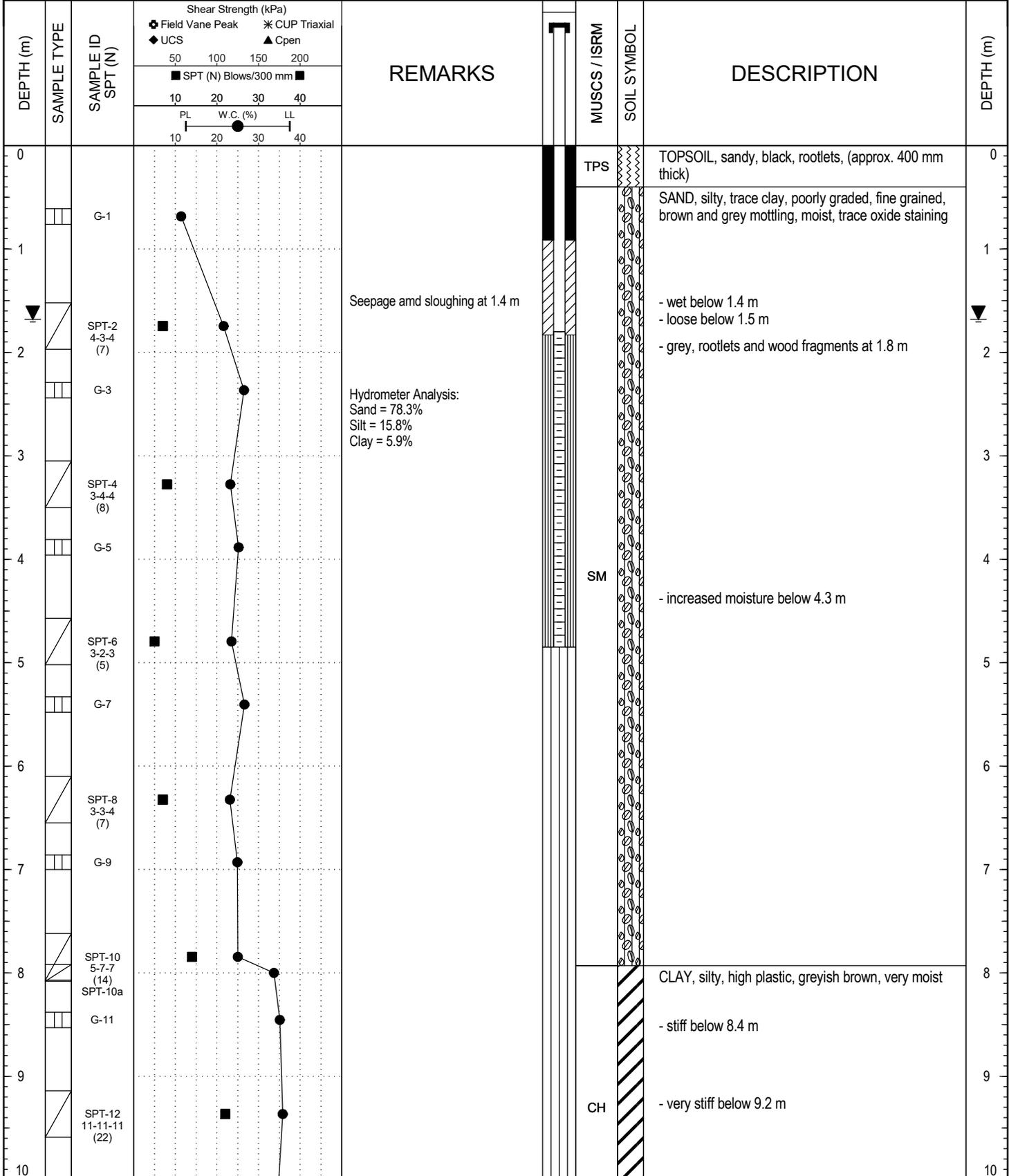
Groundwater Results

CLIENT: BCL Engineering Ltd. PROJECT: Corman Park Subdivision TEST HOLE NO: TH23-01

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5738447 m, Easting: 387142 m ELEVATION:

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough



DRILLING CO.: MARL Technologies
 RIG TYPE: Truck Mounted
 DRILL METHOD: Solid Stem Auger
 INSPECTOR: XTA

COMPILED BY: CHN
 REVIEWED BY: AJG

COMPLETION DEPTH: 10.7 m
 COMPLETION DATE: 5/17/2023

Page 1 of 2



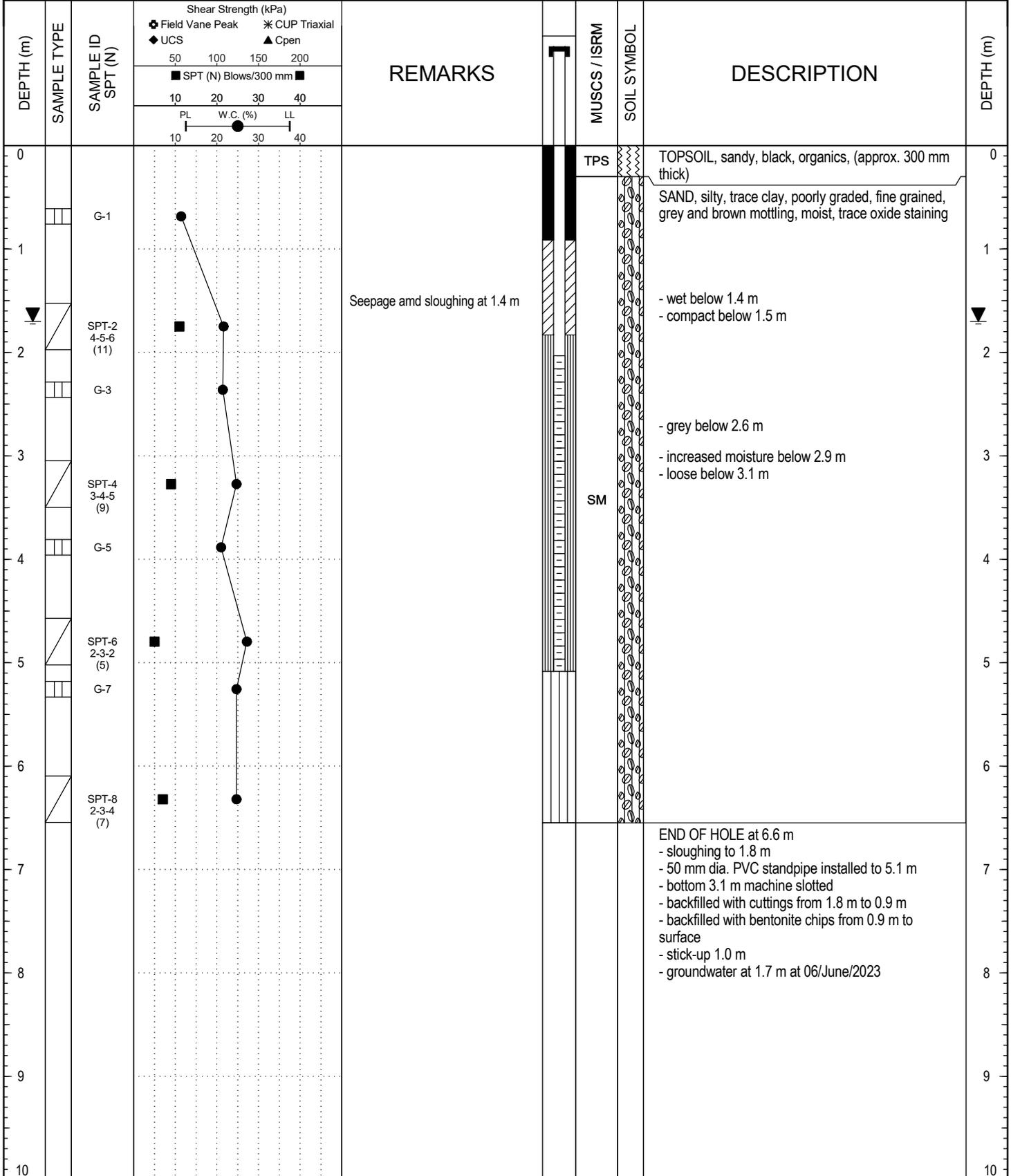
CLIENT: BCL Engineering Ltd.		PROJECT: Corman Park Subdivision		TEST HOLE NO: TH23-01						
PROJECT NO: 37139		UTM 13N NAD83, Northing: 5738447 m, Easting: 387142 m		ELEVATION:						
SAMPLE TYPE: <input type="checkbox"/> Grab Sample <input checked="" type="checkbox"/> Standard Penetration Test										
BACKFILL TYPE: <input checked="" type="checkbox"/> Bentonite <input checked="" type="checkbox"/> Drill Cuttings <input type="checkbox"/> Slough										
DEPTH (m)	SAMPLE TYPE	SAMPLE ID SPT (N)	Shear Strength (kPa)		REMARKS	STANDPIPE	MUSCS / ISRM	SOIL SYMBOL	DESCRIPTION	DEPTH (m)
			Field Vane Peak ◆ UCS	* CUP Triaxial ▲ Cpen						
			50 100 150 200 10 20 30 40 PL W.C. (%) LL 10 20 30 40							
10		G-13							CLAY (continued) - medium plastic, firm below 10.2 m	10
11		G-14							END OF HOLE at 10.7 m - sloughing to 1.8 m - 50 mm dia. PVC standpipe installed to 4.9 m - bottom 3.1 m machine slotted - backfilled with cuttings from 1.8 m to 0.9 m - backfilled with bentonite chips from 0.9 m to surface - stick-up 1.2 m - groundwater at 1.7 m at 06/June/2023	11
12										12
13										13
14										14
15										15
16										16
17										17
18										18
19										19
20										20
 THURBER ENGINEERING LTD.		DRILLING CO.: MARL Technologies								
		RIG TYPE: Truck Mounted				COMPILED BY: CHN		COMPLETION DEPTH: 10.7 m		
		DRILL METHOD: Solid Stem Auger				REVIEWED BY: AJG		COMPLETION DATE: 5/17/2023		
		INSPECTOR: XTA						Page 2 of 2		

CLIENT: BCL Engineering Ltd. PROJECT: Corman Park Subdivision TEST HOLE NO: TH23-02

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768424 m, Easting: 387238 m ELEVATION:

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough



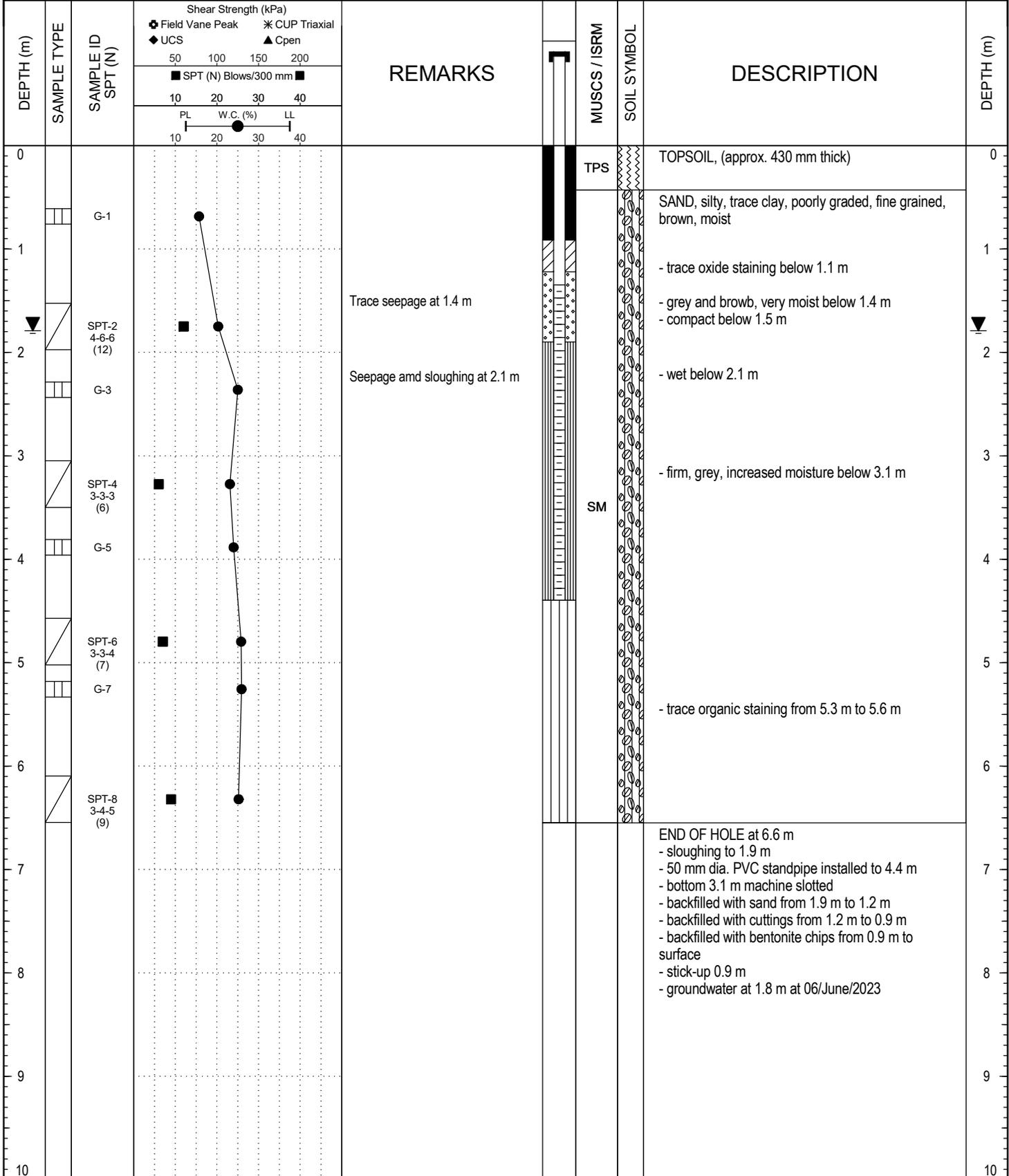
DRILLING CO.: MARL Technologies
 RIG TYPE: Truck Mounted
 DRILL METHOD: Solid Stem Auger
 INSPECTOR: XTA
 COMPILED BY: CHN
 REVIEWED BY: AJG
 COMPLETION DEPTH: 6.6 m
 COMPLETION DATE: 5/17/2023
 Page 1 of 1

CLIENT: BCL Engineering Ltd. PROJECT: Corman Park Subdivision TEST HOLE NO: TH23-03

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768426 m, Easting: 387354 m ELEVATION:

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Sand Slough



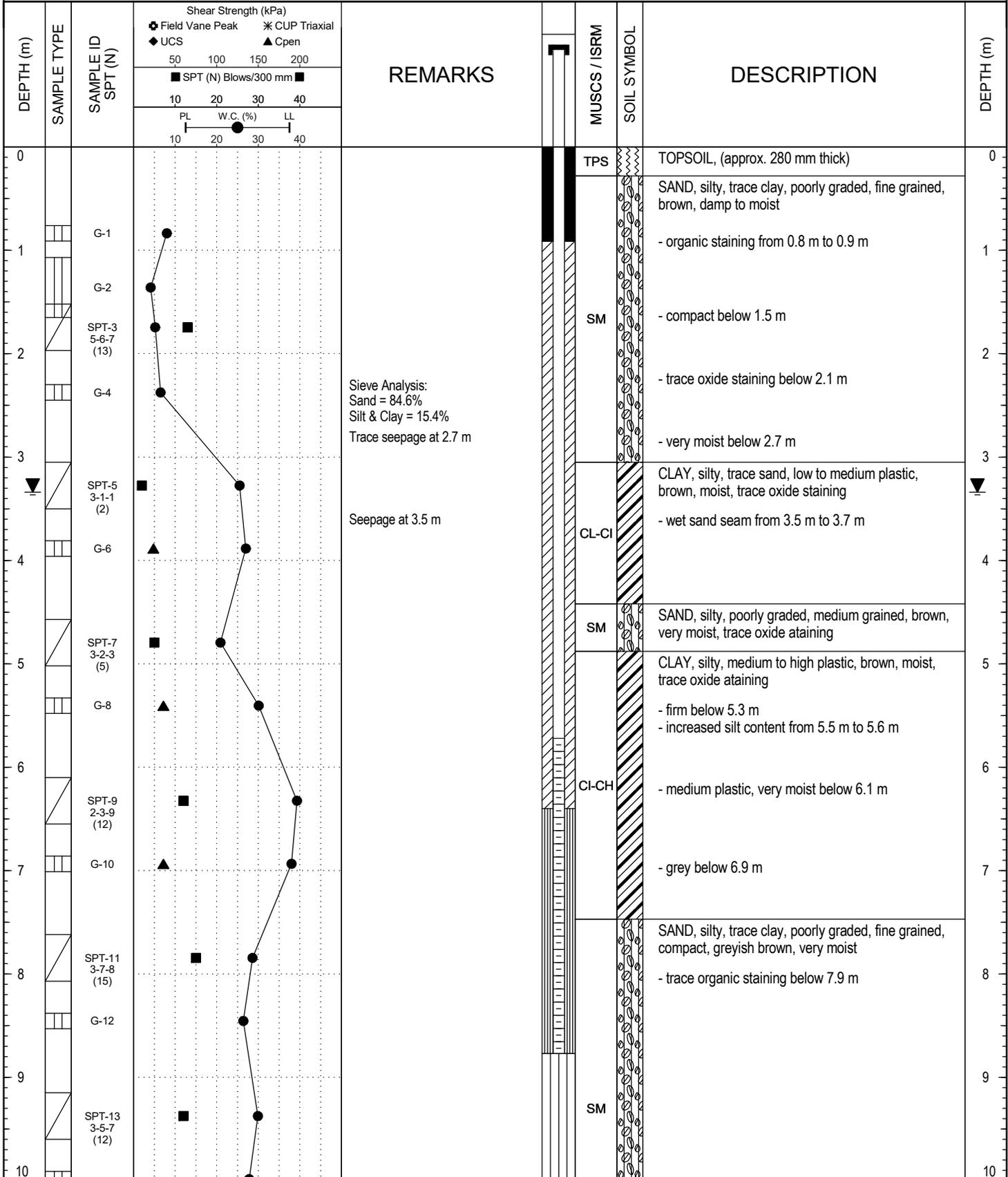
	DRILLING CO.: MARL Technologies		
	RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 6.6 m
	DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023
	INSPECTOR: XTA		Page 1 of 1

CLIENT: BCL Engineering Ltd. PROJECT: Corman Park Subdivision TEST HOLE NO: TH23-04

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768438 m, Easting: 387481 m ELEVATION:

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough



	DRILLING CO.: MARL Technologies	COMPILED BY: CHN	COMPLETION DEPTH: 11.1 m
	RIG TYPE: Truck Mounted	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023
	DRILL METHOD: Solid Stem Auger	INSPECTOR: XTA	
			Page 1 of 2

CLIENT: BCL Engineering Ltd.	PROJECT: Corman Park Subdivision	TEST HOLE NO: TH23-04
PROJECT NO: 37139	UTM 13N NAD83, Northing: 5768438 m, Easting: 387481 m	ELEVATION:

SAMPLE TYPE: <input type="checkbox"/> Grab Sample <input checked="" type="checkbox"/> Standard Penetration Test

BACKFILL TYPE: <input checked="" type="checkbox"/> Bentonite <input checked="" type="checkbox"/> Drill Cuttings <input type="checkbox"/> Slough

DEPTH (m)	SAMPLE TYPE	SAMPLE ID SPT (N)	Shear Strength (kPa)		REMARKS	STANDPIPE	MUSCS / ISRM	SOIL SYMBOL	DESCRIPTION	DEPTH (m)
			Field Vane Peak ◆ UCS	* CUP Triaxial ▲ Cpen						
10		G-14							SAND (continued)	10
11		SPT-15 5-7-9 (16)	10	20					END OF HOLE at 11.1 m - sloughing to 6.4 m - 50 mm dia. PVC standpipe installed to 8.8 m - bottom 3.1 m machine slotted - backfilled with cuttings from 6.4 m to 0.9 m - backfilled with bentonite chips from 0.9 m to surface - stick-up 1.0 m - groundwater at 3.3 m at 06/June/2023	11
12										12
13										13
14										14
15										15
16										16
17										17
18										18
19										19
20										20

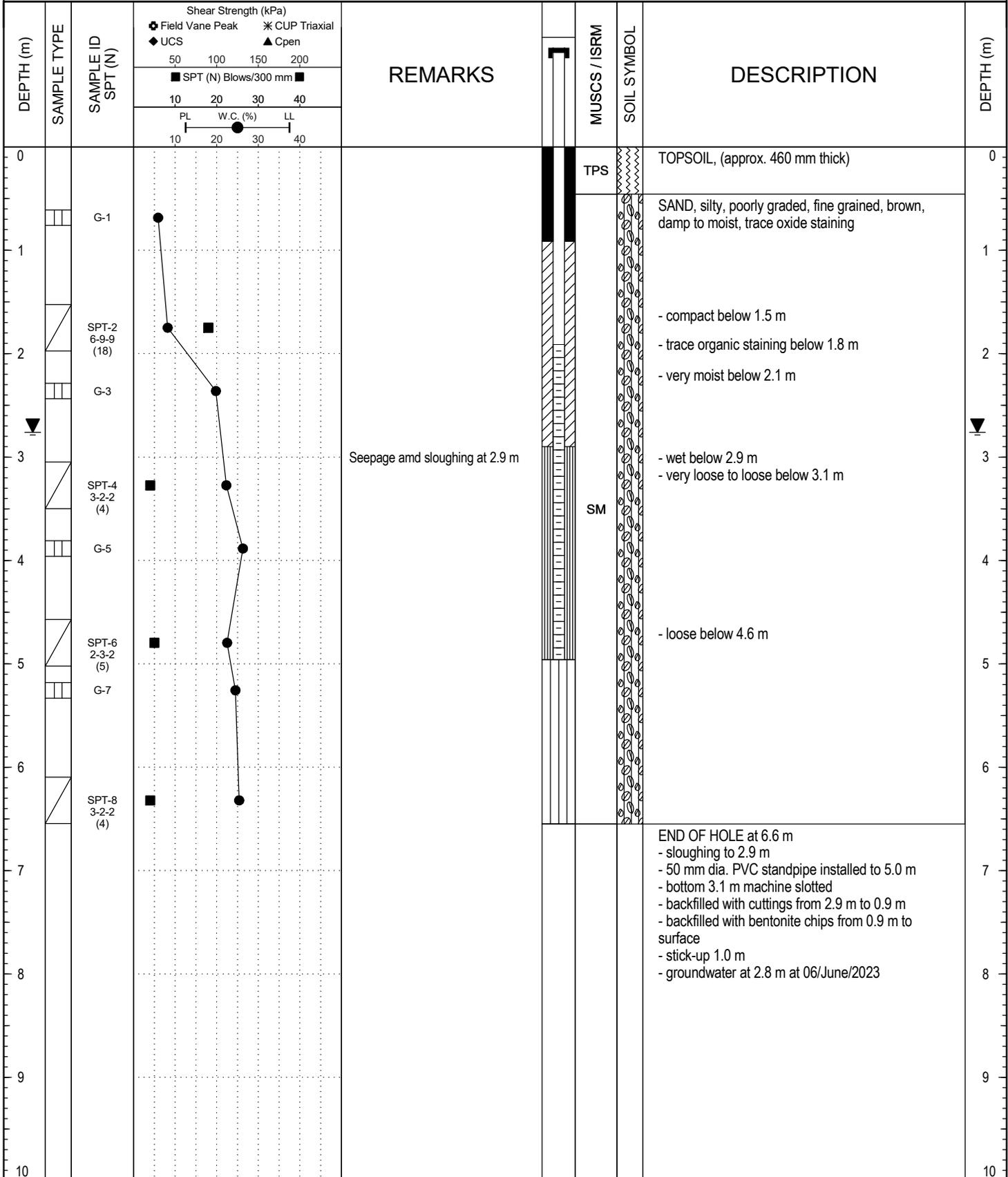
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	RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 11.1 m	
	DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023	
	INSPECTOR: XTA			

CLIENT: BCL Engineering Ltd. PROJECT: Corman Park Subdivision TEST HOLE NO: TH23-05

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768370 m, Easting: 387196 m ELEVATION:

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough



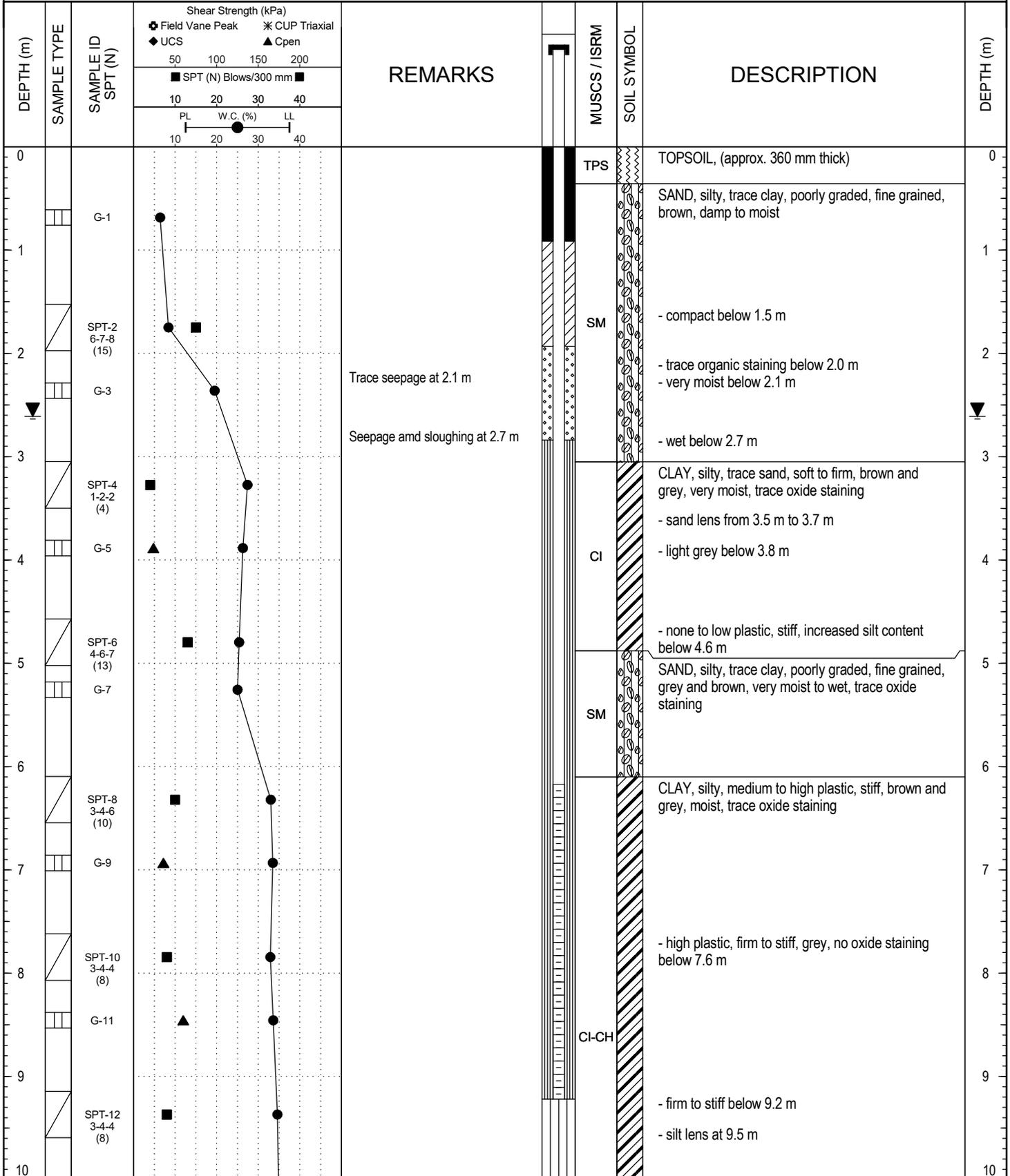
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	RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 6.6 m
	DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023
	INSPECTOR: XTA		Page 1 of 1

CLIENT: BCL Engineering Ltd. PROJECT: Corman Park Subdivision TEST HOLE NO: TH23-06

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768334 m, Easting: 387322 m ELEVATION:

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Sand Slough



	DRILLING CO.: MARL Technologies	COMPILED BY: CHN	COMPLETION DEPTH: 11.1 m
	RIG TYPE: Truck Mounted	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023
	DRILL METHOD: Solid Stem Auger	INSPECTOR: XTA	
			Page 1 of 2

CLIENT: BCL Engineering Ltd. PROJECT: Corman Park Subdivision TEST HOLE NO: TH23-06

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768334 m, Easting: 387322 m ELEVATION:

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Sand Slough

DEPTH (m)	SAMPLE TYPE	SAMPLE ID SPT (N)	Shear Strength (kPa)		REMARKS	STANDPIPE	MUSCS / ISRM	SOIL SYMBOL	DESCRIPTION	DEPTH (m)
			Field Vane Peak ◆ UCS	CUP Triaxial ▲ Cpen						
10		G-13						CLAY (continued)	10	
11		SPT-14 3-3-4 (7)	■	●				- firm below 10.7 m	11	
12								END OF HOLE at 11.1 m - sloughing to 2.8 m - 50 mm dia. PVC standpipe installed to 9.2 m - bottom 3.1 m machine slotted - backfilled with sand from 2.8 m to 1.9 m - backfilled with cuttings from 1.9 m to 0.9 m - backfilled with bentonite chips from 0.9 m to surface - stick-up 1.0 m - groundwater at 2.6 m at 06/June/2023	12	
13									13	
14									14	
15									15	
16									16	
17									17	
18									18	
19									19	
20									20	



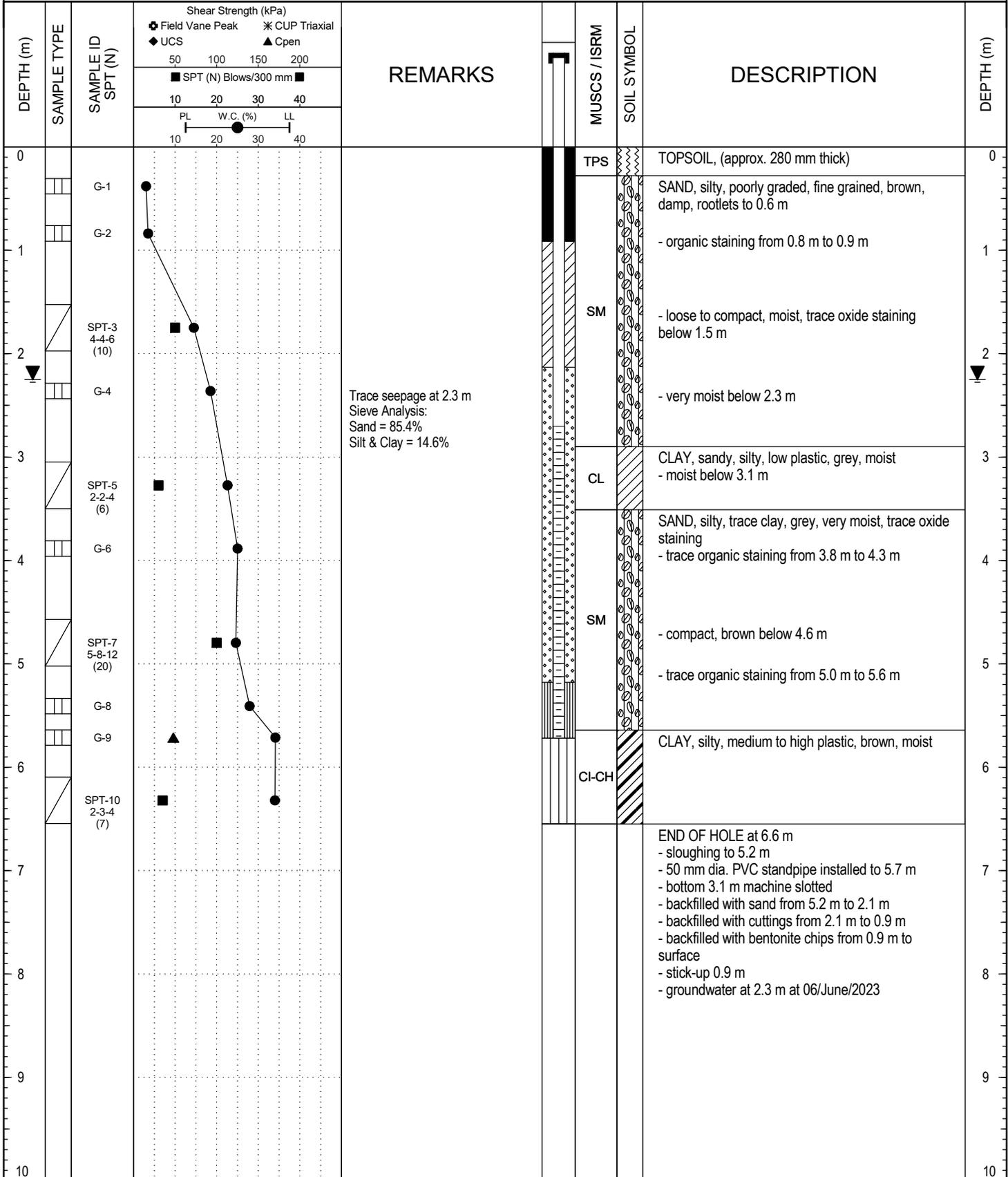
DRILLING CO.: MARL Technologies			
RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 11.1 m	
DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023	
INSPECTOR: XTA			

CLIENT: BCL Engineering Ltd. PROJECT: Corman Park Subdivision TEST HOLE NO: TH23-07

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768327 m, Easting: 387469 m ELEVATION:

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Sand Slough



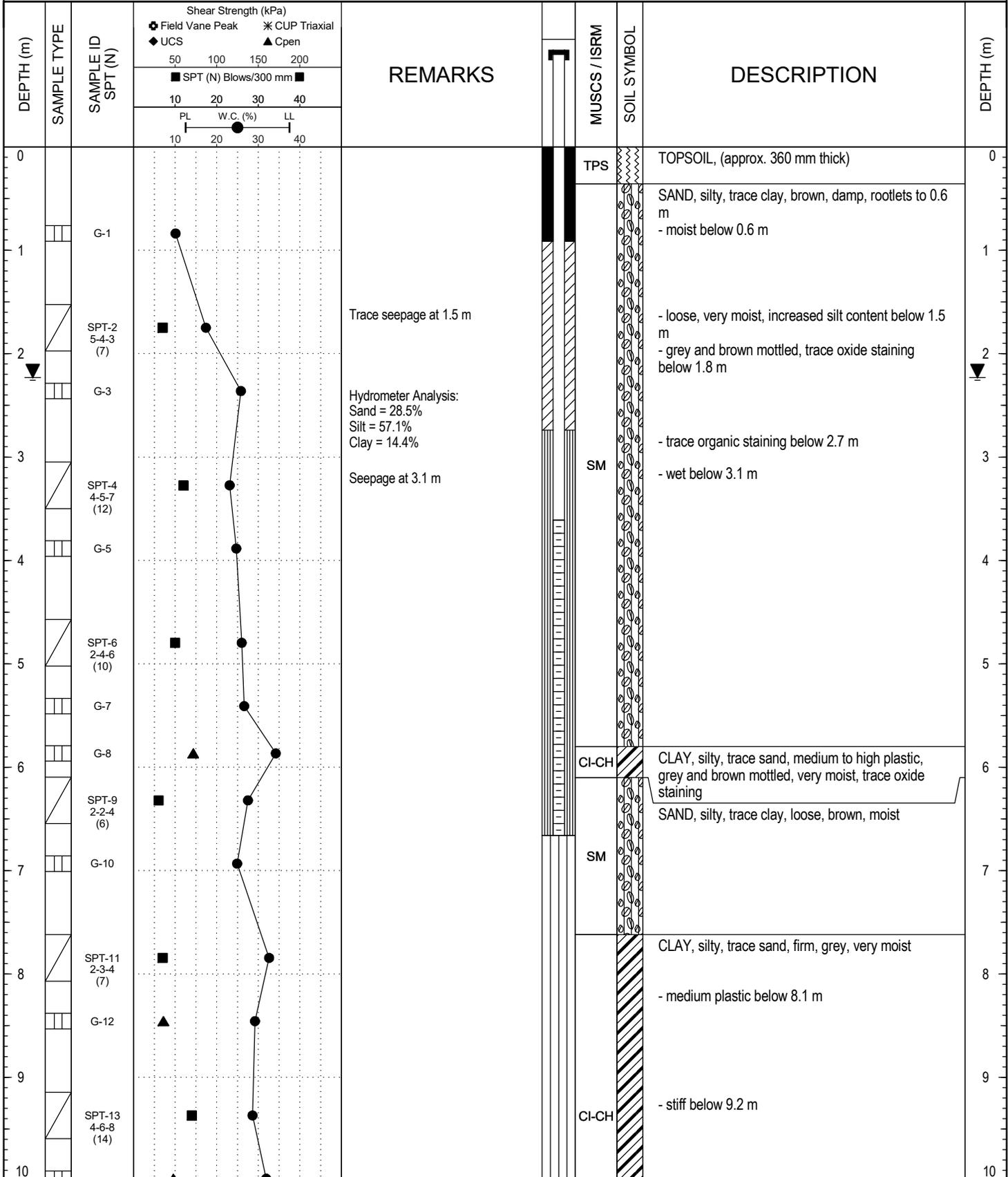
DRILLING CO.: MARL Technologies
 RIG TYPE: Truck Mounted COMPILED BY: CHN COMPLETION DEPTH: 6.6 m
 DRILL METHOD: Solid Stem Auger REVIEWED BY: AJG COMPLETION DATE: 5/17/2023
 INSPECTOR: XTA

CLIENT: BCL Engineering Ltd. PROJECT: Corman Park Subdivision TEST HOLE NO: TH23-08

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768196 m, Easting: 387264 m ELEVATION:

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough



	DRILLING CO.: MARL Technologies			
	RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 11.1 m	
	DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023	
	INSPECTOR: XTA			

CLIENT: BCL Engineering Ltd. PROJECT: Corman Park Subdivision TEST HOLE NO: TH23-08

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768196 m, Easting: 387264 m ELEVATION:

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough

DEPTH (m)	SAMPLE TYPE	SAMPLE ID SPT (N)	Shear Strength (kPa)		REMARKS	STANDPIPE	MUSCS / ISRM	SOIL SYMBOL	DESCRIPTION	DEPTH (m)
			Field Vane Peak ◆ UCS	* CUP Triaxial ▲ Cpen						
10		G-14							CLAY (continued)	10
11		SPT-15 5-6-8 (14)	■ SPT (N) Blows/300 mm ■						END OF HOLE at 11.1 m - sloughing to 2.7 m - 50 mm dia. PVC standpipe installed to 6.7 m - bottom 3.1 m machine slotted - backfilled with cuttings from 2.7 m to 0.9 m - backfilled with bentonite chips from 0.9 m to surface - stick-up 0.9 m - groundwater at 2.2 m at 06/June/2023	11
12										12
13										13
14										14
15										15
16										16
17										17
18										18
19										19
20										20



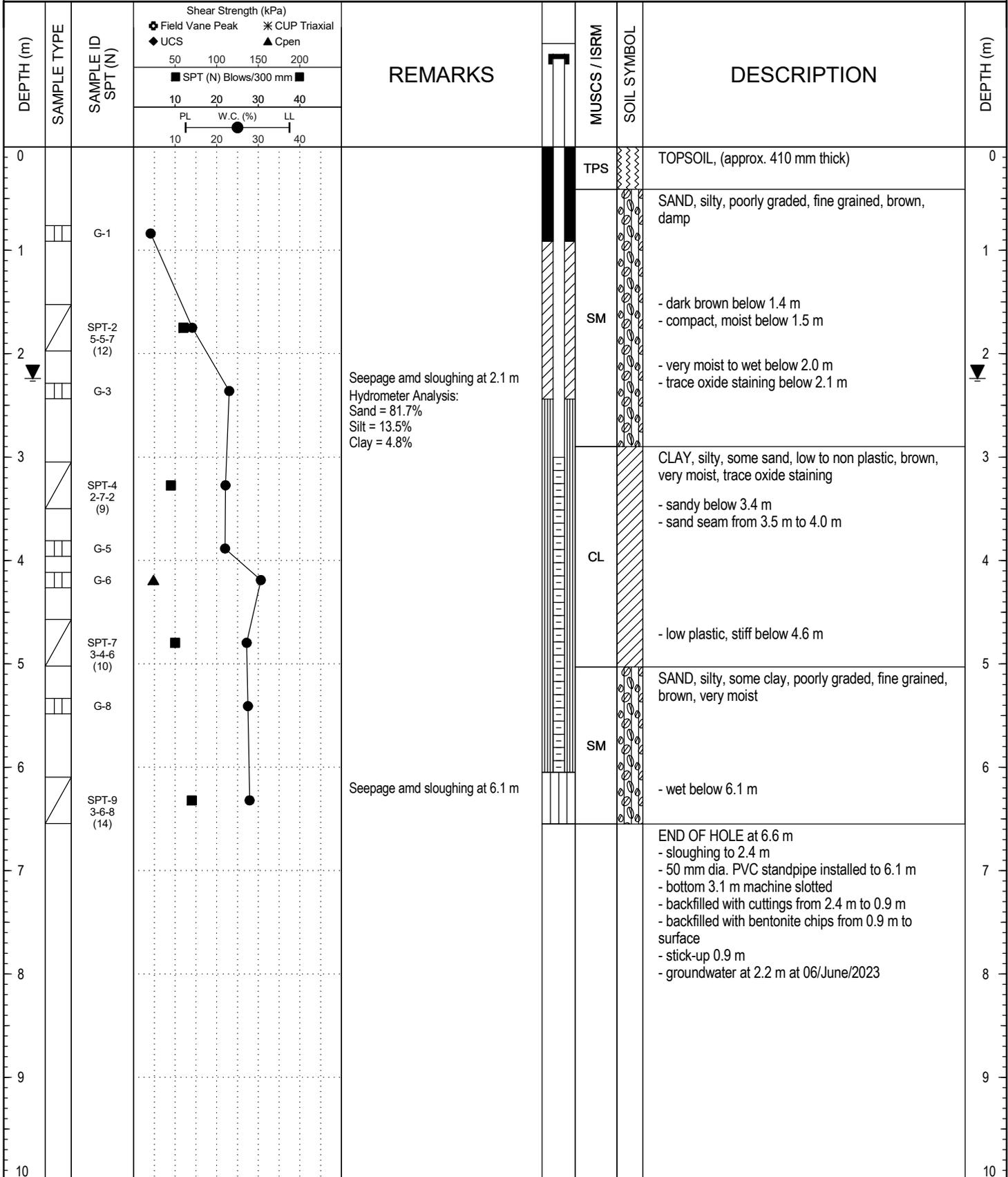
DRILLING CO.: MARL Technologies			
RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 11.1 m	
DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023	
INSPECTOR: XTA			

CLIENT: BCL Engineering Ltd. PROJECT: Corman Park Subdivision TEST HOLE NO: TH23-09

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768199 m, Easting: 387400 m ELEVATION:

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough

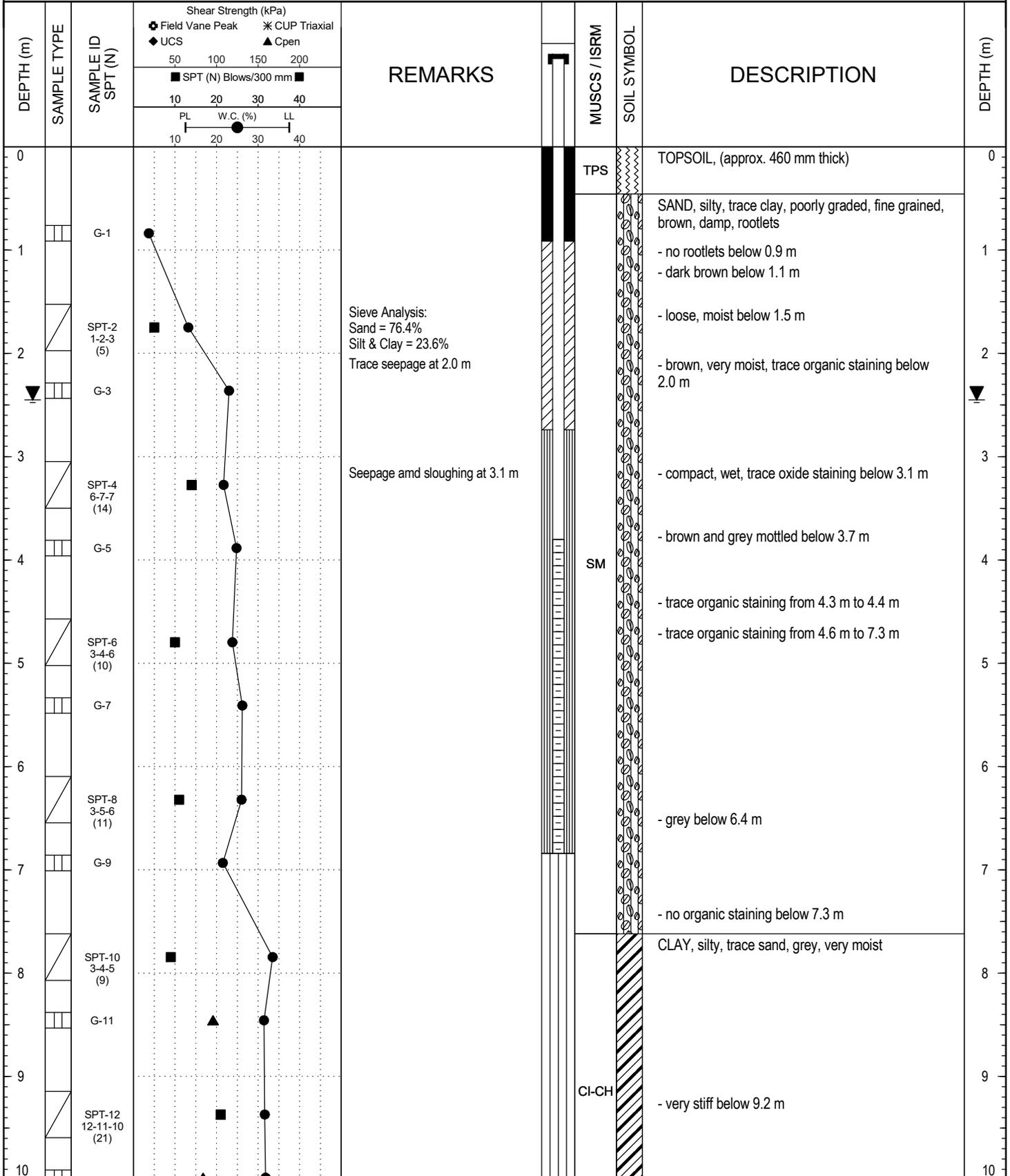


CLIENT: BCL Engineering Ltd. PROJECT: Corman Park Subdivision TEST HOLE NO: TH23-10

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768187 m, Easting: 387502 m ELEVATION:

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough



DRILLING CO.: MARL Technologies
 RIG TYPE: Truck Mounted
 DRILL METHOD: Solid Stem Auger
 INSPECTOR: XTA
 COMPILED BY: CHN
 REVIEWED BY: AJG
 COMPLETION DEPTH: 10.7 m
 COMPLETION DATE: 5/18/2023
 Page 1 of 2

CLIENT: BCL Engineering Ltd.		PROJECT: Corman Park Subdivision			TEST HOLE NO: TH23-10					
PROJECT NO: 37139		UTM 13N NAD83, Northing: 5768187 m, Easting: 387502 m			ELEVATION:					
SAMPLE TYPE: <input type="checkbox"/> Grab Sample <input checked="" type="checkbox"/> Standard Penetration Test										
BACKFILL TYPE: <input checked="" type="checkbox"/> Bentonite <input checked="" type="checkbox"/> Drill Cuttings <input type="checkbox"/> Slough										
DEPTH (m)	SAMPLE TYPE	SAMPLE ID SPT (N)	Shear Strength (kPa)		REMARKS	STANDPIPE	MUSCS / ISRM	SOIL SYMBOL	DESCRIPTION	DEPTH (m)
			Field Vane Peak ◆ UCS	* CUP Triaxial ▲ Cpen						
			50 100 150 200 10 20 30 40 PL W.C. (%) LL 10 20 30 40							
10		G-13							CLAY (continued)	10
11		G-14	▲	●					END OF HOLE at 10.7 m - sloughing to 2.7 m - 50 mm dia. PVC standpipe installed to 6.8 m - bottom 3.1 m machine slotted - backfilled with cuttings from 2.7 m to 0.9 m - backfilled with bentonite chips from 0.9 m to surface - stick-up 0.9 m - groundwater at 2.5 m at 06/June/2023	11
12										12
13										13
14										14
15										15
16										16
17										17
18										18
19										19
20										20
 THURBER ENGINEERING LTD.		DRILLING CO.: MARL Technologies								
		RIG TYPE: Truck Mounted			COMPILED BY: CHN	COMPLETION DEPTH: 10.7 m				
		DRILL METHOD: Solid Stem Auger			REVIEWED BY: AJG	COMPLETION DATE: 5/18/2023				
		INSPECTOR: XTA								



THURBER ENGINEERING LTD.

APPENDIX E

Borehole Logs

TABLE 1: Groundwater Analytical Results

Sample Location			0W-01	0W-02	0W-03	0W-05		SMoE (2019) Standards			
Sample ID			0W-01	0W-02	0W-03	OW-5	OW-5	SEQS Tier 1	SEQS Tier 2	SEQS Tier 1	SEQS Tier 2
Sample Date (yyyy mm dd)			2019 06 13	2019 06 13	2019 06 13	2019 06 19	2019 06 20	Agricultural Land Use, Coarse-Grained Soil	Agricultural Land Use, Coarse-Grained Soil ^b	Residential Land Use, Coarse-Grained Soil	Residential Land Use, Coarse-Grained Soil ^b
Parameter	Units	RDL	Analytical Results								
Physical Parameters											
Total Ions	mg/L	1	532	377	1,960	-	976	n/a	n/a	n/a	n/a
Ion Balance	%	0	0.40	3.43	0.29	-	0.50	n/a	n/a	n/a	n/a
Total Hardness	mg/L	1	300	232	1,040	-	512	n/a	n/a	n/a	n/a
Total Dissolved Solids	mg/L	5	459	336	2,020	-	800	500	500	500	500
Conductivity	µS/cm	1	632	450	2,290	-	1,150	n/a	n/a	n/a	n/a
pH	pH	0.07	8.11	8.18	8.01	-	7.90	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5
Dissolved Inorganics											
Nitrate Nitrogen	mg/L	0.01	0.29	2.9	< 0.01	< 0.01	-	3	10	3	10
Fluoride	mg/L	0.01	0.31	0.10	0.26	-	0.72	0.12	1.5	0.12	1.5
Total Alkalinity (as CaCO3)	mg/L	1	273	218	333	-	394	n/a	n/a	n/a	n/a
Alkalinity, Phenolphthalein (as CaCO3)	mg/L	1	< 1	< 1	< 1	-	< 1	n/a	n/a	n/a	n/a
Bicarbonate	mg/L	1	333	266	406	-	481	n/a	n/a	n/a	n/a
Carbonate	mg/L	1	< 1	< 1	< 1	-	< 1	n/a	n/a	n/a	n/a
Hydroxide	mg/L	1	< 1	< 1	< 1	-	< 1	n/a	n/a	n/a	n/a
Major Ions											
Calcium	mg/L	0.1	69	70	181	-	80	n/a	n/a	n/a	n/a
Chloride	mg/L	1	12	6	16	-	29	100	250	120	250
Magnesium	mg/L	0.1	31	14	143	-	76	n/a	n/a	n/a	n/a
Potassium	mg/L	0.1	1.6	2.8	7.9	-	5.0	n/a	n/a	n/a	n/a
Sodium	mg/L	0.1	23	8.3	178	-	75	200	200	200	200
Sulphate	mg/L	0.2	62	10	1,030	-	230	100	500	100	500
Microbiological Tests											
Total Coliforms	mpn/100mL	1	160	520	2,100	4	-	> RDL	> RDL	> RDL	> RDL
E. Coli	mpn/100mL	1	< 1 ^a	< 1 ^a	< 1 ^a	< 1 ^a	-	> RDL	> RDL	> RDL	> RDL

Associated SRC file(s): 2019-7902, 2019-8264, 2019-8292, 2019-8514.

All terms defined within the body of SNC-Lavalin's report.

< Denotes concentration less than indicated detection limit.

- Denotes analysis not conducted.

n/a Denotes no applicable standard/guideline.

RDL Denotes reported detection limit.

BOLD	Concentration greater than the SEQS Tier 1 Agricultural Land Use, Coarse-Grained Soil Standards.
<i>ITALIC</i>	Concentration greater than the SEQS Tier 2 Agricultural Land Use, Coarse-Grained Soil Standards (Potable).
<u>UNDERLINE</u>	Concentration greater than the SEQS Tier 1 Residential Land Use, Coarse-Grained Soil Standards.
SHADED	Concentration greater than the SEQS Tier 2 Residential Land Use, Coarse-Grained Soil Standards (Potable).

^a Laboratory detection limit exceeds regulatory standard/guideline.

^b Potable exposure pathway.

Table 4.2.1
Water and Soil Lab Results
Grasswood Hydrogeology

Parameter	Units	Sample ID ALS ID Date Sampled	Criteria	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	
				Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID	Sample ID
				AL104	BH201	BH202	BH203	BH204	BH205	BH206	BH207	BH208	BH210	BH211	BH213	BH212	DUP 1	DUP 2	DUP 3
				L1172891-8	L1172891-3	L1172891-2	L1172891-5	L1172891-7	L1172891-9	L1172891-11	L1172891-12	L1172891-4	L1172891-6	L1172891-1	L1172891-10	L1172891-13	L1172891-15	L1172891-14	L1172891-16
				7/4/2012	7/4/2012	7/4/2012	7/4/2012	7/4/2012	7/4/2012	7/4/2012	7/4/2012	7/4/2012	7/4/2012	7/4/2012	7/4/2012	7/4/2012	7/4/2012	7/4/2012	7/4/2012
				Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water	Water
				Saskatchewan Drinking Water Standards & Objectives															
Parameter	Units	Detection Limit																	
Health and Toxicity Metals																			
Total Mercury in Water by CRC ICPMS																			
Mercury (Hg)-Total	mg/L	0.00005	-	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	-	<0.000050	-
Total Metals in Water by CRC ICPMS																			
Aluminum (Al)-Total	mg/L	0.01	-	37.4 *	10.5 *	1.24 *	150 *	8.21 *	72.6 *	88.0 *	0.76 *	8.33 *	58.9 *	4.64 *	0.586 *	79.6 *	-	89.5 *	-
Arsenic (As)-Total	mg/L	0.0002	0.025	0.0516 *	0.0103 *	0.00346 *	0.268 *	0.0164 *	0.0629 *	0.0756 *	0.0023 *	0.0119 *	0.0779 *	0.00444 *	0.00213 *	0.0811 *	-	0.0881 *	-
Barium (Ba)-Total	mg/L	0.0002	1	2.75 *	0.709 *	0.0686 *	23.1 *	0.683 *	3.20 *	4.93 *	0.0412 *	0.834 *	4.80 *	0.352 *	0.136 *	2.64 *	-	3.04 *	-
Boron (B)-Total	mg/L	0.02	5	<0.10 *	0.060 *	0.188 *	0.23 *	0.052 *	<0.20 *	<0.20 *	0.43 *	0.025 *	<0.10 *	0.035 *	0.038 *	<0.20 *	-	<0.20 *	-
Cadmium (Cd)-Total	mg/L	0.00002	-	0.00138 *	0.000302 *	0.000081 *	0.0108 *	0.000624 *	0.00179 *	0.00491 *	<0.00020 *	0.000332 *	0.00282 *	0.000332 *	0.000025 *	0.00247 *	-	0.00273 *	-
Chromium (Cr)-Total	mg/L	0.0002	-	0.0615 *	0.0155 *	0.00205 *	0.265 *	0.0131 *	0.115 *	0.147 *	<0.0020 *	0.0125 *	0.0978 *	0.00745 *	0.00127 *	0.132 *	-	0.147 *	-
Copper (Cu)-Total	mg/L	0.001	1	0.0629 *	0.0278 *	0.0032 *	0.319 *	0.0172 *	0.149 *	0.200 *	<0.010 *	0.0158 *	0.160 *	0.0060 *	0.0021 *	0.178 *	-	0.201 *	-
Iron (Fe)-Total	mg/L	0.02	0.3	89.0 *	16.4 *	2.45 *	430 *	21.1 *	160 *	207 *	1.47 *	17.7 *	175 *	6.69 *	1.25 *	178 *	-	203 *	-
Lead (Pb)-Total	mg/L	0.0001	0.01	0.0727 *	0.0257 *	0.00150 *	0.383 *	0.0190 *	0.118 *	0.177 *	0.0013 *	0.0134 *	0.162 *	0.00416 *	0.00085 *	0.115 *	-	0.138 *	-
Manganese (Mn)-Total	mg/L	0.0006	0.05	1.29 *	0.998 *	0.695 *	29.6 *	1.12 *	2.78 *	5.50 *	0.247 *	1.89 *	4.12 *	0.826 *	0.617 *	4.37 *	-	4.95 *	-
Selenium (Se)-Total	mg/L	0.0002	0.01	0.0023 *	0.00072 *	<0.00020 *	0.0069 *	0.00034 *	0.0096 *	<0.0020 *	<0.0020 *	0.00800 *	0.0195 *	<0.00020 *	<0.00020 *	0.0099 *	-	0.0098 *	-
Uranium (U)-Total	mg/L	0.00002	0.02	0.0134 *	0.0276 *	0.0270 *	0.0256 *	0.00163 *	0.0265 *	0.0300 *	0.195 *	0.00397 *	0.00942 *	0.00520 *	0.00284 *	0.0159 *	-	0.0181 *	-
Zinc (Zn)-Total	mg/L	0.006	5	0.401 *	0.0910 *	0.0134 *	0.667 *	0.0736 *	0.667 *	0.974 *	<0.060 *	0.0691 *	0.631 *	0.0311 *	0.0080 *	0.685 *	-	0.771 *	-
Miscellaneous Parameters																			
Turbidity	NTU	0.1	-	1740	424	55.8	>4000	>4000	613	>4000	134	1340	>4000	372	13.5	>4000	927	-	-
Routine Potable Water																			
Alkalinity, Total																			
Alkalinity, Total (as CaCO3)	mg/L	5	500	227	296	383	314	282	294	423	508	341	224	294	190	374	512	-	-
Bicarbonate (HCO3)	mg/L	5	-	277	361	467	383	344	359	516	620	417	274	359	231	456	625	-	-
Hydroxide (OH)	mg/L	5	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	-
Carbonate (CO3)	mg/L	5	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	-	-
Chloride (Cl)																			
Chloride (Cl)	mg/L	1	250	7.4	6.7	5	40.6	3.4	5.2	1.8	98 *	7.9	5.2	1.9	2.3	9.1	101 *	-	-
Fluoride (F)																			
Fluoride (F)	mg/L	0.1	-	0.23	0.2	0.22	0.2	<0.10	0.22	0.14	0.32	<0.10	<0.10	0.3	0.2	0.21	0.31	-	-
ICP Cations																			
Calcium (Ca) Dissolved	mg/L	1	-	73.4	88.8	127	173	89.9	106	110	467 *	140	63.4	84.2	76.2	109	459 *	-	-
Magnesium (Mg) Dissolved	mg/L	1	200	28.8	25.7	54.2	53.7	35.8	30.9	41.7	817 *	32.5	14.9	26.1	21.3	35.2	815 *	-	-
Potassium (K) Dissolved	mg/L	1	-	4	3.4	6.9	7.2	10.5	2.9	3.4	51 *	4.7	2.3	2.5	3.1	5.5	51 *	-	-
Sodium (Na) Dissolved	mg/L	2	300	29.2	15.8	66	44.7	9.4	7.7	7.6	1180 *	16.5	5.4	7.2	8.6	27.5	1160 *	-	-
Sulfur (as SO4) Dissolved	mg/L	3	500	112	35.9	263	186	104	95.3	18.3	6240 *	139	18	30.2	95.5	87.7	6400 *	-	-
Iron (Fe) & Manganese (Mn) - Dissolved																			
Iron (Fe)-Dissolved	mg/L	0.03	-	<0.030	<0.030	0.082	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.035	<0.030	<0.030	0.07	<0.030	-	-
Manganese (Mn)-Dissolved	mg/L	0.001	-	0.0309	0.602	0.574	0.0895	0.297	0.163	0.184	0.254	0.0057	0.113	0.538	0.526	0.386	0.244	-	-
Nitrate, Nitrite and Nitrate+Nitrite-N																			
Nitrate+Nitrite-N	mg/L	0.5	-	<0.50	<0.50	<0.50	51.3	<0.50	0.83	<0.50	<0.50	7.12	0.67	<0.50	<0.50	<0.50	<0.50	<0.50	-
Nitrate-N	mg/L	0.5	10	<0.50	<0.50	<0.50	51.0	<0.50	0.72	<0.50	<0.50	7.1	0.61	<0.50	<0.50	<0.50	<0.50	<0.50	-
Nitrite-N	mg/L	0.05	3.2	<0.050	<0.050	<0.050	0.276	<0.050	0.11	<0.050	0.058	<0.050	0.065	<0.050	<0.050	<0.050	0.08	-	-
pH and Conductivity																			
pH	pH	0.1	-	7.46 *	7.28 *	7.19 *	7.51 *	7.59 *	7.66 *	7.49 *	7.39 *	7.24 *	7.33 *	7.37 *	7.52 *	7.58 *	7.42 *	-	-
Conductivity (EC)	uS/cm	10	-	651	639	1150	1420	711	721	786	8800	920	443	588	550	834	8800	-	-
Total Coliform, Ecoli Meoli Blue & HPC																			
Escherichia Coli meoli blue MF																			
E. Coli	CFU/100mL	1	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	10	-	-	<1
Heterotrophic Plate Count																			
Heterotrophic Plate Count	CFU/mL	10	-	>3000	>3000	>3000	>3000	>3000	>3000	>3000	>3000	>3000	>3000	>3000	>3000	>3000	-	-	>3000
Total Coliforms																			
Total Coliforms	CFU/100mL	1	0, no OVERGROWN	190	890	OVERGROWN	<1	30	70	40	210	<1	-	OVERGROWN	OVERGROWN	10	-	-	OVERGROWN
Miscellaneous																			
Biochemical Oxygen Demand	mg/L	2	-	23	6	8	10	26	7	7	5	7	-	12	55	4	-	-	-
TDS (Calculated)	mg/L	n/a	1500	391	354	752	921	422	428	437	9160	577	247	329	321	499	9290	-	-
Cation - Anion Balance	%	n/a	-	2.2	3.2	2.1	0.7	1.3	1	2.4	0.1	0.2	-3.9	1.1	1.3	0.6	-1.6	-	-
Hardness (as CaCO3)	mg/L	n/a	800	302	328	540	653	372	392	446	4530	483	220	318	278	417	4500	-	-
Soils																			
Total Available Nitrogen	mg/kg	2.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Nitrogen by LECO	%	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Available Ammonium-N	mg/kg	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate+Nitrite-N	mg/kg	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate-N	mg/kg	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite-N	mg/kg	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* = Result Qualified **Bold-Exceeds Guidelines**

APPENDIX E

POTABLE WATER CORRESPONDENCE



SaskWater

Via Email: ktraves@bcl-eng.ca

March 18, 2025

(306) 694-7746

Mr. Kevin Traves
102139536 Saskatchewan Ltd.
1814 EASTHILL
SASKATOON SK S7J 3C1

File: 1021395

Dear Mr. Traves:

Re: SaskWater Confidential – Conditional Approval for 102139536 Saskatchewan Ltd.

Thank you for your request for potable water for a total peak flow of 2.6 imperial gallons per minute (igpm) for the proposed 14 lots at LSD13-34-35-05 W3M in the R.M. of Corman Park.

SaskWater has completed its review of your Request for Service and is pleased to provide conditional approval for the 2.6igpm flow allocation for the proposed 14 country residential lots. Please provide SaskWater, no later than March 31, 2026, with notifications from the R.M. of Corman Park and the Community Planning Branch of Municipal Affairs with confirmation approving the 14 lots. Once final approval has been received, SaskWater will execute an agreement with you or amend the water supply agreement with an existing water utility supplied by SaskWater.

If you require any additional information regarding the above, please contact me at the above number or call 1-888-230-1111, press 2 for Customer Services.

Yours truly,

A handwritten signature in black ink, appearing to read 'Nish Prasad', with a horizontal line underneath.

Nish Prasad
Manager, Customer Service

NP/sm

APPENDIX F

DRAINAGE STUDY AND PLANS

October 23, 2025
 File #96.00

Ms. Maggie Schwab
 Crosby Hanna & Associates
 407C 1st Avenue North
 Saskatoon, SK S7K 1X5

Dear Ms. Schwab:

Re: Proposed Subdivision – LS 13 Sec. 34 Twp. 35 Rge.5 W3Mer.

As requested, we are pleased to submit the following letter report as part of the R. M. of Corman Park’s Comprehensive Development Review process. The purpose of this report is to outline the proposed plan for drainage and storm water management within the development to mitigate any adverse effects within the surrounding area as a result of changes in land use or development. The report also establishes safe building elevations and provides comments on the potential restrictions with respect to foundation construction.

1. INTRODUCTION

The proposed subdivision of LS13 Sec. 34 Twp. 35 Rge. 5 W3M is a country residential development located in the southeast corner of Clarence Avenue and Grasswood Road. The parcel of land is 16.142 ha (39.89 acres) in size. The development plan consists of 13 residential lots. Phase 1 of the development is comprised of 6 lots each 2.47 acres in size. Phase 2 of the development includes 7 lots, ranging in size from 1.79 to 3.21 acres in size. The lot sizing average for the entire development is 2.48 acres in size. An existing two storey dwelling is located on the property and is situated on Lot H. An existing barn is situated on Lot J. A summary of the lot sizing is provided in Table 1.

Table 1: Lot Details		
Description	Phase	Size
Lot D	Phase 1	1.00 ha (2.47 ac)
Lot E	Phase 1	1.00 ha (2.47 ac)
Lot F	Phase 1	1.00 ha (2.47 ac)
Lot G	Phase 1	1.00 ha (2.47 ac)
Lot H	Phase 1	1.00 ha (2.47 ac)
Lot J	Phase 1	1.00 ha (2.47 ac)
Lot 1	Phase 2	0.72 ha (1.79 ac)
Lot 2	Phase 2	0.81 ha (1.99 ac)
Lot 3	Phase 2	0.96 ha (2.38 ac)
Lot 4	Phase 2	1.00 ha (2.47 ac)
Lot 5	Phase 2	0.97 ha (2.40 ac)
Lot 6	Phase 2	1.30 ha (2.21 ac)
Lot 7	Phase 2	1.29 ha (3.19 ac)
Average		1.00 ha (2.48 ac)



2. EXISTING LAND USE AND FEATURES

The land is primarily used for agricultural purposes as pasture with upwards of 35 acres routinely harvested for animal feed or grazing. A small area in the southwest corner of the property is developed and includes a two-story dwelling with attached garage, a barn, a small shed, and hay shelter. This developed area generally comprises of 5 acres and is fully surrounded by large, mature trees. Within the 5-acre site there is a small garden, fenced corrals, shallow water wells, and access roads and trails. The site was reported to contain an orchard north of the existing home. The 5-acre developed site is generally contained within Lot H and Lot J.

Standing water is not commonly observed on the property. The site was dry and accessible throughout the topographic survey and geotechnical investigations completed in May 2023. Surface or standing water was not observed throughout the 2023 season.

3. LOCAL TOPOGRAPHY

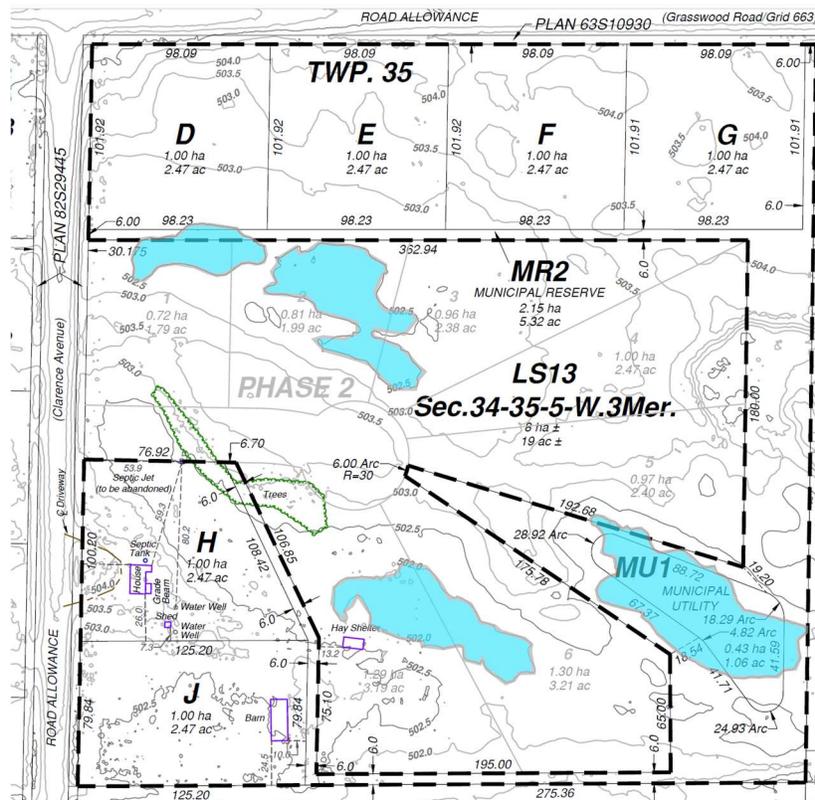
The development topography can be described as gently sloped and well drained. The property generally slopes from the north-west corner recorded at an elevation of 505.0m to the south-east corner recorded at an elevation 502.0m, resulting in a surface gradient of approximately 0.5%. The site appears to be positively graded throughout, with contour lines at consistent intervals.

As noted, standing water was not observed on the property throughout the 2023 site investigations. However, in reviewing the topographic data, there are four localized areas natural depressions (basins) that could hold water during an extreme precipitation event or during spring melt.

The characteristics of each basin is summarized below in Table 2:

Table 2: Basin Characteristics		
Description	Surface Area (m ²)	Topographic Elevation (m)
Basin A	1,380	502.5 +/-
Basin B	3,087	502.5 +/-
Basin C	3,053	502.0 +/-
Basin D	4,779	502.0 +/-

The location of the basins within the development are demonstrated below.



4. HISTORICAL CONDITIONS

Historical imagery for 24 dates extending from 2002 to 2023 were captured. The image of each event is appended, in chronological order with dates shown. A review of the historical imagery indicates the natural depressions are normally dry but have demonstrated brief periods of standing water from time to time.

The topography and imagery confirm the following:

- Standing water events have been observed in 2 of the 11 data-set years;
- Surface water events appear brief, and usually dissipated within the same year. For example, May 2012 indicated some saturation of these sites, and completely dry by September of the same year.
- 2014 is the year with standing water most prominent within the data set. Surface water was present onsite extending from May 12 and completely dry by August 17. No water observed in the following year.
- 2014 is noteworthy, in that the July 14 image suggested prominent standing water, but the site was completely dry by August 17, just over one month later.
- No significant standing water observed in the last 10 years.

Table 3 below summarizes the site observations.

Table 3: Historical Conditions				
Date	Basin A	Basin B	Basin C	Basin D
August 10 2002	Dry	Dry	Dry	Dry
May 9 2004	Dry	Dry	Dry	Dry
June 9 2004	Dry	Dry	Dry	Dry
August 31 2006	Dry	Dry	Dry	Dry
May 28 2012	Saturated – 10%	Saturated – 10%	Saturated – 10%	Saturated – 10%
Sept 20 2012	Dry	Dry	Dry	Dry
May 12 2014	Wettest Observed	Wettest Observed	Wettest Observed	Wettest Observed
July 7 2014	Saturated – 30%	Saturated – 30%	Saturated – 90%	Saturated – 90%
July 14 2014	Saturated – 10%	Saturated – 10%	Saturated – 70%	Saturated – 70%
August 17 2014	Dry	Dry	Dry	Dry
August 13, 2015	Dry	Dry	Dry	Dry
August 23, 2015	Dry	Dry	Dry	Dry
August 31, 2015	Dry	Dry	Dry	Dry
November 16, 2015	Dry	Dry	Dry	Dry
June 29, 2016	Dry	Dry	Dry	Dry
July 27, 2016	Dry	Dry	Dry	Dry
August 19, 2016	Dry	Dry	Dry	Dry
July 9, 2017	Dry	Dry	Dry	Dry
May 5, 2020	Dry	Dry	Dry	Saturated - 5%
October 25, 2020	Dry	Dry	Dry	Dry
April 20, 2021	Dry	Dry	Dry	Dry
April 27, 2021	Dry	Dry	Dry	Dry
April 29, 2021	Dry	Dry	Dry	Dry
July 7, 2023	Dry	Dry	Dry	Dry

Note: Saturation percentages based on visual assessment of historical imagery.

The historical conditions demonstrated above provide valuable insight to the natural flood potential of the site. With standing water observed at 502.5m in the north-west quadrant and 502.0m in the south-east, these events should be cross referenced with the results of this study to confirm a safe building elevation.

The imagery does not provide any evidence surface water released onto the surrounding properties (outlet), which is also supported by the topographic information. Basin D is lower in elevation than all property boundaries, and the images do not show surface water extending beyond the boundaries. The importance of this observation is that surface water has likely infiltrated into the underlying sandy soils in the undeveloped state.

5. DRAINAGE PLAN

The proposed country residential development is intended to be an acreage style development. Site grading will be expected within the vicinity of the proposed home, driveway and access, and any other anticipated outbuildings on the site. Little to no lot grading is expected otherwise.

Based on the historical conditions described above, standing water is dissipated into the underlying soils. As such, additional site grading would not be required to direct natural surface runoff along property lines or adjacent ditches. Once localized grading around the homes or outbuildings is complete, potential homeowners could leave the balance of the lot in a natural state, and will most likely choose to do so. However, the development should consider positive drainage and grading along all property lines to intercept any lot runoff and direct it towards the final drainage basin or outlet. Modifications to the rear lot lines is captured in the overall drainage design, allowing homeowners to direct the water to the front (municipal roads and ditch network), and to the rear of the property.

Surface runoff is intended to be conveyed overland via ditches to adjacent roads, using culverts at driveways and intersections, as well as at locations of natural drainage paths which have been defined with 3m and 6m wide swale easements. The conceptual plan for site drainage is to continue the use of Basin D for collection, the most prominent storage area.

The Natural Resources Conservation Service (NRCS) method was used to determine the runoff characteristics of the soils in the study area. In the NRCS method soils are divided into four hydrologic soil groups (HSG), A, B, C and D, according to their infiltration rate. The characteristics of the hydrologic soil groups are as follows:

Group A: High Infiltration rates (low runoff potential); well to excessively drained deep sands or gravel; deep loess; aggregated silts.

Group B: Moderate infiltration rates when thoroughly wetted; moderately deep to deep; moderately well to well drained; moderately fine to moderately coarse textures, shallow loess; sandy loam.

Group C: Low infiltration rates when thoroughly wetted; soils with a layer that impedes downward water movement; moderately fine to fine texture; clay loams; shallow sandy loams; soils low in organic content; soils usually high in clay.

Group D: Very low infiltration rates (high runoff potential) when thoroughly wetted; clay soils with high swelling potential; permanent high water table; claypan or clay layer at or near the surface; heavy plastic clays; certain saline soils.

Based on the above description of the HSGs and the subsurface soils within the study area being predominately comprised of sandy soils as described in the geotechnical report, which is conducive to high infiltration rates, the soils were classified as HSG A.

The rational method was used to compute runoff volumes for the pre-development and post-development condition. The runoff coefficient reflects the ability of the drainage area to convert rainfall to runoff. It is a factor representing the soil type, surface slope, storm return period, and rainfall intensity. Values of the runoff coefficient (C-factor) for various development conditions are provided in Table 4.

Pre-development conditions (pasture) at a slope of 0.5% will realize a runoff coefficient of 0.15 as suggested in Table 4.

Table 4: Existing Conditions and Run-off Coefficients			
Slope	Less than 2%	2% to 6%	Greater than 6%
Forrest	0.08	0.11	0.14
Meadow	0.14	0.22	0.30
Pasture	0.15	0.25	0.37
Farmland	0.14	0.18	0.22
Industrial	0.85	0.85	0.86
Commercial	0.88	0.88	0.89
Streets	0.76	0.77	0.79
Parking Lots	0.95	0.96	0.97
Disturbed Areas	0.65	0.67	0.69
Residential Lots	0.22	0.26	0.29

The resulting pre-development runoff potential based on the total area of 161,420 m² is in the order of 2,663 m³ based on the 1:100-year return period, 24-hour duration storm. As described earlier in the report, the runoff appears to be temporarily captured within four natural depressions measuring 12,300 m² in size. The runoff potential will realize a temporary ponding depth of 0.21m within these sites, generally confirmed by the observations of the historical imagery.

The post-development conditions will add hard surfaces such as roads, driveways and outbuildings structures that are less permeable and will increase the runoff potential of the site. Further development of the yard sites may be realized with increased mowing frequencies, increased seeding, and fertilizing from time to time increasing the runoff potential. The site specific (post-development) conditions can generally expect the following:

- Construction of 400 m² (4,300 ft²). primary residence with a high runoff coefficient of 0.95.
- Construction of 300 m² (3,200 ft²) ancillary building with a high runoff coefficient of 0.95.
- Construction of 600 m² driveway (100m long by 6m wide); presumably asphalt in future years realizing a 0.90 runoff coefficient.
- Improvements of the balance of the natural pasture land to manicured soft landscaping (ie. grass / trees / shrubs, etc.). This may increase the runoff coefficient from 0.15 to 0.20 over time (although some landscaping and moisture reliant species can decrease the runoff coefficient from the natural state.). A change from 0.15 to 0.20 is considered conservative estimate and allows for other yard-site incidentals (patios, sport courts, etc.).
- Development of the municipal road allowance to include 1,600 m² of asphalt surfacing within the right-of-way (150m long road at 7.4m asphalt width + 30m turn-around bulb). Adjacent ditching to be re-vegetated to natural grasses.

The post-development conditions are summarized below, which are based on the 1:100-year return period, 24-hour duration storm event, with a 25% increase in accordance with the RM of Corman Park's development policy. The resulting storm conditions is 110mm of rainfall.

Description	Component Area		Primary Residence		Driveway		Outbuilding		Grass / Landscaping		Composite C-factor	Runoff Potential (1:100+25%) (m ³)
	(acres)	(m ²)	Area (m ²)	C-factor	Area (m ²)	C-factor	Area (m ²)	C-factor	Area (m ²)	C-factor		
Lot D	2.47	9,974	400	0.95	600	0.9	300	0.95	8,674	0.2	0.295	327
Lot E	2.47	10,004	400	0.95	600	0.9	300	0.95	8,704	0.2	0.294	328
Lot F	2.47	10,004	400	0.95	600	0.9	300	0.95	8,704	0.2	0.294	328
Lot G	2.47	10,004	400	0.95	600	0.9	300	0.95	8,704	0.2	0.294	328
Lot H	2.47	10,004	400	0.95	600	0.9	300	0.95	8,704	0.2	0.294	328
Lot J	2.47	10,004	400	0.95	600	0.9	300	0.95	8,704	0.2	0.294	328
Lot 1	1.79	7,250	400	0.95	600	0.9	300	0.95	5,950	0.2	0.330	267
Lot 2	1.99	8,060	400	0.95	600	0.9	300	0.95	6,760	0.2	0.317	285
Lot 3	2.38	9,639	400	0.95	600	0.9	300	0.95	8,339	0.2	0.298	320
Lot 4	2.47	10,004	400	0.95	600	0.9	300	0.95	8,704	0.2	0.294	328
Lot 5	2.40	9,720	400	0.95	600	0.9	300	0.95	8,420	0.2	0.297	322
Lot 6	3.21	13,001	400	0.95	600	0.9	300	0.95	11,701	0.2	0.273	395
Lot 7	3.19	12,920	400	0.95	600	0.9	300	0.95	11,620	0.2	0.273	393
Road Allowance	1.60	6,472			1600	0.9			4,872	0.2	0.373	269
MR	5.33	21,577							21,577	0.2	0.200	480
MU	1.06	4,274							4,274			
Total / Average	40	162906	5200	0.95	9400	0.9	3900	0.95	144406	0.2	0.282	5,118

The storage requirements are expected to be in the order of 5,188 m³. Note that the storm water pond design and calculations presented within the table above account for the entirety of the expected post-development conditions. These calculations consider the potential landscaping (loss) of existing drainage basins A, B and C.

6. STORM WATER POND

To accommodate the storage requirements identified above, the development can consider the development of a storage pond located within a designated municipal utility (MU) located within the south east corner of the development. The proposed MU has an area of 4,274 m².

The storage requirements of 5,118 m³ can be stored entirely within the MU footprint, requiring an active storage depth of approximately 1.20m. The pond should be excavated to extend to an elevation of 500.50m, approximately 0.50m above to recorded ground water elevations, for constructability reasons. However, the pond can be excavated deeper to allow for a permanent water feature within the development if desired.

Based on a floor elevation of 500.50 and an active storage depth of 1.20m, the storm water pond will realize an expected high-water elevation of 501.70m. Note that the high-water level remains slightly below the natural ground elevations within this area which are recorded at 502.0m.

The south-east corner of the development is the natural drainage point for the parcel of land, and should be left in the natural state to ensure the pre-existing outlet is in place. The existing ground elevations and noted at 502.0. This will allow the pond to overflow under extreme circumstances and conditions, thereby offering a controlled overflow at an elevation of 502.0. However, the collected water from the runoff will largely infiltrate into the underlying soils; frequent overflow conditions should be rare.

7. SAFE BUILDING ELEVATIONS

Consistent with best practices, safe building elevations should observe the historical flood elevations, expected flood elevations based on the grading and storm water plan, and include additional factors of safety over and above the highest flood potential of the site design. The storage facility will manage extreme storm events. The natural flood potential of the site has been observed to be in the order of 502.5m in the north-western area of the property, and 502.0m in the south-east. An adequate buffer or "free-board" should be observed for safe building elevations to account for any extraneous or unforeseen development characteristics (ie. blocked drainage routes, ice damming, extended period of wet weather, etc.).

While a standard of 0.5m of freeboard is generally accepted in such developments, it is important to note that in rural settings the outlet conditions rely on overland flows in the adjacent ditches to natural water courses. All these conditions are difficult to predict and can often change with downstream development or changes to the natural drainage patterns. As such, a minimum of 1.0m freeboard is recommended to be applied to any homes or dwellings, resulting in a safe building elevation (SBE) of 503.50m under any of the storage option noted above, with Option 1 representing the worst-case conditions.

This SBE should apply to the lowest foundation opening, which is typically the basement windows. Openings could extend below the safe building elevations if adequately protected with window wells or retaining walls constructed at or above the safe building elevations. Outbuildings would have some flexibility in final elevations as the flood damage risk is lower

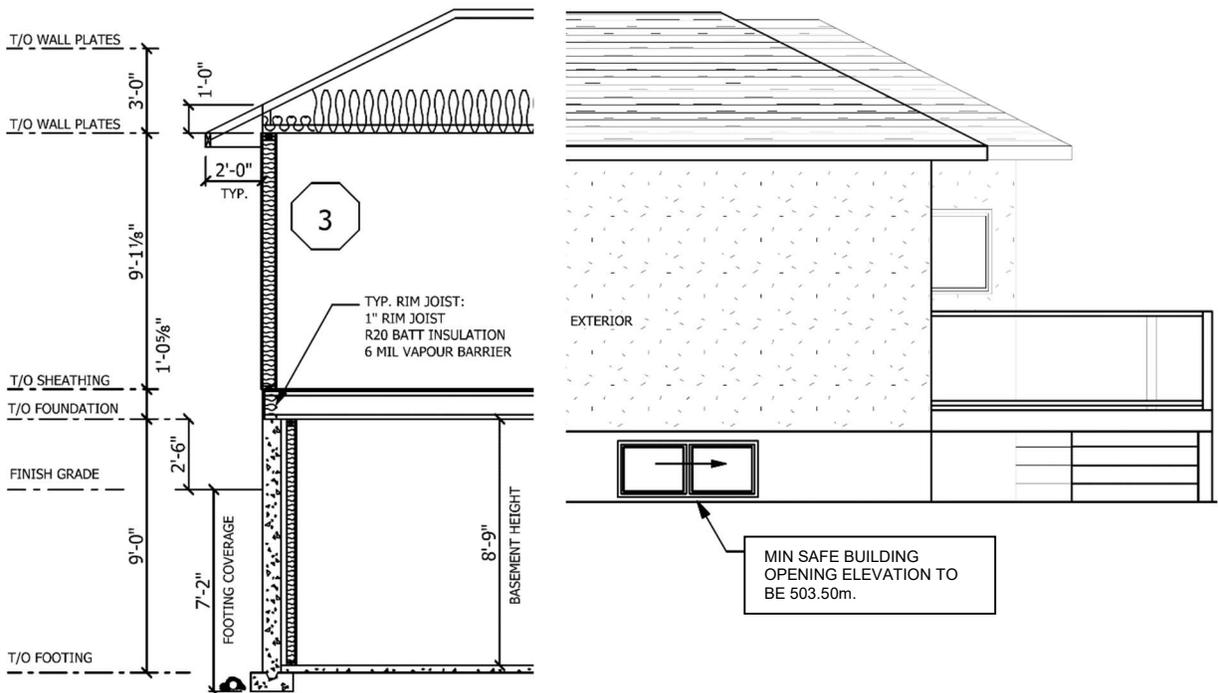
compared to a finished dwelling. Such instances should be reviewed on a case-by-case basis if a deviation from the SBE is requested.

The safe building elevation noted above describes the surface conditions in which a property or structure could experience surficial flooding during extreme rainfall events. Groundwater elevations, however, may also restrict foundations depths. The geotechnical investigation (Reference *Proposed Residential Subdivision LS13 34-35-5 W3M, Thurber Engineering June 27, 2023*), Section 5.6, states that basements should be founded at least 1.0m above the observed groundwater level. The testholes reports observed the following:

Testhole Indicator	Ground Surface Elevation (m)	Depth to Groundwater (m)	Anticipated Groundwater Elevation (m)
23-01	502.50	1.7	500.8
23-02	502.50	1.7	500.8
23-03	503.0	1.8	501.2
23-04	504.0	3.3	500.7
23-05	503.5	2.8	500.7
23-06	503.0	2.6	500.4
23-07	502.5	2.3	500.2
23-08	502.5	2.2	500.3
23-09	502.0	2.2	499.8
23-10	502.5	2.5	500.0

Based on the test holes, groundwater elevations average 500.5m across the site, and could be expected as high as 501.2m, thereby potentially restricting the depth of the foundation to 502.2m. Considering 2.7m (9ft) basements are common and allowing 0.80m of exposed basement foundation for a conventional 0.76m (30") high basement window, a basement could be excavated to a depth of 1.6m to 2.2m (5'4" to 7"4") m below the safe building elevation which meets all typical building practices. This observes both the potential surface water flood elevations through the lowest foundation opening (with minimum 1.0m freeboard), and allows a basement to be founded at least 1.0m above the observed groundwater elevations.

The sections below provide a visual representation of the minimum building elevation, adhering to the safe building elevation, and the resulting excavation depth of 2.2m (7' 2") to observe basement excavation limitations.



The geotechnical investigation states that basements may not be feasible due to high (ground) water levels, and that the final building locations within each lot be individually assessed to confirm. These assessments should include a review of the basement foundation plans along with the landscaping / grading intent of the site as both the SBE and the groundwater restrictions must be adhered to.

While the SBE and the high groundwater table could be considered a restriction, rural builds have been observed increase both the building heights and increase the exposure height of foundation walls to accommodate taller windows. In some instances, full walkout basements are implemented "at-grade", supported by extended grading modifications (mounding) to the front area of the home to achieve this build intent. These building practices can be accommodated in a rural setting as a large site provides significant flexibility in grading opportunities, and the tendencies of such builds easily meet the SBE requirements and avoid ground water issues.

8. EXISTING STRUCTURES

The landscaping surrounding the existing home located on Lot H has been graded to an elevation of 503.50m meeting the safe building elevation recommended within. The home is constructed with a full depth concrete basement foundation. Furthermore, neither groundwater or surface floods have been a historical issue with the existing home, providing reliable evidence of the recommendations within this report. The existing home complies with the implementation of the grading and drainage plan referenced within this report.

9. PROJECT PHASING

The storage requirements described within this report are required at full build-out of the development. However, all natural storage basins are located in the Phase 2 development area. As such, development and buildout of Phase 1 will not remove any natural storage depressions, and will have minor variances on the runoff potential of the site. The minor variances (increases) can be easily managed with the natural basins within the development

Storm water management could be deferred in its entirety to Phase 2, at which time additional site data and observations could be incorporated into the study to determine the management practice best suited for the development. Area grading for Phase 1 could be limited to the rear lot lines and peripheral drainage areas to allow the completion of the individual lot grading and the installation of utilities if applicable.

All building restrictions (safe building elevations and ground water limitations) described within consider the worst-case scenario of storm water management plan and must be adhered to in both phases.



10. RECOMMENDATIONS

Based on the above, it is recommended to proceed with the grading plan noted herein, consider the storm water management options, and potential phasing of the project. At minimum, the development must incorporate the following characteristics:

- Construct a storm water pond with the designated MU to include a retention pond at an elevation range of 500.5m to 501.7m. providing a storage capacity of 5,118 m³.
- Observe a safe building elevation (lowest foundation opening) of 503.50m throughout the entire development. The safe building elevation is to apply to the lowest foundation opening, or protective measure thereof (window well, retaining wall, etc.).
- Limit basement foundation depth (if applicable) to 1.0m above the observed groundwater table.

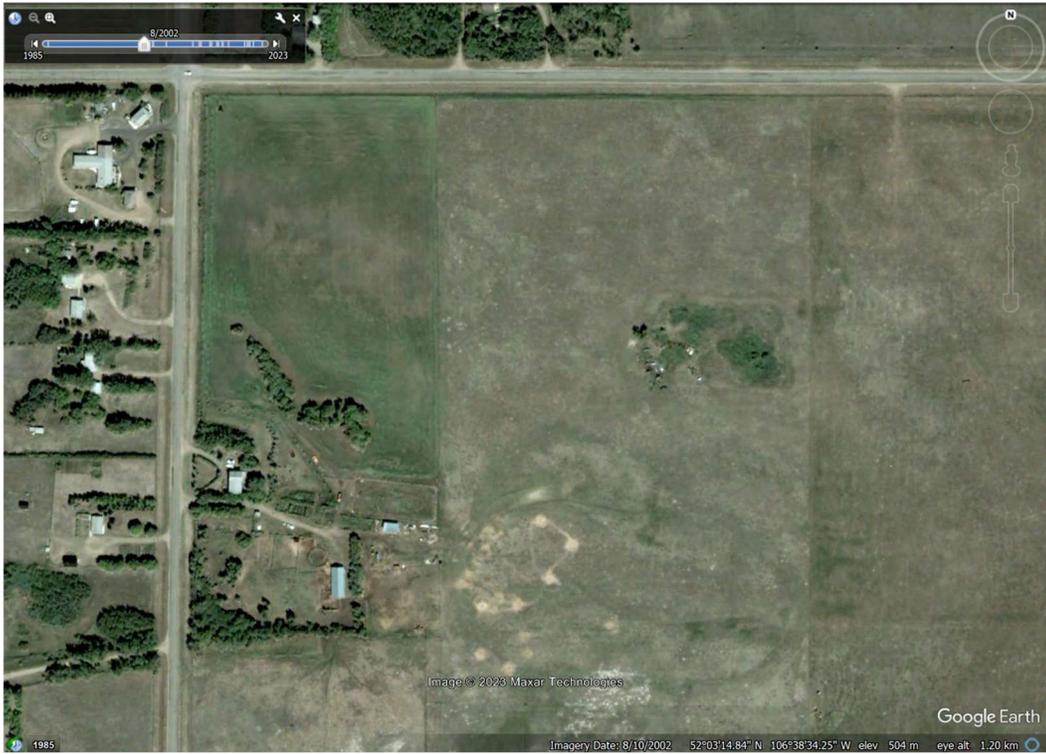
We trust this provides the information you require at this time. If you have any questions or require additional information, please do not hesitate to call.

Yours truly,

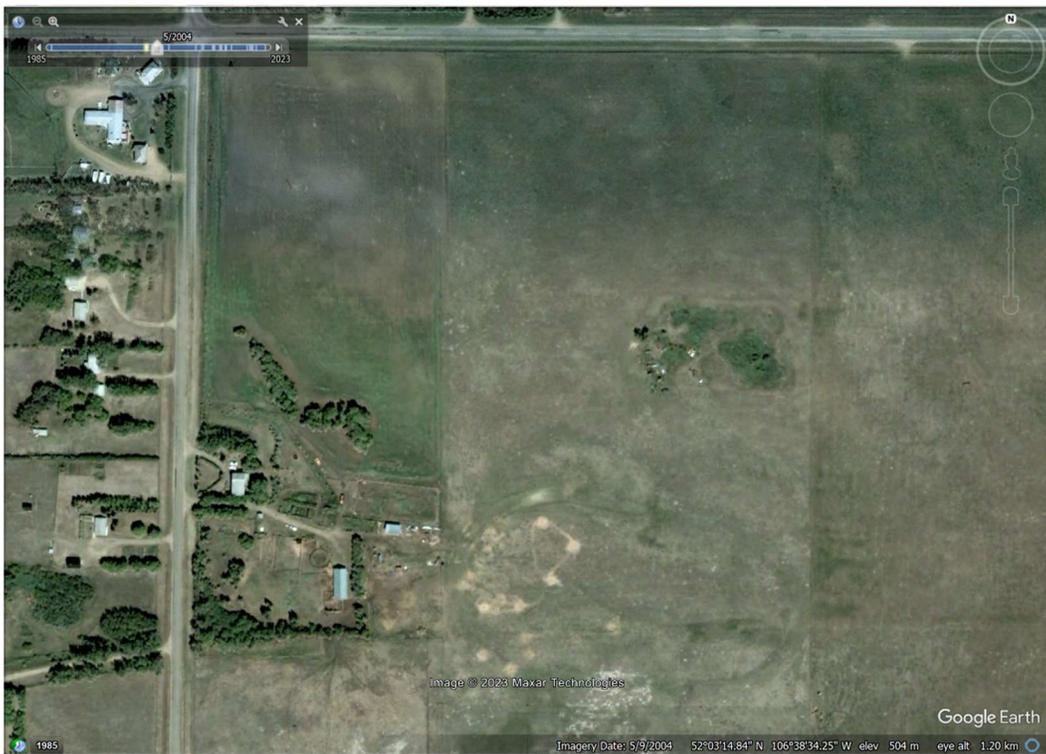
BCL Engineering Ltd.

A handwritten signature in blue ink, appearing to read "K.J. Traves".

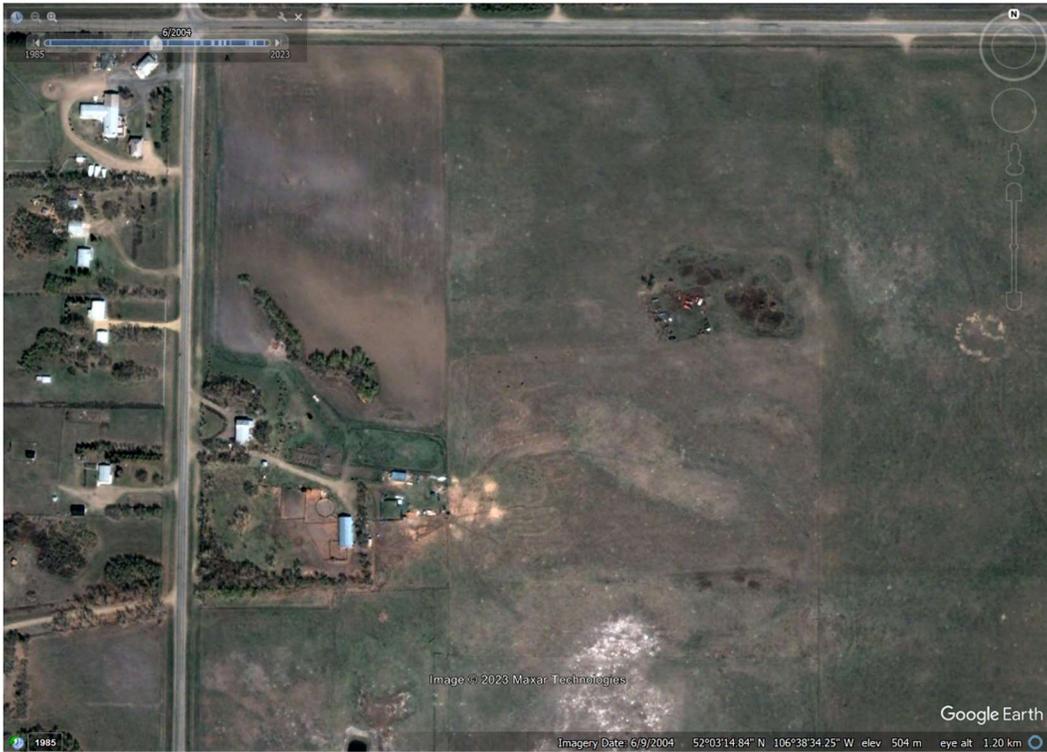
K.J. Traves, P.Eng.



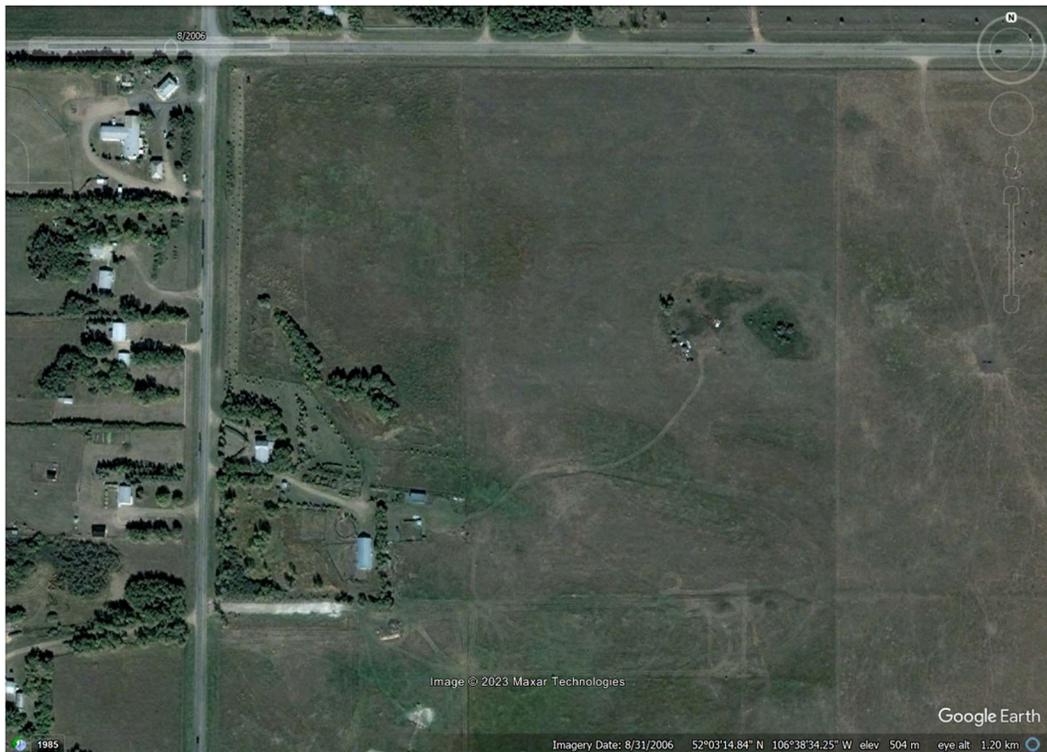
August 10, 2002 – Existing Conditions



May 9, 2004 – Existing Conditions



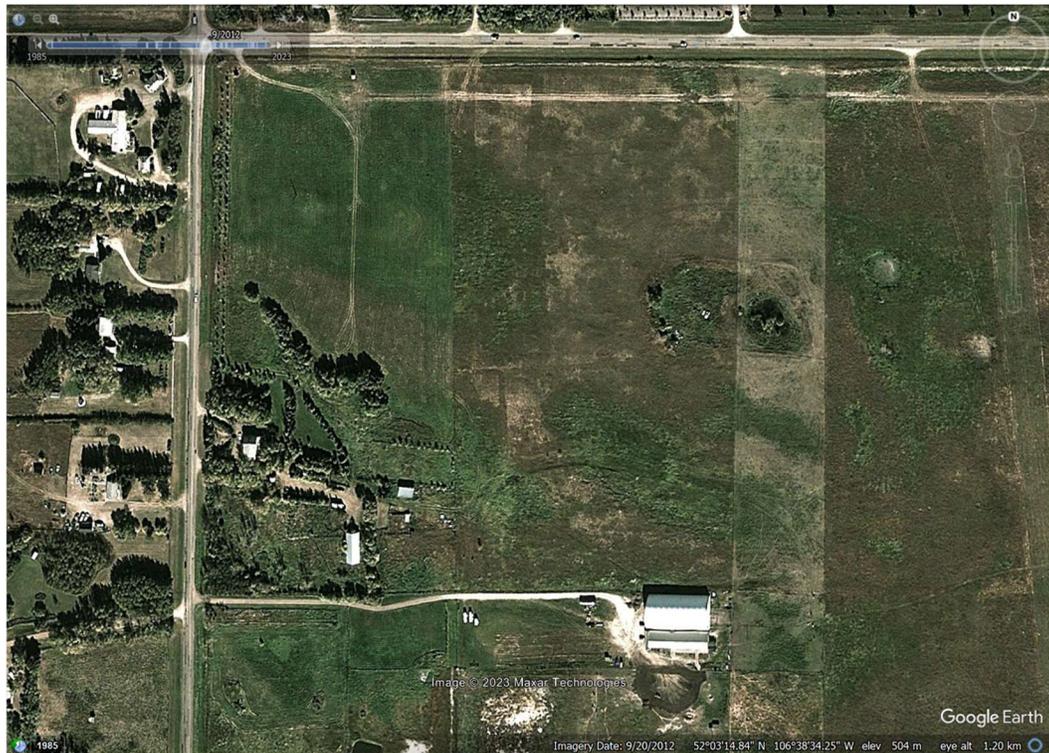
June 9, 2004 – Existing Conditions



August 31, 2006 – Existing Conditions



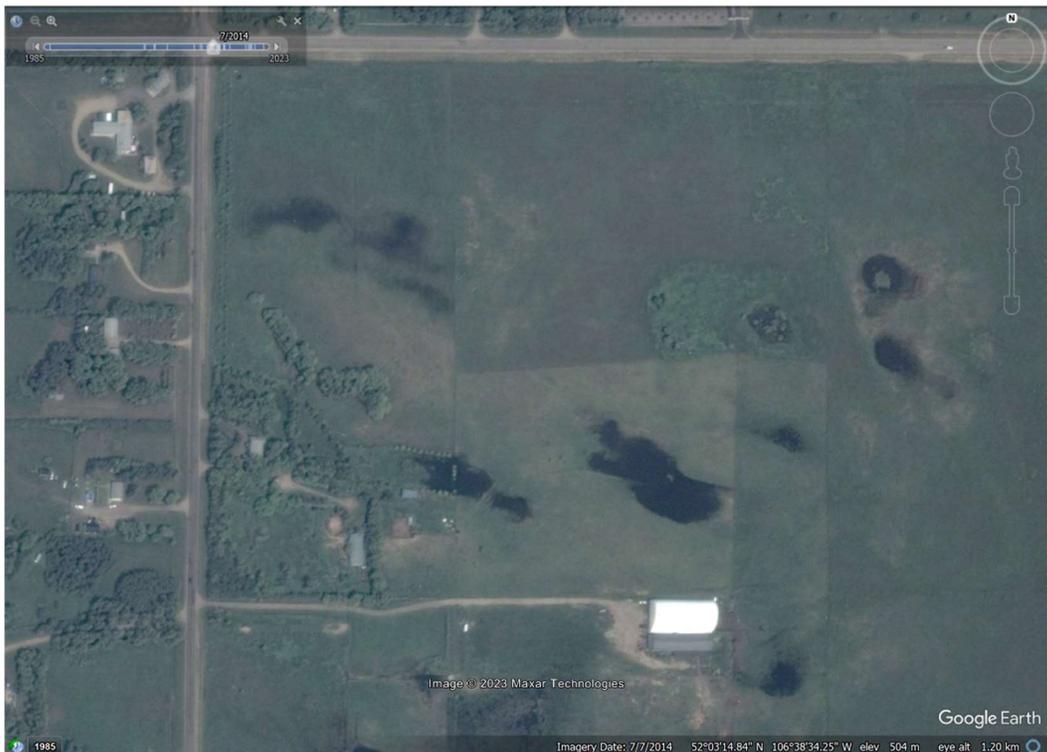
May 28, 2012 - Existing Conditions



September 20, 2012 – Existing Conditions



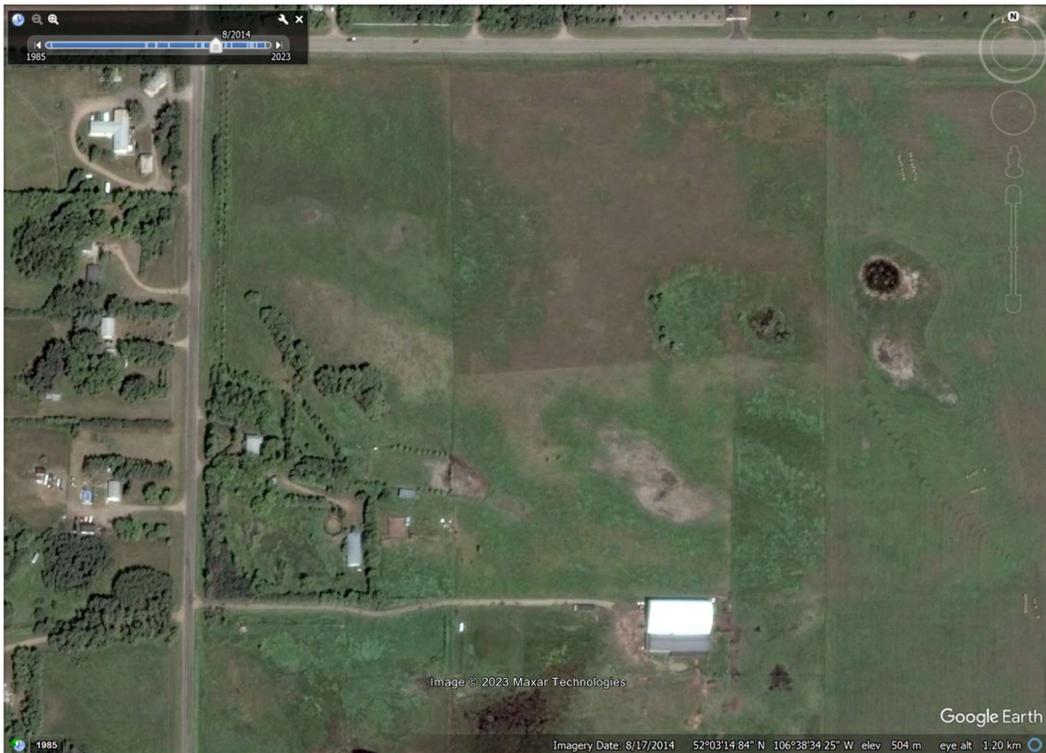
May 12, 2014 – Existing Conditions (note standing water)



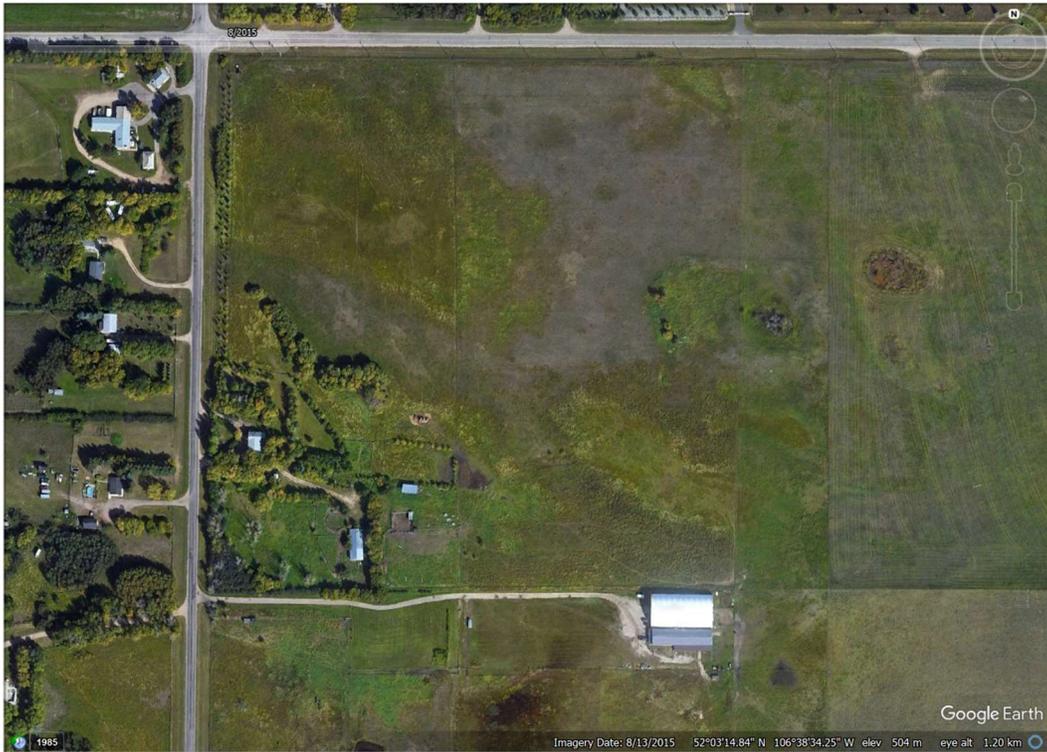
July 7, 2014 – Existing conditions (note standing water)



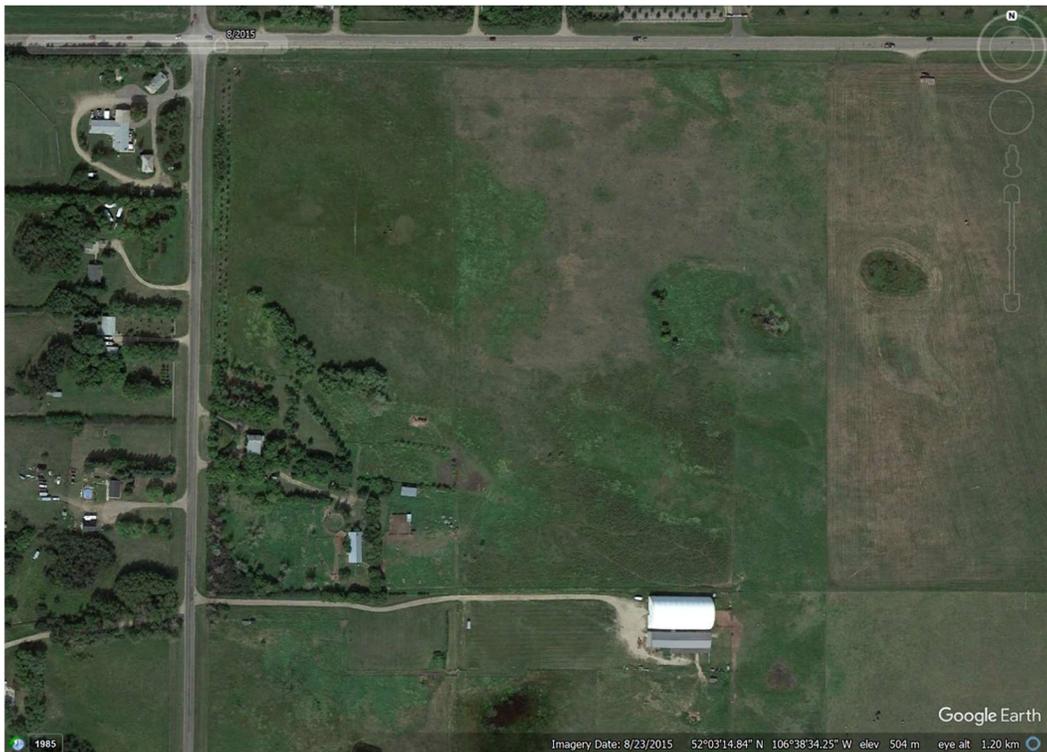
July 13, 2014 – Existing conditions (note standing water)



August 17, 2014 – Existing Conditions (surface water non-existent).



August 13, 2015 – Existing Conditions



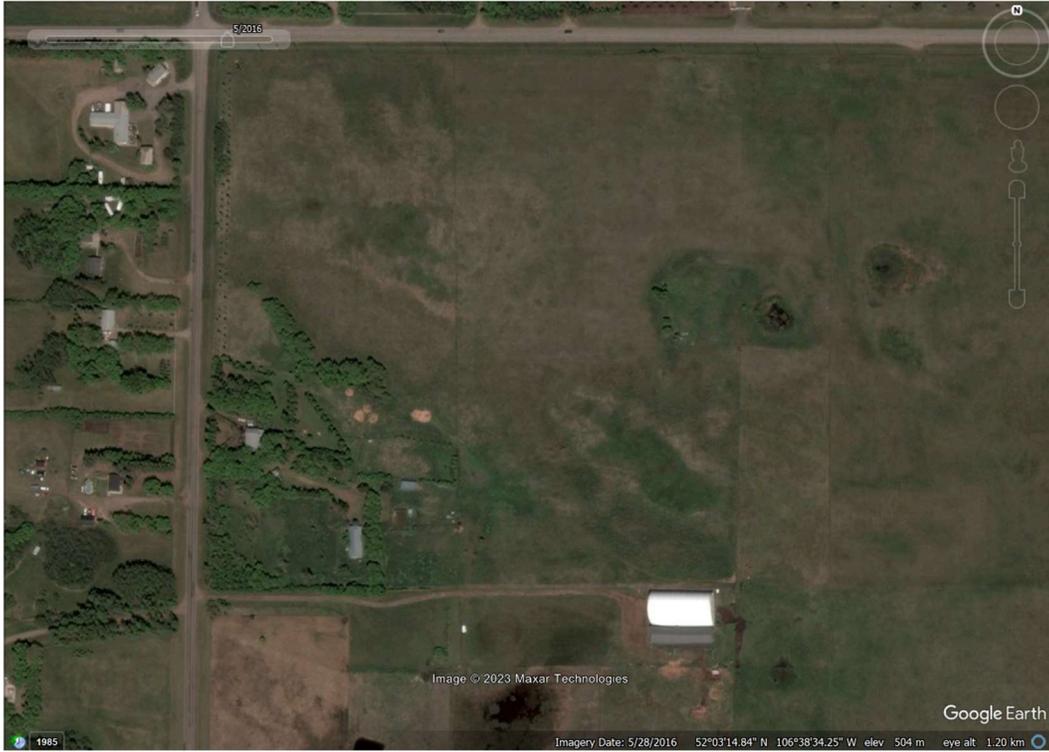
August 23, 2015 – Existing Conditions



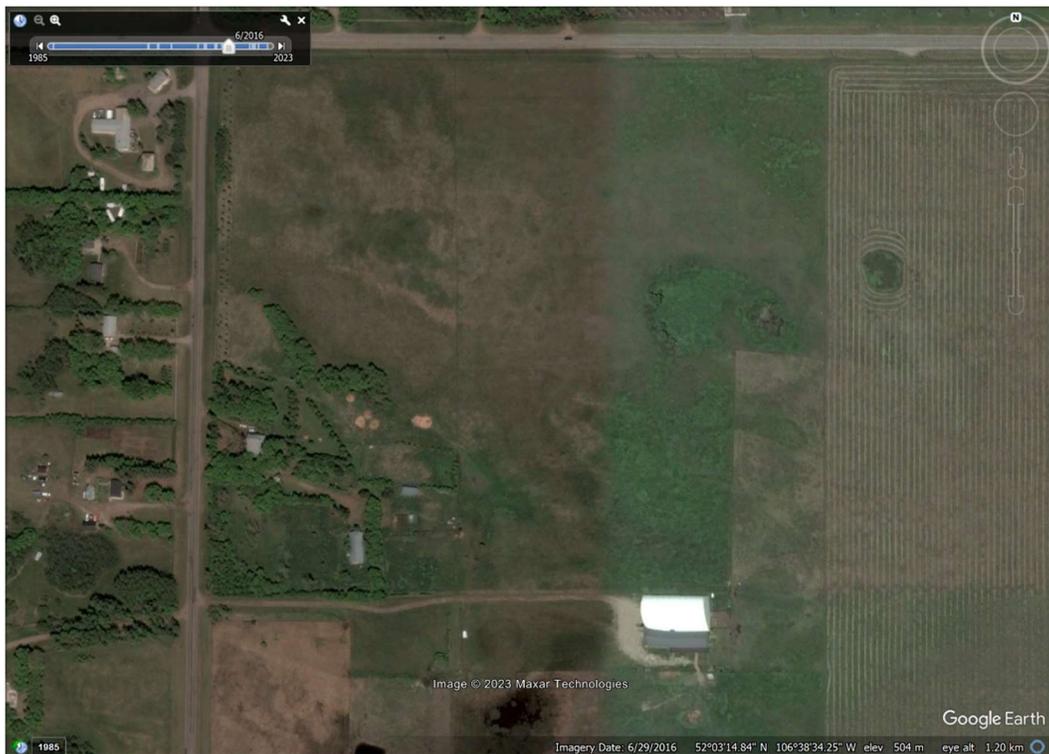
August 31, 2015 – Existing Conditions



November 16, 2015 – Existing Conditions



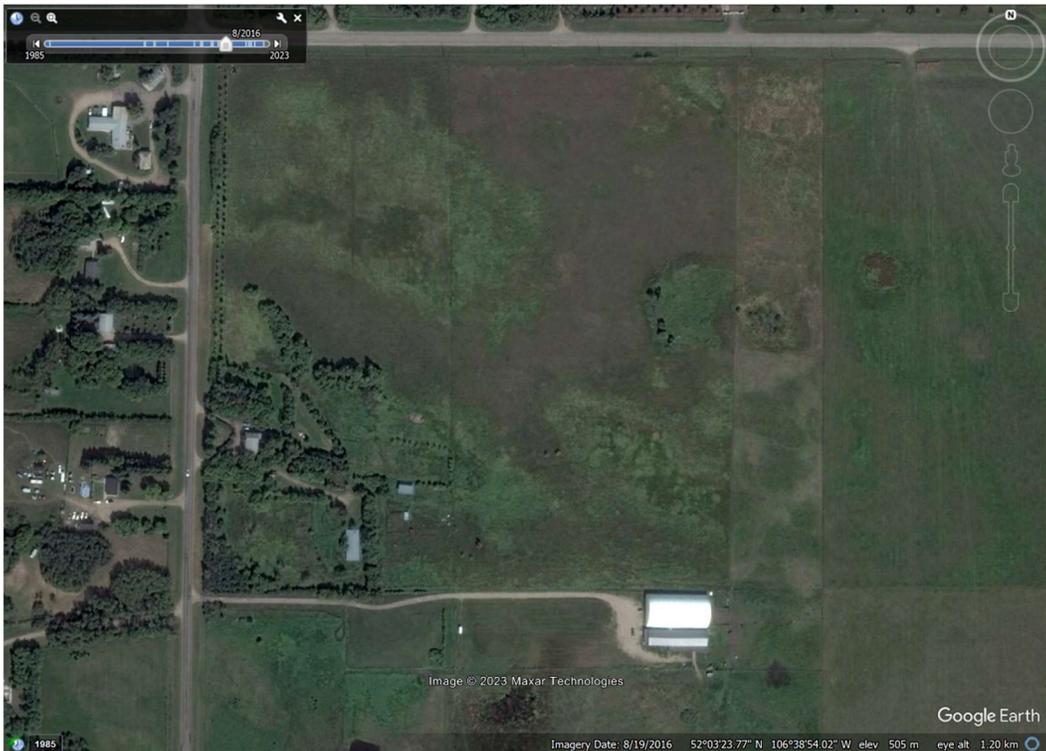
May 28, 2016 – Existing Conditions



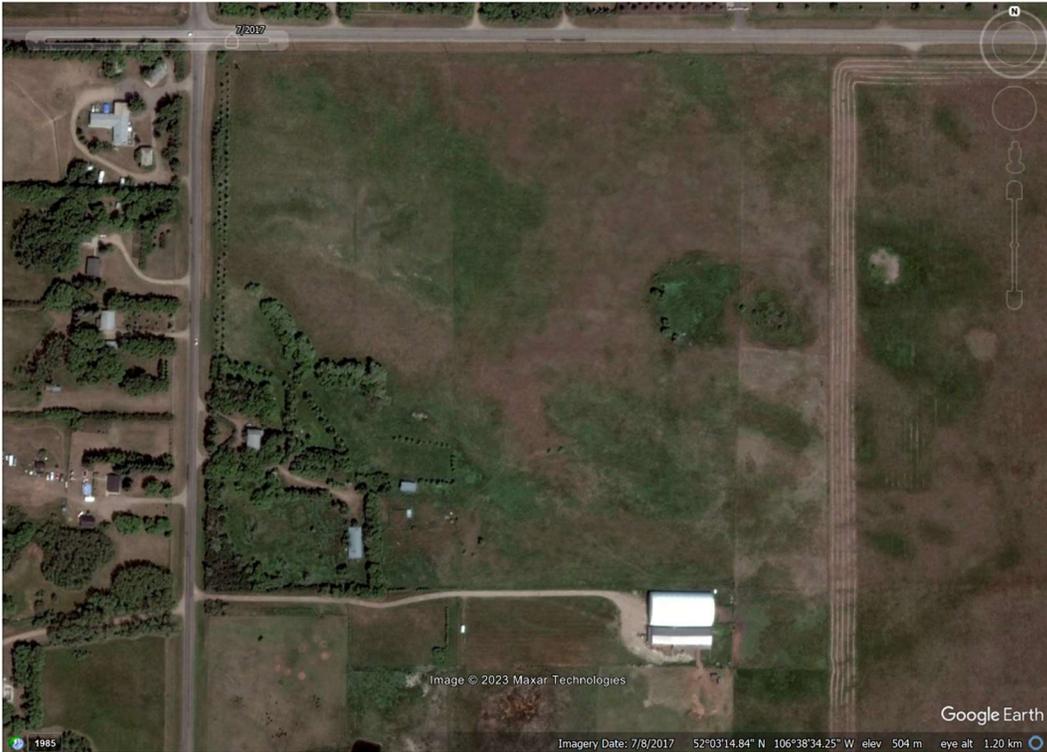
June 29, 2016 – Existing Conditions



July 27, 2016 – Existing Conditions



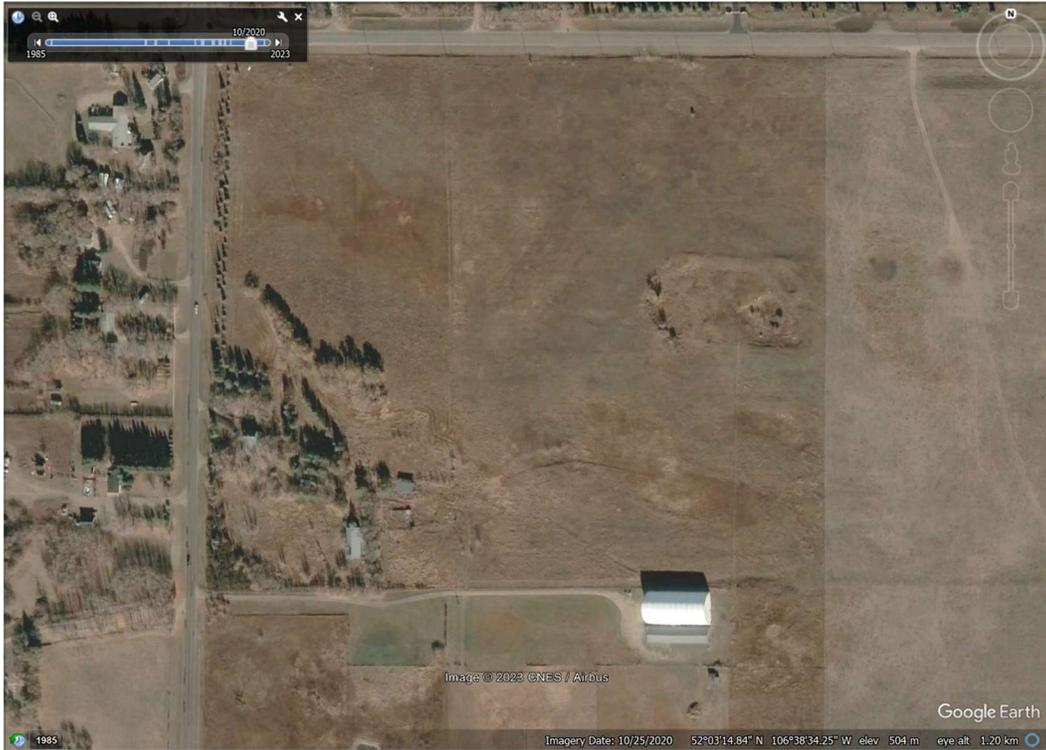
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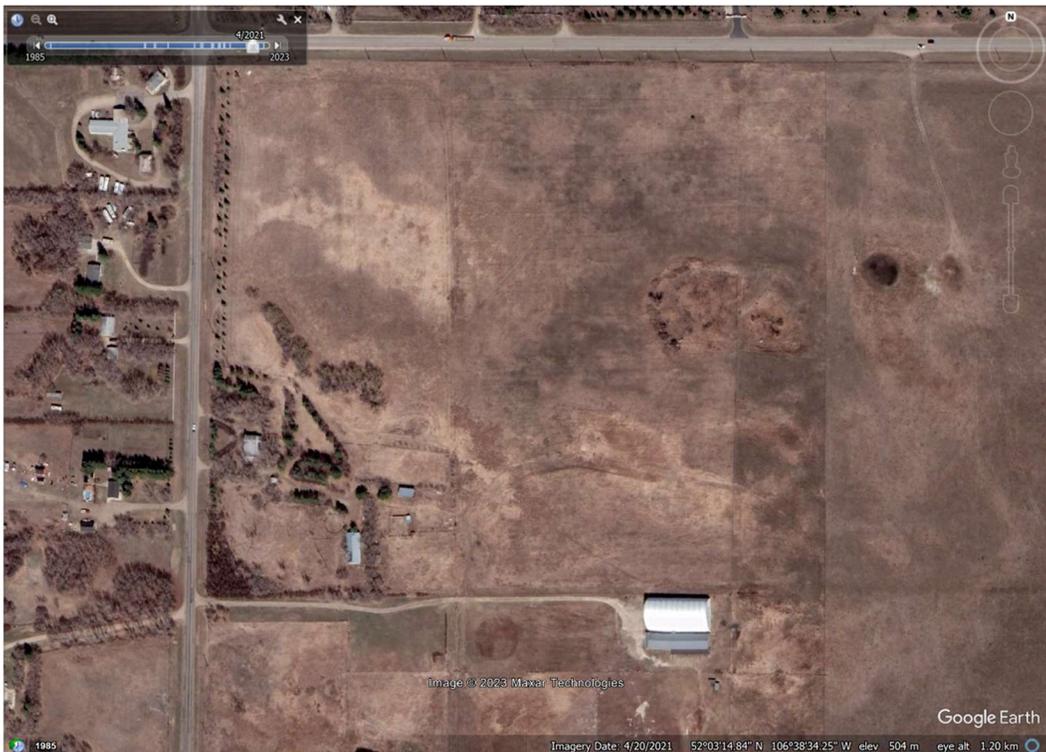
July 8, 2017 – Existing Conditions



May 5, 2020 – Existing Conditions



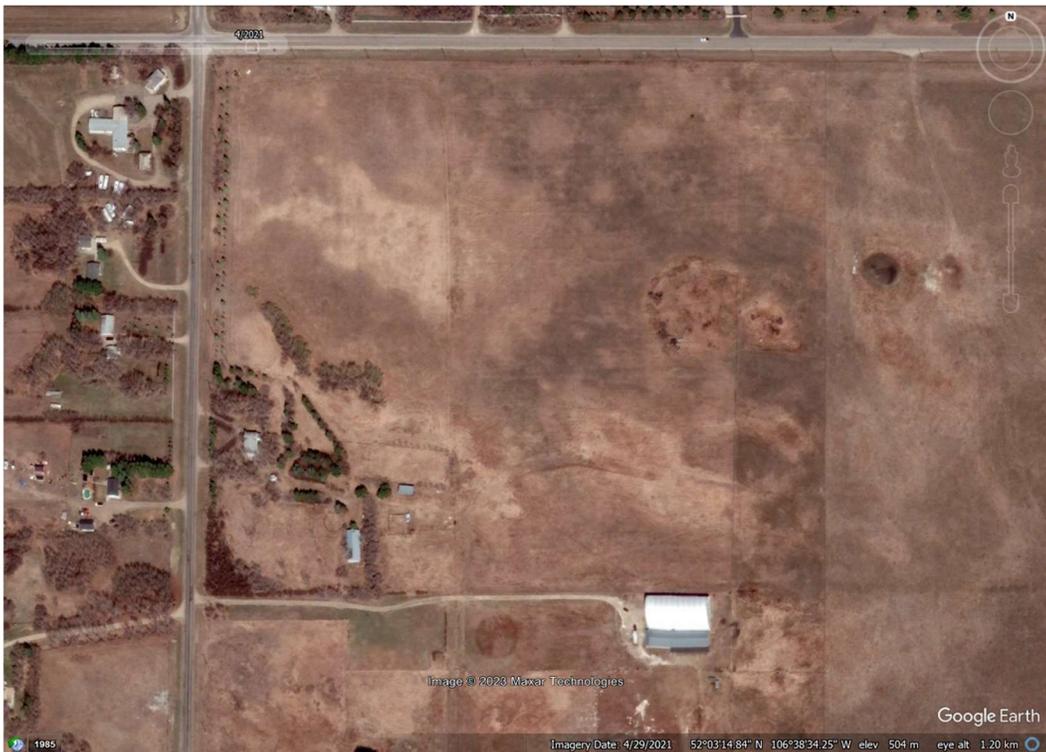
October 25, 2020 – Existing Conditions



April 20, 2021 – Existing Conditions



April 27, 2021 – Existing Conditions



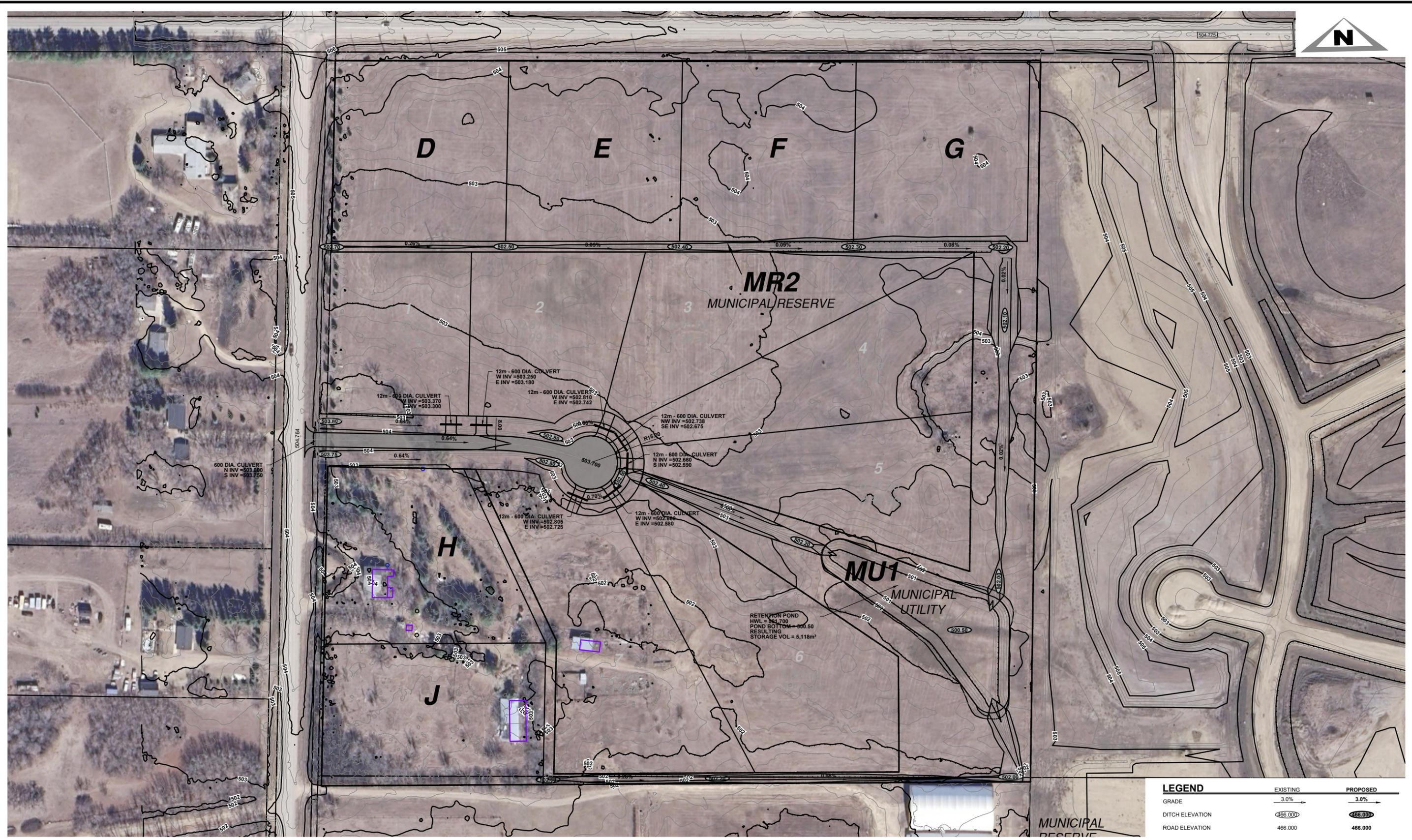
April 29, 2021 – Existing Conditions



November 22, 2021 – Existing Conditions



July 7, 2023 – Existing Conditions



LEGEND		EXISTING	PROPOSED
GRADE		3.0%	3.0%
DITCH ELEVATION		466.000	466.000
ROAD ELEVATION		466.000	466.000

ASSOCIATION OF PROFESSIONAL ENGINEERS & GEOSCIENTISTS OF SASKATCHEWAN
 CERTIFICATE OF AUTHORIZATION
BCL ENGINEERING LTD.
 NUMBER C0312
 PERMISSION TO CONSULT HELD BY:
 DISCIPLINE SASK. REG. No. SIGNATURE
 MUNICIPAL 13963

**PRELIMINARY ONLY
 NOT FOR CONSTRUCTION**

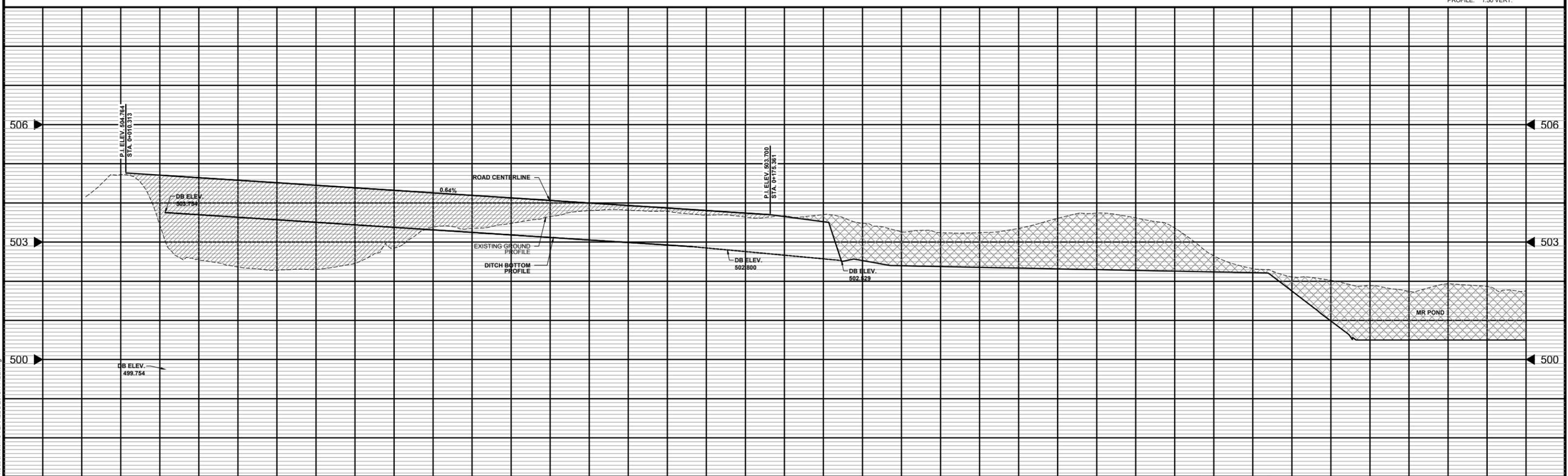
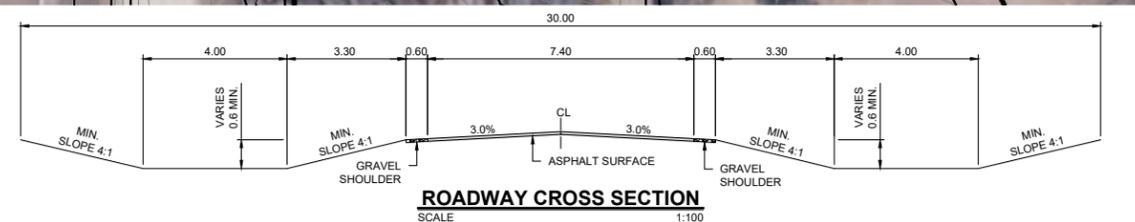
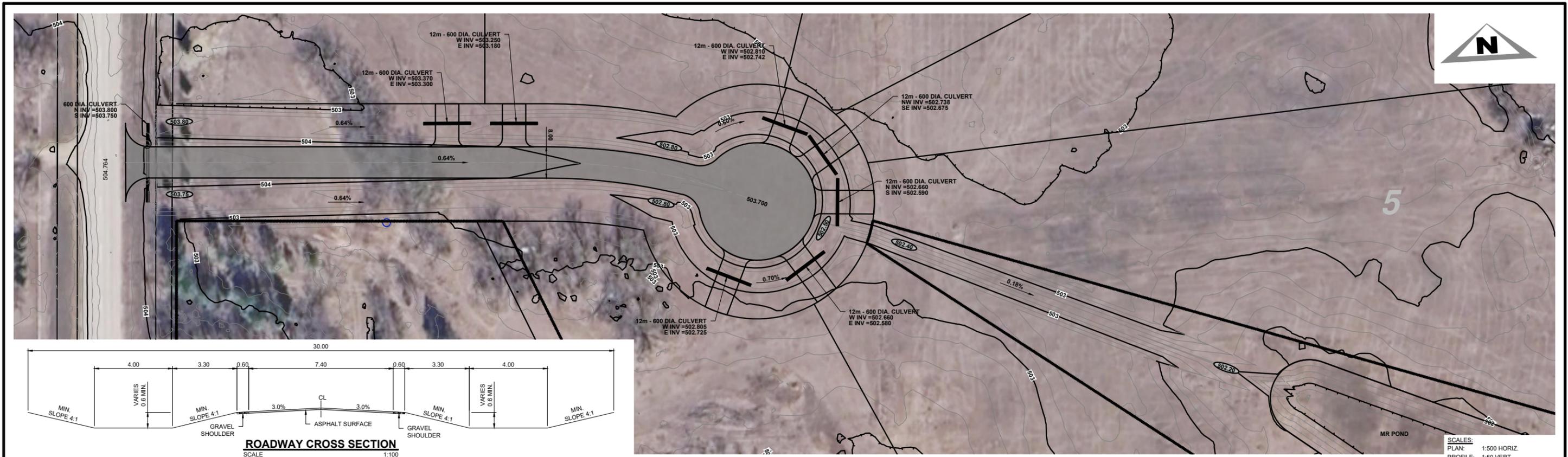
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No.	REVISION	DATE	BY	STAMP



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DATE:	2025/10/22	POPLAR POINT SUBDIVISION DEVELOPMENT SEC 34 - 35 - 05- W3M GRADING PLAN	
DRAWN:	D.J.F.	SCALE:	1:1000
CHECKED:	K.J.T.	REV. No.	0
DESIGNED:	K.J.T.	PROJECT No.	
			SHEET: 01 OF 03

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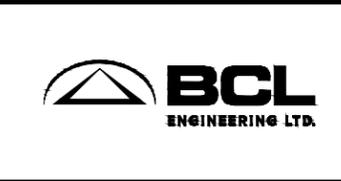
ASSOCIATION OF PROFESSIONAL ENGINEERS & GEOSCIENTISTS OF SASKATCHEWAN
CERTIFICATE OF AUTHORIZATION
BCL ENGINEERING LTD.
NUMBER C0312
PERMISSION TO CONSULT HELD BY:
DISCIPLINE SASK. REG. No. SIGNATURE
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**PRELIMINARY ONLY
NOT FOR CONSTRUCTION**

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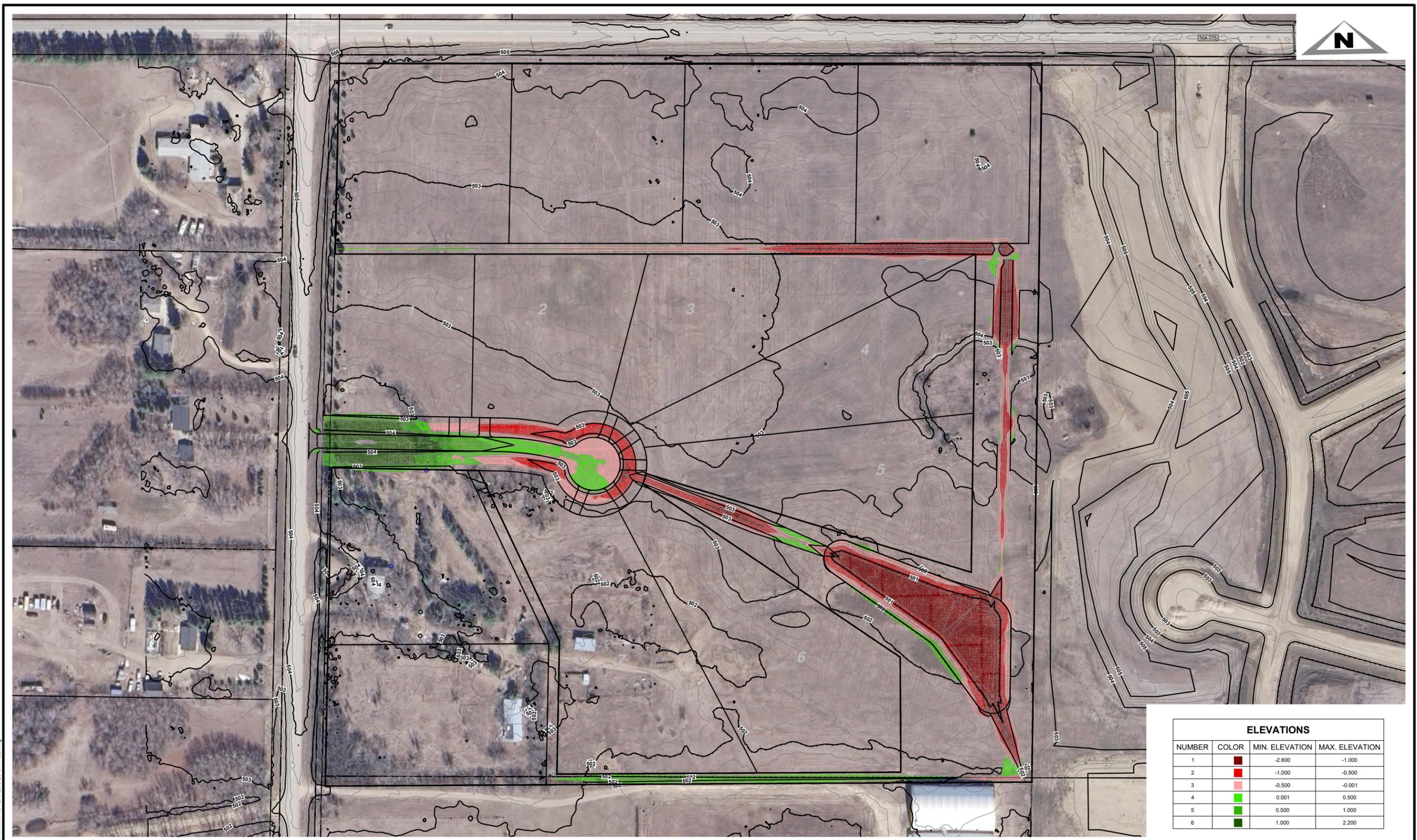
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SCALES TO BE DOUBLED FOR ANSI B PAPER SIZES.

No.	REVISION	DATE	BY	STAMP



JOB No.	102139536 SASK LTD.			
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ELEVATIONS			
NUMBER	COLOR	MIN. ELEVATION	MAX. ELEVATION
1	Red	-2.600	-1.000
2	Dark Red	-1.000	-0.500
3	Light Red	-0.500	-0.001
4	Light Green	0.001	0.500
5	Medium Green	0.500	1.000
6	Dark Green	1.000	2.200

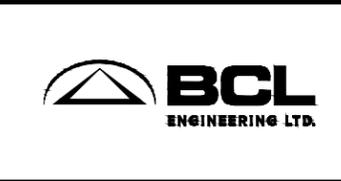
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ASSOCIATION OF PROFESSIONAL ENGINEERS
& GEOSCIENTISTS OF SASKATCHEWAN
CERTIFICATE OF AUTHORIZATION
BCL ENGINEERING LTD.
NUMBER C0312
PERMISSION TO CONSULT HELD BY:
DISCIPLINE SASK. REG. No. SIGNATURE
MUNICIPAL 13963

**PRELIMINARY ONLY
NOT FOR CONSTRUCTION**

0 50 100 Meters
SCALES SHOWN REFER TO ANSI D PAPER SIZE.
SCALES TO BE DOUBLED FOR ANSI B PAPER SIZES.

No.	REVISION	DATE	BY	STAMP



JOB No. 000
DATE: 2025/10/22
DRAWN: D.J.F.
CHECKED: K.J.T.
DESIGNED: K.J.T.

102139536 SASK LTD.
**SUBDIVISION DEVELOPMENT
SEC 34 - 35 - 05- W3M
CUT-FILL PLAN**

SCALE: 1:1000 REV. No. 0 PROJECT No. SHEET: 03 OF 03

APPENDIX G

CORRESPONDENCE WITH LORAAS DISPOSAL

From: [Tim Morse](#)
To: [Maggie Schwab](#)
Subject: Re: Loraas letter
Date: Friday, September 20, 2024 12:42:57 PM
Attachments: [image001.png](#)
[image002.png](#)
[image003.png](#)

To whom it may concern.

Please use this email as verification that Loraas Disposal is able to provide all services including waste, recycle and organics to the area around and including Land Location NW 34-35-05 W3. Any concerns or questions can be directed to:

Tim Morse
Territory Manager
Loraas Disposal
tim.morse@loraas.ca

Thank you.

Get [Outlook for Android](#)

From: Maggie Schwab <mschwab@crosbyhanna.ca>
Sent: Friday, September 20, 2024 12:31:02 PM
To: Tim Morse <tim.morse@loraas.ca>
Subject: RE: Loraas letter

Afternoon Tim,

I'm following up on this letter. Any chance you could get it to me today?

Maggie Schwab RPP MCIP
CROSBY HANNA & ASSOCIATES
407C 1st Ave N, Saskatoon, SK S7K 1X5
t : 306.665.3441
c: 306.227.6617
e : mschwab@crosbyhanna.ca
www.crosbyhanna.ca
  

From: Tim Morse <tim.morse@loraas.ca>
Sent: Monday, March 11, 2024 2:09 PM
To: Maggie Schwab <mschwab@crosbyhanna.ca>
Subject: Re: Loraas letter

Hi Maggie. I will get that to you shortly. Sorry. Was off last week and just trying to catch

up.

Get [Outlook for Android](#)

From: Maggie Schwab <mschwab@crosbyhanna.ca>
Sent: Thursday, March 7, 2024 1:06:45 PM
To: Tim Morse <tim.morse@loraas.ca>
Subject: RE: Loraas letter

Afternoon Tim,

I'm following up to see if you have been able to consider the below request?

Kindest regards,

Maggie Schwab RPP MCIP
CROSBY HANNA & ASSOCIATES
407C 1st Ave N, Saskatoon, SK S7K 1X5
t : 306.665.3441
c: 306.227.6617
e : mschwab@crosbyhanna.ca
www.crosbyhanna.ca
  

From: Maggie Schwab
Sent: Wednesday, January 31, 2024 8:55 AM
To: Tim Morse <tim.morse@loraas.ca>
Subject: Loraas letter

Good Morning Tim,

We (at Crosby Hanna & Associates) have once again been retained by a Developer who wishes to rezone and subdivide 9 lots in the RM of Corman Park. The development is located at the corner of Clarence Avenue Grasswood Road (development concept attached).

As a part of the rezoning requirements set out by the RM, we need to ensure that Loraas Disposal can provide solid waste/recycling/organics removal services.

The proposed development is located in the NW quarter of Section 34, Township 35, Range 05, W3M and consists of 13 lots. Could you please provide me with an email or letter confirming that Loraas Disposal has capacity to accommodate solid waste and recycling services at this development?

Should you have any questions, please do not hesitate to contact me.

Thanks and have a great day!

Maggie Schwab RPP MCIP

CROSBY HANNA & ASSOCIATES

407C 1st Ave N, Saskatoon, SK S7K 1X5

t : 306.665.3441

c: 306.227.6617

e : mschwab@crosbyhanna.ca

www.crosbyhanna.ca

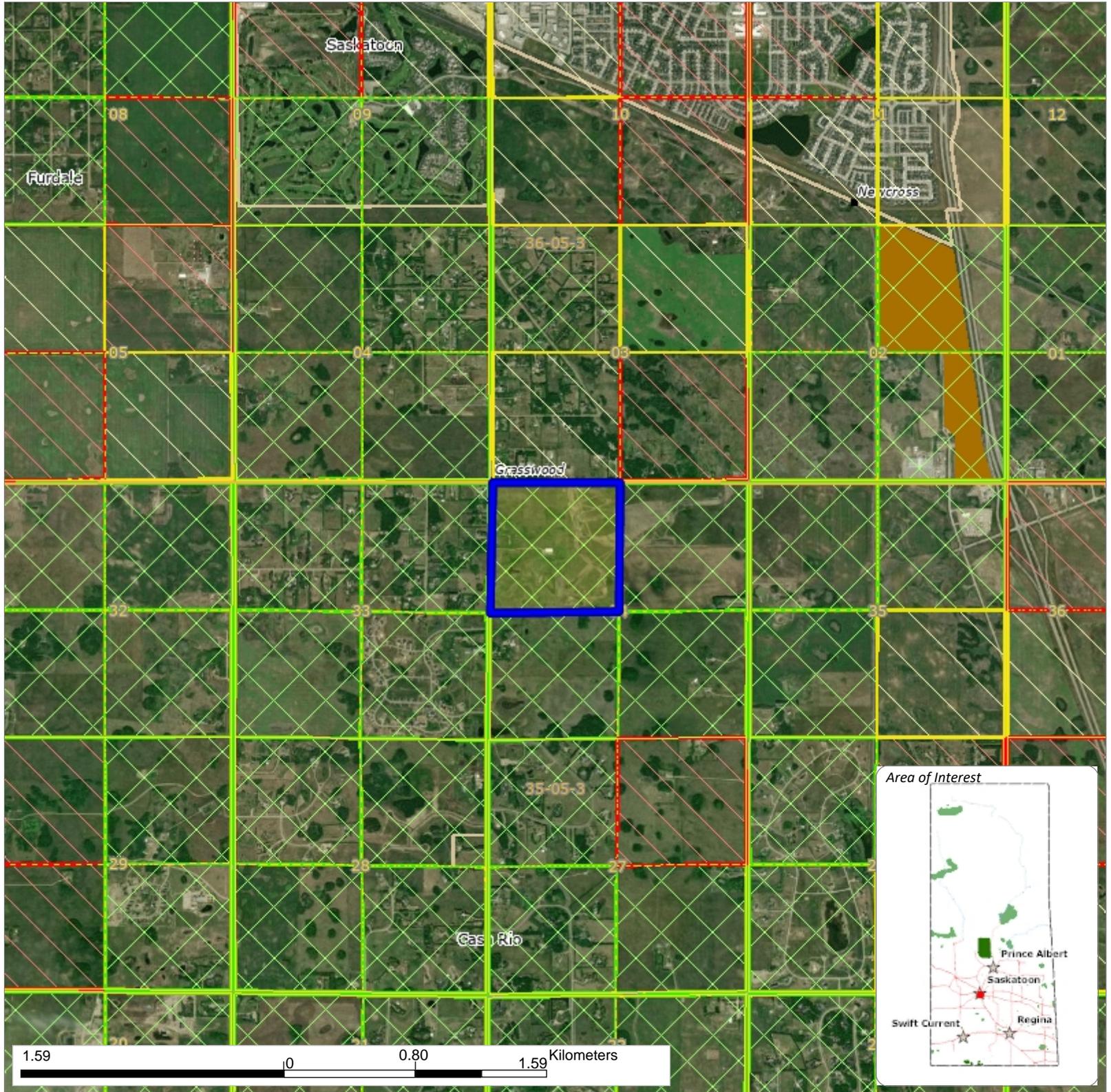


APPENDIX H

HERITAGE CONSERVATION BRANCH QUERY

Sensitivity: This selection is Not Heritage Sensitive.
This development has heritage clearance to proceed. Do not submit this project to the Heritage Conservation Branch. Keep this report for your records.

Report Generated
Jan/29/2024 2:52 PM



Parcel Description	Sensitivity	Parcel Description	Sensitivity
NW-34-35-05-3	N		

Sensitivity Legend:

Y = Heritage Sensitive, C = Conditionally Heritage Sensitive, N = Not Heritage Sensitive, Blank = Heritage Sensitive.

When the parcel description and sensitivity listing is blank, the project is outside of the quarter sections screened for sensitivity. All projects within these areas are automatically heritage sensitive and require review.

If needed, please complete the appropriate referral form and submit the project to the Heritage Conservation Branch for further screening. Project referrals must be accompanied by survey plans. The Screening Report can be saved and/or printed for your records, but does not need to be submitted as part of the referral. <https://www.saskatchewan.ca/residents/parks-culture-heritage-and-sport/heritage-conservation-and-commemoration/archaeology/submit-your-land-and-resource-proposal-for-a-heritage-review>

Disclaimer:

Attention landowners: The majority of small scale activities that involve improvements to, or maintenance of, private property usually have little or no impact on archaeological heritage resources. Access the Exempt Activities Checklist for Private Landowners to determine if your proposed activity is exempt from archaeological heritage screening using the Developers' Online Screening Tool. If the activity is exempt, please retain a copy (paper or electronic) of the completed Exempt Activities Checklist for Private Landowners for your records. Include the completed checklist with any applications for regulatory approvals or permits that may be required for the proposed activity to confirm that heritage concerns have been addressed.

Exempt Activities Checklist: <https://applications.saskatchewan.ca/eachecklist>

Contact us:

For more information, please contact the Heritage Conservation Branch:

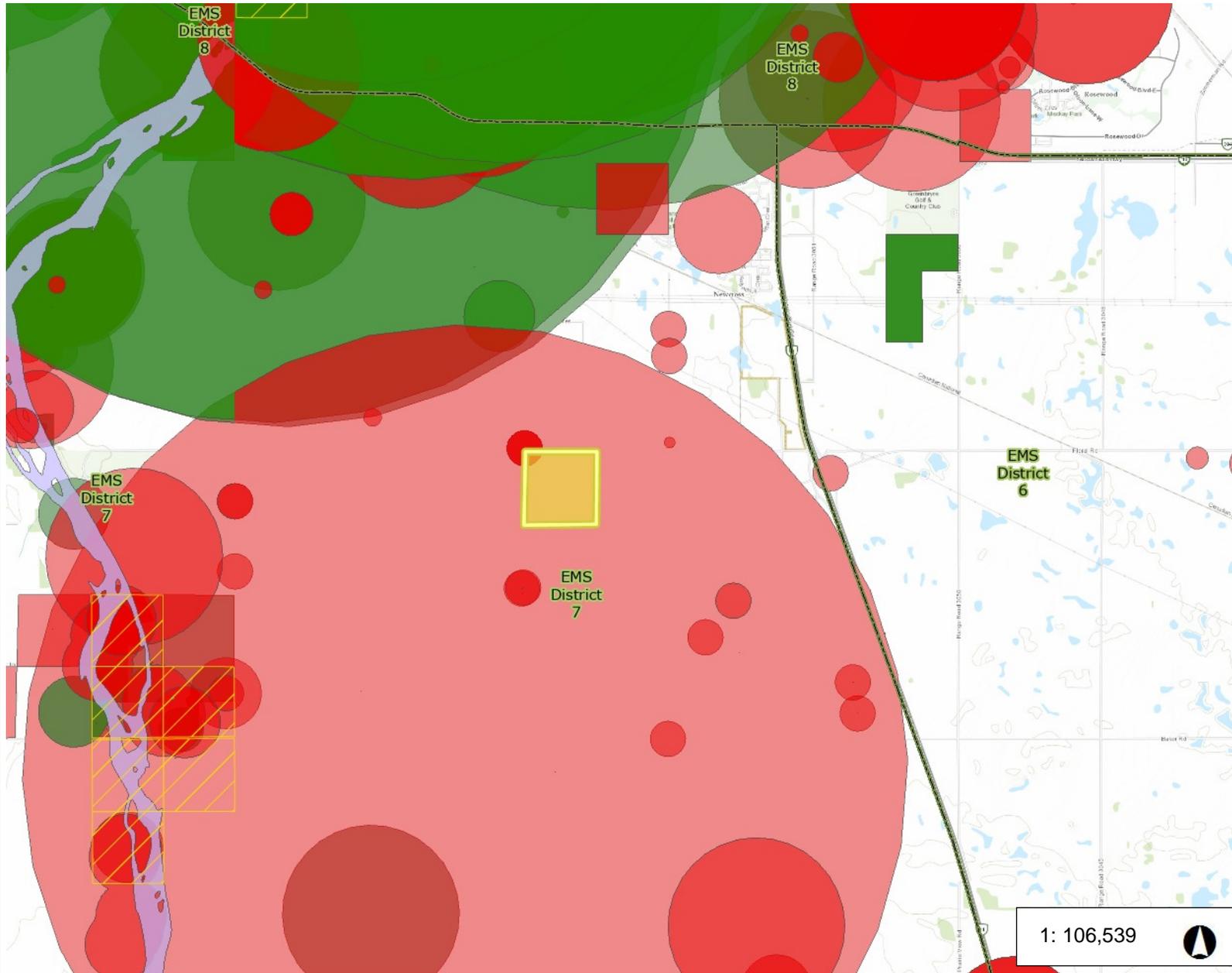
Email: arms@gov.sk.ca

Tel 306-787-2817.

APPENDIX I

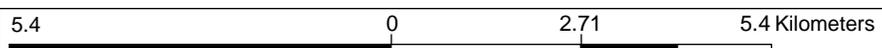
ENVIRONMENTAL DATABASE QUERY

Poplar Point Environmental Screening



- ### Legend
- Provincial Boundary
 - Ecological Management Spec...
 - Road Corridor Game Preserve
 - Agricultural Crown Land
 - Rare and Endangered Species**
 - Animal Assemblage
 - Fungus
 - Invertebrate Animal
 - Nonvascular Plant
 - Other (Botanical)
 - Vascular Plant
 - Vertebrate Animal
 - Water Security Agency
 - Game Preserve
 - National Wildlife Area
 - Migratory Bird Sanctuary
 - Conservation Easements
 - Crown Land Subdivisions
 - Ecological Reserves
 - Fish and Wildlife Development**
 Managing Jurisdiction
 - Ducks Unlimited Canada
 - Ducks Unlimited Canada; Nature C
 - Government of Saskatchewan, Min
 - Nature Conservancy of Canada
 - Nature Conservancy of Canada: Sa

1: 106,539



WGS_1984_Web_Mercator_Auxiliary_Sphere
 © Latitude Geographics Group Ltd.

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.
THIS MAP IS NOT TO BE USED FOR NAVIGATION

Notes

APPENDIX J

GEOTECHNICAL STUDY



THURBER ENGINEERING LTD.

Proposed Residential Subdivision

LS13 34-35-5 W3M

RM of Corman Park

Geotechnical Investigation

Client Name: 102139536 Saskatchewan Ltd.

Date: June 27, 2023

File: 37139-10



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THURBER ENGINEERING LTD.

STATEMENT OF LIMITATIONS AND CONDITIONS

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Drawing No. 37139-10-1 - Site Plan Showing Approximate Test Hole Locations

APPENDIX B

Symbols and Terms Used on Test Hole Logs

Modified Unified Soils Classification

Test Hole Logs

APPENDIX C

Laboratory Test Results

APPENDIX D

Recommended Construction Procedures



1. INTRODUCTION

At the request of 102139536 Saskatchewan Ltd., Thurber Engineering Ltd. (Thurber) has conducted a geotechnical investigation for a proposed residential subdivision located at LS 13 Section 34-35-5 W3M in the Rural Municipality (RM) of Corman Park, Saskatchewan.

The geotechnical investigation was carried out in general accordance with our proposal to Mr. Riley Ness and Mr. Kevin Traves dated April 6, 2023. Thurber received notice to proceed on May 9, 2023.

It is a condition of this report that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

2. PROPOSED DEVELOPMENT

The project site is about 29.8 acres (12.1 hectares) and is located south of Saskatoon, Saskatchewan in the Rural Municipality of Corman Park No. 344. The site is at the southeast corner of the intersection of Grasswood Road and Clarence Avenue and is currently under agricultural development. It is our understanding that development will occur over two stages and when fully developed, will consist of 14 to 16 country residential lots and one lot dedicated to park space.

Thurber's scope of this geotechnical investigation is to provide information about the subsurface conditions across the site and to provide preliminary geotechnical recommendations for site development, grading, and residential building foundations.

A site-specific geotechnical investigation should be conducted to provide geotechnical recommendations pertinent to larger developments, such as multi-family residential buildings or commercial developments if any are planned.

The location of the site, proposed site boundary and test hole locations are shown on Drawing No. 37139-10-1 in Appendix A.

3. METHOD OF INVESTIGATION

3.1 Field Program

The field program consisted of a desktop review and drilling program. The drilling program was completed between May 17th and May 18th, 2023. Ten test holes were drilled using a



truck-mounted auger drill rig operated by Mobile Augers from Saskatoon, Saskatchewan. The drilling program was monitored on a full-time basis by one of our field engineers. The approximate test hole locations are shown on Drawing No. 37139-10-1 in Appendix A.

Prior to commencing drilling, utility locates were completed using Sask 1st Call (SaskTel, SaskEnergy, SaskPower, BH Telecom and the Dundurn Rural Water Utility), Access Cable, RM of Corman Park, and the Lost River Water Utility.

The test holes were drilled to depths ranging from about 6.6 m to 11.1 m below the existing ground surface. Disturbed soil samples were obtained from the auger flights at regular intervals during drilling. Standard Penetration Tests (SPTs) were conducted at regular intervals during drilling and the undrained shear strength (C_{open} value) of cohesive samples was estimated using a pocket penetrometer.

Water and slough levels were noted during and immediately after completion of the drilling program, before backfilling the test holes. Standpipe piezometers (50 mm diameter PVC pipes) were installed in all test holes drilled. The results of the drilling and field testing are shown on the test hole logs in Appendix B. An explanation of the symbols and terms used to describe observations on the test hole logs and the Modified Unified Soil Classification system are also provided in Appendix B.

3.2 Laboratory Testing

Laboratory testing included visual classification and determination of the natural moisture content of all soil samples retrieved. In addition, Atterberg Limit testing, grain size distribution analyses and water-soluble sulphate content tests were carried out on select disturbed soil samples.

The results of the laboratory testing are presented on the test hole logs and laboratory results for the grain size distribution tests and water-soluble sulphate concrete tests are included in Appendix C.

4. SITE DESCRIPTION

4.1 Surface Conditions

At the time of the field investigation, the site was being used for agricultural purposes. The site was generally flat to slightly gently rolling terrain. The site is approximately 12 hectares in area.

The proposed site is fronted by Grasswood Road (Township Road No. 360) on the north side, and Clarence Avenue South along the west border.

There is currently a house and a barn located towards the southwest corner of the property and within part of the proposed development. The general layout of the site is shown on Drawing No. 37139-10-1, in Appendix A.

4.2 Subsurface Soil Conditions

The results of the geotechnical investigation indicate that subsurface soil conditions encountered at the site generally comprised topsoil, underlain by fine grained sand followed by high plastic, glaciolacustrine clay.

The topsoil encountered during drilling varied from about 0.28 m to 0.46 m thick and contained varying amounts of organics and rootlets. It should be noted that the topsoil thickness may vary between test holes and could vary from what was measured at the test hole locations.

Sand was encountered below the topsoil and extended to variable depths in all of the test holes drilled for this investigation. The sand was generally fine grained and contained some silt and trace clay. The sand was generally loose to compact in density and moist to wet. Discontinuous layers clay were encountered within the sand in TH23-4 and TH23-6 to TH23-9.

The sand was underlain by high plastic clay in TH23-1, TH23-6, TH23-7, TH23-8 and TH23-10. The clay varied from firm to stiff in consistency. The depth the clay was encountered varied from about 5.6 m to 7.8 m.

A detailed description of subsurface conditions observed at each test hole location is presented on the test hole logs in Appendix B.

4.3 Groundwater Seepage and Sloughing Soils

Sloughing and groundwater seepage were observed in the test holes during and immediately after drilling. Standpipe piezometers were installed in all test holes. Groundwater level readings were taken in the standpipe piezometers at the end of the field drilling program and again on June 6, 2023, approximately 19 days following installation of the standpipe piezometers. A summary of the groundwater level measurements observed at the test hole locations is presented in Table 4.3.1. Locations where seepage and sloughing conditions were encountered are noted on the test hole logs in Appendix B.

Table 4.3.1: Short Term Groundwater Levels

TEST HOLE	DEPTH OF STANDPIPE (m)	DEPTH TO GROUNDWATER (m)	
		I.A.D.**	JUNE 6, 2023
23-1	4.9	3.9	1.7
23-2	5.1	2.0	1.7
23-3	4.4	1.2	1.8
23-4	8.8	6.5	3.3
23-5	5.0	1.9	2.8
23-6	9.2	6.1	2.6
23-7	5.7	4.0	2.3
23-8	6.7	5.5	2.2
23-9	6.1	2.4	2.2
23-10	10.7	5.9	2.5

** Immediately after drilling and piezometer installation

The groundwater level measurements are relatively short term and may not represent stabilized groundwater conditions. In addition, groundwater levels may vary between test hole locations and may fluctuate in response to seasonal factors and precipitation, and vary across the site; hence, the actual groundwater conditions at the time of construction could vary and could be higher than those recorded during this investigation.

4.4 Frost Action

The near surface soils encountered in the test holes consist of silty sand which is considered to have moderate to high frost susceptibility.

The estimated frost penetration depth in the loose to compact sand at this site is based on a mean annual freezing index (AFI) of 1,800-degree days Celsius is 1.9 m. For the 50-year return period freezing index of 2,600 degree-days Celsius, the corresponding frost penetration depth is 2.6 m. The average frost depth may be used during construction provided the owner is prepared to accept some risk of undesirable performance; the 50-year return period depth should be used for design.

The estimated depth of frost penetration is for a uniform soil type with no snow cover. The depth of frost penetration will be reduced if turf or snow cover is present.



4.5 Site Seismic Classification

Based on available geotechnical information, the site is classified as Site Class D in accordance with the site classification as per Table 4.1.8.4-B of the 2020 NBC.

5. GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

5.1 General

The subsurface conditions encountered at the test hole locations generally consisted of loose to compact, fine grained sand, with variable silt and clay layers and underlain by firm to stiff, high plastic clay. Groundwater seepage and sloughing soils were encountered at depths varying between about 1.7 m to 3.3 m below ground within the sand in all test holes drilled on the site.

General grading plans were not known at the time of preparation of this report. Overall, the site is suitable for the proposed residential development from a geotechnical perspective. However, basements may not be suitable due to the high groundwater levels encountered across the site. It is recommended that the final building location within each lot be individually assessed to determine if a basement is feasible.

Discussions of the geotechnical considerations at the site and preliminary design and construction recommendations for the proposed development are presented in the following sections. Additional construction guidelines are provided in Appendix D.

5.2 Site Preparation Grading and General Fill Placement

Site preparation should include the removal of all topsoil, organic soils and all unsuitable materials under development areas and roadways. Topsoil may be stockpiled and reused on this site where required after final grading is complete.

Site grading is anticipated to consist of a mixture of minor cuts and fills across the site. Additional geotechnical assessment should be conducted if grading will include raising the overall grade of individual lots or the entire subdivision by more than 1 m. The onsite sand and clay are generally suitable for site grading. However, the following considerations are provided when using the onsite materials:

- 1) The fine-grained sand contains some silt and variable silt and clay layers and is susceptible to frost heave if it is placed within the depth of frost penetration and has a source of water.



- 2) The fine-grained sand will be susceptible to erosion by wind and water, and easily disturbed during placement.
- 3) Groundwater was relatively shallow at the site and earthworks, and specifically cut sections may become difficult with depth.
- 4) On site borrow sources may be limited to shallow depths due to the high groundwater table, and the utilization of soils below the water table will require drying.
- 5) High plastic clay was encountered at depths of about 5 m to 8 m, which is generally beyond shallow cut depths.

Geotechnical monitoring and review is recommended during subgrade preparation to identify suitable on-site fill materials and to confirm the subgrade quality. Proof rolling should be undertaken to identify soft areas requiring additional work. Scarification and re-compaction are typically required to achieve a suitable subgrade. Where soft or weak soils are encountered, removal and replacement or additional soil stabilization measures may need to be undertaken. A geotextile and/or geogrid may be required to provide separation and reinforcement in areas of weak subgrade soils. The sub-cut depths, where required, should be decided in the field by qualified geotechnical personnel at the time of grading.

Use of the onsite sand for fill placement will require handling so that it is compacted uniformly to reduce the potential for differential settlement.

All backfill material for site raising should be placed on unfrozen ground.

The following general guidelines for fill placement and compaction are recommended:

- Structural fill under sidewalks and roadways should be placed in 150 mm maximum lifts compacted thickness and compacted to at least 98 percent of Standard Proctor Maximum Dry Density (SPMDD) within ± 2 percent of Optimum Moisture Content (OMC).
- General site grading fills outside of building footprints should also be placed in 150 mm lifts compacted thickness and compacted to at least 95 percent of SPMDD within ± 2 percent of OMC. If high plastic clay is used for general grading, the fill moisture content of the fill should be between OMC and two percent above OMC.
- All fill used for landscaping purposes needs only moderate compaction (i.e. 92 percent of SPMDD) to ensure future settlements do not considerably affect design drainage provisions.



- Frozen fill, snow, ice, or other deleterious material should not be included in fills. Further information on placement and compaction procedures during cold weather construction can be provided on request.
- The density of compacted fills should be confirmed by field density test measurements during construction.

Permanent site drainage should be developed at early stages of construction to improve site trafficability and reduce future frost effects on the subgrade. The final site grades should be sloped to shed water away from the buildings and roadways.

5.3 Underground Utilities

5.3.1 Temporary Excavations

The depths and types of trenches were not known at the time of this report. In general, the depth of services is not expected to extend beyond about 3 m below ground surface. Based on the test holes drilled during this investigation, excavation will extend through a mixture of fine-grained sand with silt and clay layers and lenses.

The short term groundwater levels ranged from 1.7 m to 3.3 m, and groundwater seepage should be expected within the excavations, depending on final site grades and the design elevations of the buried utilities.

Conventional trenched excavations may be feasible for servicing depths in the order of 3 m, if pumping and dewatering methods are utilized.

Alternatively, trenchless installations could be considered. Trenchless installation methods, such as horizontal directional drilling should account for the high groundwater levels.

The type of material encountered in the trenches will largely govern the temporary excavation slope requirements. Based on Saskatchewan Occupational Health and Safety (OH&S) regulations, the soils at this site can generally be classified as Type 4 Soils and temporary unsupported excavation slopes can be typically cut at 3H:1V through the native sand and clay. If softer clays or loose sand is encountered, flatter slope angles may be required. Additional investigation and inspection during trenching should be undertaken to identify changes in soil type that may result in a change to the above classifications.



Groundwater seepage was observed in the test hole locations at depths below about 1.7 m below the existing ground surface; however, final grading plans in relation to these observations are not known at this time. Seepage may also be encountered at different depths across this site.

Excavated material should be kept back from the top of the trench by at least the depth of excavation. Personnel should not be allowed in the open trenches during installations without proper safety precautions being taken. In all cases, excavations should be consistent with Saskatchewan OH&S Regulations.

5.3.2 Temporary Dewatering

Groundwater seepage within the depth of open excavations should be expected. The fine-grained sand has a high permeability. As such, the rate of seepage within the fine-grained sand may require well points. Alternatively, dewatering may be performed using submersible pumps placed in a perforated or screened pipe wrapped in non-woven geotextile installed in a hole extending 1 m to 2 m below the base of the excavation. The annulus of the hole between the excavation and pipe should be backfilled with clean drainage rock.

5.3.3 Bedding

It is expected that most trenches will terminate in loose sand. Depending on the bedding material requirements for buried pipes, additional subgrade preparation may be required. Additional subgrade preparation may require over-excavation by about 0.6 m and replacement with granular backfill or lean mix concrete. Woven geotextile should be placed at the base of the sub-excavation to provide separation between the softer or looser subgrade soils and overlying granular backfill.

5.3.4 Trench Backfill

Where the alignments of the trench excavations coincide with those of the proposed roadways and other grade supported elements, such as sidewalks, the major issue will be to provide sufficient and uniform compaction of the trench backfill to reduce differential settlement of the ground surface. To limit differential settlement along proposed roadway alignments a pre-trench excavation to a depth of about 1.5 m over the full width of the roadway is recommended. This provides for a more uniform subgrade condition over the full width of the roadway.

It is anticipated that materials excavated from the trenches will be used as backfill. Therefore, trench backfills will consist of a mixture of the existing sand and clay.



The trench backfill material should be free of organic or deleterious material, and should not be placed frozen, nor placed at temperatures below freezing. Heavy compaction equipment should not be allowed to operate above the pipe until 1 m of backfill has been placed and compacted above the pipe.

Even when compacted to the above standards, settlement of the trench backfill may occur in the first one to two years after placement.

5.4 Foundations

Spread footings for residential houses may be founded on the native sand or clay. As noted in Section 5.1, basements may not be feasible due to the high groundwater table, and constructing footings below the water table will be difficult. Due to the underlying soils consisting of variable silts and clay layers, some differential movements should be expected.

Preliminary assessment of the site suggests that feasible deep foundations for residential development include helical piles. Cast-in-place concrete friction piles may not be feasible due to the high groundwater and sloughing conditions within the sand.

5.4.1 Footings

Preliminary recommendations for footings are as follows:

- Exterior spread footings should be founded at a minimum depth of 1.5 m below finished ground level for heated structures. Interior footings may be founded below basement level (where basements are deemed feasible). All footings supporting unheated structures should be founded at least 2.6 m below finished grade. Alternatively, the foundations may be placed at shallower depths and protected with rigid insulation.
- Footings should be constructed above the groundwater table.
- All footings should be founded on undisturbed, loose to compact sand.
- High plastic clay was noted on site, but generally at deeper depths. However, if encountered at shallower depths, footings placed on the high plastic clay at this site may be subject to differential movements due to swelling or shrinkage associated with fluctuations in the moisture content.
- Fill, organic material, or local soft zones in footing trenches should be removed and replaced with lean concrete or compacted gravel fill. Disturbed soil should not be allowed to remain in the footing trenches.



- Strip and square footings founded on the loose to compact sand may be designed using a factored ULS bearing resistance of 100 kPa and 120 kPa, respectively; based on ultimate bearing capacities of 200 kPa and 240 kPa, respectively, and a geotechnical resistance factor (Φ) of 0.5.
- Assuming 25 mm of settlement, strip and square footings may be designed using an SLS bearing resistance of 65 kPa and 80 kPa, respectively. Additional analysis is required to provide SLS bearing resistance values for different amounts of settlement.
- Care should be taken to prevent excessive drying or wetting of the bearing surface during construction. Where over-dried or wet soils are encountered, on the bearing surface, it will be necessary to undercut these areas and replace with lean concrete.
- The base of the footing trench should not be allowed to freeze as this could result in heave of the foundation soils and subsequent settlement of the footing upon thawing.
- Footing trenches should be inspected by Thurber to confirm that the footings are founded in suitable foundation soils prior to forming and pouring concrete.

5.4.2 Helical Piles

Helical steel piles are considered feasible for the site. The depth of penetration and required design of helices (single or multiple) will depend on the soil conditions and design axial loads.

Helical pile capacities are highly dependent on the pile design geometry and method of installation. It is therefore general industry practice for the piling contractor to design and warrant the pile designs based on the design loads and expected soil conditions. The helical pile design should be reviewed by a geotechnical engineer. In addition, the structural capacity should be checked by a structural engineer for the applied loading conditions.

Helices may be founded in either compact sand or firm to stiff clay. The preliminary axial capacity of helical piles can be estimated using bearing capacity theory. The major factors that affect the vertical capacity are the pile geometry (diameter, depth and spacing of helices), soil and ground water profile and the installation procedures. The following equation may be used for preliminary assessment of ultimate the axial resistance of the soil for a single helix.

$$Q_u = (c_u \cdot N + \gamma' \cdot H) \cdot \frac{\pi(D^2 - d^2)}{4} + Q_s$$

Where:

- N** = Bearing capacity factor N_c , for piles in compression:
 Use 9 for helix diameters smaller than 0.5 m
 Use 7 for helix diameters between 0.5 and 1 m
 Use 6 for helix diameters greater than 1 m
 Uplift capacity factor N_u , for piles in tension use: $N_u = 1.2 \times H/D_1 \leq 9$
- C_u** = Undrained shear strength at the depth of the helix plate
 (use 50 kPa)
- γ'** = Effective unit weight (use 10 kN/m³ below 1.5 m)
- H** = Helix embedment (m)
- D** = Helix plate diameter (m)
- D_1** = Diameter of uppermost helix
- d** = Pile shaft diameter
- Q_s** = ultimate shaft resistance (kN).

Shaft friction (Q_s) should generally be ignored in design for when the helical pile shaft diameter is 0.15 m or less.

For piles with multiple helices, the ultimate resistance should use the sum of the ultimate resistance calculated for each individual helix, only if the helices are spaced at least three helix diameters apart.

When designing the piles, the ultimate resistance of the pile should be multiplied by a geotechnical resistance factor of 0.4.

The pile designer/installer must consider items including the design of the helices, shaft structural capacity, buckling considerations, installation, and performance requirements. It is recommended that the final helical pile design be reviewed by the structural and geotechnical engineer (Thurber) prior to commencing installation.

Helical piles should not be installed at spacing closer than three times the largest helix diameter, center to center.

5.4.2.1 Helical Pile Installation Input and Specifications

The Helical Pile Contractor should submit detailed drawings for review by the owner's structural and geotechnical engineers at least two weeks in advance of the start of pile installation.

Helical piles should be installed by an experienced operator and should be installed vertically with continuous and consistent pile advancement. Inclined helical piles should be installed at the designed angle of inclination with continuous and consistent pile advancement. Rotating the pile without advancing and/or backing up of the pile is not permitted as these installation methods will increase the risk of disturbance of the soil, resulting in a decrease in available resistance.

Pile installation should be carried out under the full-time pile monitoring of a qualified professional retained by the pile designer/installer who will sign off as the engineer of record on the completed works. Pile installation logs should be recorded for each pile. The installation logs should record detailed information including the pile name/location, the pile shaft diameter, the helical plate diameter, pitch and location on the shaft, the torque throughout the depth of installation, and installed depth. Helical pile capacities should also be evaluated based on torque measurements, and pile designs may need to be revised based on these measurements.

Field verification of all helical pile installations should be carried out using empirical methods correlating installation torque with axial resistance. Installation torque should be measured directly from the drive head using an in-line dynamometer. The pile installation contractor should provide a recent calibration record for the dynamometer in advance of pile installation. Field verification using estimates of the drive head torque based on correlations with hydraulic pressure drop at the drive head is not acceptable.

Helical plates should be true circular helices with leading and trailing edges aligned within 5 mm of parallel. Helical piles should be advanced such that the rate of advance is equal to at least 85 percent of the pitch of the helical plate. Downward pressure on the pile (i.e., crowd) may be required to achieve this. Helical piles should be advanced at a rate no faster than 25 revolutions per minute.

5.4.2.2 Uplift Resistance

Uplift loads can be resisted by the pile shaft and helices. Piles resisting uplift load should be installed at a minimum depth ratio (H/D) of four, or below frost depth, whichever is greater.



The ultimate axial helix resistance calculated using the equations provided in Section 5.4.2 should be multiplied by a geotechnical resistance factor of 0.3 for piles subject to uplift loads. The upper 1.5 m of the pile shaft should be neglected when calculating the uplift resistance.

Piles subjected to frost heave forces should be checked for adequate resistance to uplift. Adfreeze forces may be estimated based on an adfreeze friction value of 100 kPa between steel and soil-applied around the pile circumference over the expected maximum frost depth for piles.

Resistance to frost uplift forces will be provided by dead load acting on the pile, the weight of the pile, and the frictional resistance on the shaft below the frozen zone and the pile helices. Since the adfreeze values are ultimate values, and the frost depths provided are based on 50-year return periods, a geotechnical resistance factor of 0.8 should be applied to the ultimate uplift resistance calculated using the equations provided above, for resisting frost heave.

5.5 Pile Caps and Grade Beams

Where piles are used, grade beams and pile caps may be required along the top of the piles. Precautions should be taken to prevent heaving of the grade beams or pile caps due to frost penetration and/or swelling of the underlying soil.

The recommended construction procedures for preventing heave under the grade beam or pile cap is through use of a crushable, non-degradable void form material. Design and selection of an appropriate void filler should consider the potential heaving movements noted above. The grade beam must be designed in accordance with the crushing strength of the void filler used, and the piles must be able to resist the resulting uplift load.

5.6 Basements

Basements for this site may not be feasible due to high water levels. Basements should be founded at least 1 m above the observed groundwater level. As noted in Section 5.1, it is recommended that the final building location within each lot be individually assessed to see if a basement is feasible.

Perimeter foundation drains should be placed around all basement walls at footing level and be surrounded with at least 500 mm of free draining gravel and enveloped with a non-woven geotextile layer.

Additional backfilling and dewatering considerations can be provided upon request, if individual sites are identified as suitable for basement development.

5.7 Slab-on-Grade

A concrete floor slab-on-grade is considered feasible construction at the site subject to the following recommendations:

- All topsoil, organics, poor-quality fill, and any other deleterious materials should be removed from within the slab footprint.
- Sub-excavate below the design subgrade level by at least 200 mm below the underside of the floor slab. The exposed subgrade surface should be relatively flat and level to allow for the placement of an even layer of granular fill material.
- The upper 150 mm of the exposed subgrade surface should be scarified and compacted to 95 percent of the SPMDD within ± 2 percent of OMC.
- Any fill required to raise the site to the design subgrade level may consist of inorganic, low to medium plastic clay or granular fill (i.e., suitable fill). The fill should be placed and compacted in 150 mm lifts (compacted thickness) to at least 95 percent of the SPMDD within ± 2 percent of OMC.
- Areas of soft, loose and/or wet subgrade soil should be sub-cut and replaced with suitable fill placed in 150 mm lifts (compacted thickness) and compacted to 95 percent of the SPMDD within ± 2 percent of OMC.
- Prior to placement of granular fill, the prepared subgrade surface should be reviewed by Thurber to confirm that all topsoil, organics, poor quality fill and any other deleterious materials have been removed and to assess if the subgrade surface has been adequately prepared.
- The 200 mm of granular fill below of the slab should consist of crushed, base course material compacted to 98 percent of the SPMDD within ± 2 percent of OMC. The granular base course should meet the gradation requirements presented in Table 5.7.1.

Table 5.7.1: Typical Gradation of Granular Base Leveling Course

SIEVE (METRIC SIEVE DESIGNATION)	PERCENT PASSING (%)
18 mm	100
12.5 mm	75 – 100
5 mm	50 – 75
2 mm	32 – 52
900 μm	20 – 35
400 μm	15 – 25
160 μm	8 – 15
75 μm	6 – 11

*Saskatchewan Ministry of Highways and Infrastructure Type 33 Base Course.

Other appropriate materials which fall outside the above recommended gradation limits may be suitable. Alternate materials should be evaluated by a geotechnical engineer prior to placement.

- The floor slab should be designed to tolerate some movement. The slab should float with no rigid connections to the walls, the foundation elements, or the grade beam, except at the doorway locations.
- The floor slab should be reinforced and articulated to control any cracking that may occur.
- Care should be taken to prevent excessive drying or wetting of the subgrade during construction. Subgrade that becomes overly dry or overly wet should be scarified, moisture conditioned and recompacted to 95 percent of the SPMDD within ± 2 percent of OMC.
- The subgrade and sub-slab granular fill must be protected from frost penetration before, during and following slab construction.
- Additional assessment and recommendations should be provided for unheated structures.
- Drain lines and sewers, if present below slabs, should be designed with watertight flexible, maintenance free joints.
- Surface grading and landscaping should be designed to shed water away from the building to reduce ingress of water. Similarly, downspouts should be extended well away from the building. A 300-mm thick clay cap should be provided around the perimeter of the building to prevent surface water infiltration into subgrade soils. Alternatively, asphalt surfacing could be provided to minimize the ingress of surface water.

5.7.1 Radon Mitigation System Considerations

The 2020 National Building Code (NBC) indicates that Part 9 of Division B (Housing and Small Buildings) applies to all buildings with an area not exceeding 600 m² and height of 3 storeys or less and not used for major occupancies. The NBC requires the proposed structure to include a radon mitigation rough-in, such as a granular depressurization layer beneath the floor slab, for possible subfloor depressurization to control radon concentrations.

A light-weight non-woven geotextile, installed in accordance with the manufacturer's recommendations, should be used as a separator between the prepared subgrade and the overlying granular depressurization layer. The NBC indicates the granular depressurization layer should be comprised of a 100mm (minimum) thick layer of coarse gravel installed under the entire floor slab area. However, Thurber recommends that a minimum of 150 mm of clean, well-graded

sand or gravel be utilized for this purpose beneath the floor slab and along the outside of footings or grade beams to also assist with leveling and drainage purposes. The granular material should meet the following criteria:

- Clean crushed aggregate containing not more than 10% of material passing the 4mm sieve.
- Nominal maximum aggregate size of either 20 mm or one-third of the total thickness of the layer, whichever is less.
- Minimum of 60% of material having two or more crushed faces.

The well-graded nature of the granular material may make it prone to shoving and displacement during subsequent construction activities.

A poly barrier (or equivalent) is required directly below the concrete slab. It is recommended that the poly barrier have a minimum thickness of 10 mil and/or use a top geotextile material above the granular material to protect the poly barrier from punctures or tears during the construction of the floor slab. The use of wide-base rebar chair supports should be considered in lieu of supports with legs and the poly barrier should be inspected for damage and repaired as required prior to the placing of concrete.

For buildings utilizing strip footings or grade beams that create isolated subfloor areas, piping should be installed through these features so that air can be extracted through the entire depressurization layer.

For below grade walls, a poly or bituminous barrier is required for dampproofing and to assist with vapour intrusion control. Slab joints should be tooled when poured and sealed with polyurethane caulking once cured.

Additional requirements, such as the use of radon suction pits may be required by the jurisdiction having authority. Suction pits, under slab piping, and the related venting systems shall be designed by a qualified mechanical consultant accredited as a Canadian National Radon Proficiency Program (C-NRPP) Certified Mitigation Professional.

5.8 Cement Type

Two tests were conducted to measure the water-soluble sulphate ion (SO₄) content of select soil samples recovered from the test holes. The test results showed the presence of less than

0.05 percent water-soluble sulphate (SO₄) content in the soil samples. However, water-soluble sulphates are known to exist in the clay soils in this area.

As per the guidelines of Table 3 of CSA Standard A23.1-19, the subsurface concrete at this site may be exposed to a “Moderate” degree of exposure (Exposure Class S-3) to sulphate attack and would require the use of CSA Type MS or MSb or LH or HS or HSb Portland cement. Supplementary cementitious materials may be used in combination with a hydraulic cement or a blended cement, provided that the mixture of cementitious materials meets the relevant performance requirements in Table 3, for S-1, S-2, or S-3 exposure. Following the guidelines of Table 2 of CSA A23.1-19, we recommend that such concrete should have maximum water to cementing materials ratio of 0.50 with the specified minimum 56-day compressive strength of 30 MPa and should incorporate appropriate air entrainment. Further, such concrete should be cured as per the applicable “Curing Type” stated in Tables 2 and 19.

The recommendations stated above for the subsurface concrete at this site may require further additions and/or modifications due to structural, durability, service life or other considerations that are beyond the geotechnical scope.

In addition, if imported material is required to be used at the site and will be in contact with concrete, it is recommended that the fill soil be tested for sulphate content to determine whether the above-stated recommendations remain valid.

5.9 Pavement Recommendations

5.9.1 Subgrade Preparation

The subgrades of pavement areas should be prepared in accordance with the recommendations given in Section 5.2. The subgrades should be examined by a qualified engineer or technologist upon commencement of subgrade preparation. The subgrades should be proof rolled to detect any softened or weakened zones, which should be removed and replaced with better quality fill or compacted granular fill.

The prepared subgrade should be 300 mm thick and compacted to 100 percent of the SPMDD at a moisture content between two percent below and two percent above the OMC.

A non-woven or woven geotextile may also be placed on the prepared subgrade to provide separation between the prepared subgrade and granular base course to improve performance.

As recommended in Section 5.3 for utility trench backfill, a pre-trench excavation across the full width of the roadway should be made to a depth of 1.5 m. Backfill materials within this zone should be restricted to suitable soils, which will promote the construction of stable subgrade support conditions. It is recommended that the backfill be closely monitored to confirm that stable non-deflecting subgrades are achieved. This procedure has the benefits of limiting differential settlements of trench backfill.

It is recommended that the finished subgrade surface be trimmed smooth and sloped at a minimum of 2 percent toward catch basins or perimeter drains or ditches. The purpose of this is to drain any subsurface water from the subgrade and thereby prevent ponding of water which could result in swelling, softening, and/or possible frost heaving of the subgrade. The final compacted subgrade surface should also be proof rolled to confirm that surface deflections are minimal under the influence of construction traffic.

5.9.2 Pavement Design

Assuming that the development will be subject to primarily light vehicle traffic, with occasional heavy truck traffic for garbage collection and other services, a local residential pavement structure is considered appropriate. Given the subgrade conditions at this site, a preliminary recommended pavement structure for the local roads is as follows:

- 60 mm Asphalt Concrete Pavement; over
- 150 mm Granular Base Course; over
- 150 mm Granular Subbase; over
- 300 mm of prepared subgrade.

The preliminary pavement structure should be reviewed and revised as needed once subgrade conditions and traffic loading are known for the site.

In areas subject to loading and unloading of heavy trucks such as garbage trucks collection areas or loading docks, consideration should be given to an adequately designed concrete pavement structure.

6. CONSTRUCTION MONITORING

The performance of the various site facilities and structures will depend upon the quality of workmanship during construction. This is particularly important regarding foundation installations



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and other earthwork where variations in soil conditions could occur. Therefore, it is recommended that testing, monitoring and review be provided by qualified geotechnical personnel during foundation and earthwork construction to confirm soil material encountered and/or used for construction is similar to that considered for the design. Compaction testing for backfill will also be required.



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7. SIGNATURES/CLOSURE

This report was issued before any final design or construction details had been prepared or issued. Therefore, differences may exist between the report recommendations and the final design, the contract documents, or conditions during construction. In such instances, Thurber Engineering Ltd. should be contacted immediately to address these differences. Designers and contractors undertaking or bidding the work should examine the factual results of the investigation, satisfy themselves as to the adequacy of the information for design and construction, and make their own interpretation of the data as it may affect their proposed scope of work, cost, schedules, safety, and equipment capabilities.

We trust this information meets your present needs. If you have any questions, please contact the undersigned at your convenience.

Donna Rein, P. Eng.
Materials Engineer

Date: June 27, 2023
File: 37139-10

Adam Gmeinweser, P. Eng.
Associate | Senior Geotechnical Engineer



STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

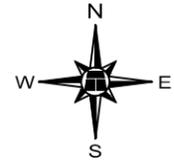


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APPENDIX A

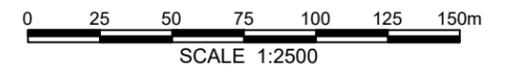
Drawing No. 37139-10-1 - Site Plan Showing Approximate Test Hole Locations

H:\37000\37139 RM of Corman Park Subdivision (LS13 Sec 34-35-5 W3M)\Drafting\37139.10-1.dwg - 1N - Jun. 22, 2023



LEGEND

- APPROXIMATE SITE BOUNDARY
- ⊕ APPROXIMATE TEST HOLE LOCATION
- (SP) STANDPIPE PIEZOMETER



AIR PHOTO FROM ESRI WORLD IMAGERY EXPORTED ON JUNE 9, 2023

102139536 SASKATCHEWAN LTD.

**DESKTOP HYDROGEOLOGICAL INVESTIGATION
PROPOSED RESIDENTIAL SUBDIVISION
LS13 34-35-5 W3M RM OF CORMAN PARK**

**SITE PLAN SHOWING APPROXIMATE
TEST HOLE LOCATIONS**

DWG No. 37139.10-1

DRAWN BY	ML
DESIGNED BY	DR
APPROVED BY	AJG
SCALE	1:2500
DATE	JUNE 2023
FILE No.	37139.20





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APPENDIX B

Symbols and Terms Used on Test Hole Logs

Modified Unified Soils Classification

Test Hole Logs

SYMBOLS AND TERMS USED ON TEST HOLE LOGS

1. VISUAL TEXTURAL CLASSIFICATION OF MINERAL SOILS

<u>CLASSIFICATION</u>	<u>APPARENT PARTICLE SIZE</u>	<u>VISUAL IDENTIFICATION</u>
Boulders	Greater than 200 mm	Greater than 200 mm
Cobbles	75 mm to 200 mm	75 mm to 200 mm
Gravel	4.75 mm to 75 mm	5 mm to 75 mm
Sand	0.075 mm to 4.75 mm	Visible particles to 5 mm
Silt	0.002 mm to 0.075 mm	Non-Plastic particles, not visible to the naked eye
Clay	Less than 0.002 mm	Plastic particles, not visible to the naked eye

2. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

<u>DESCRIPTIVE TERM</u>	<u>APPROXIMATE UNDRAINED SHEAR STRENGTH</u>	<u>APPROXIMATE SPT * 'N' VALUE</u>
Very Soft	Less than 10 kPa	Less than 2
Soft	10 - 25 kPa	2 to 4
Firm	25 - 50 kPa	4 to 8
Stiff	50 - 100 kPa	8 to 15
Very Stiff	100 - 200 kPa	15 to 30
Hard	200 - 300 kPa	Greater than 30
Very Hard	Greater than 300 kPa	

} Modified from
National Building
Code

* SPT 'N' Value Standard Penetration Test 'N' Value - refers to the number of blows from a 63.5 kg hammer free falling a height of 0.76m to advance a standard 50mm outside diameter split spoon sampler for 0.3m depth into the undrilled portion of the test hole.

3. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

<u>DESCRIPTIVE TERM</u>	<u>STANDARD PENETRATION TEST (SPT) (Number of Blows per 300 mm)</u>
Very Loose	0 - 4
Loose	4 - 10
Compact	10 - 30
Dense	30 - 50
Very Dense	Over 50

} Modified from
National Building
Code

4. LEGEND FOR TEST HOLE LOGS

SYMBOL FOR SAMPLE TYPE

 Shelby Tube	 SPT	 No Recovery	 A-Casing	 Grab	 Core
---	---	---	--	--	--

SYMBOLS USED FOR TEST HOLE LOGS

●	WC - Water Content (% by weight) of soil sample
▼	Water Level
■	SPT Standard Penetration Test 'N' Value (Blows/300mm)
▲	CPen Shear Strength determined by pocket penetrometer
CVane	Shear Strength determined by pocket vane
Cu	Undrained Shear Strength determined by unconfined compression test
SO ₄ %	Percent (%) of water soluble sulphate ions

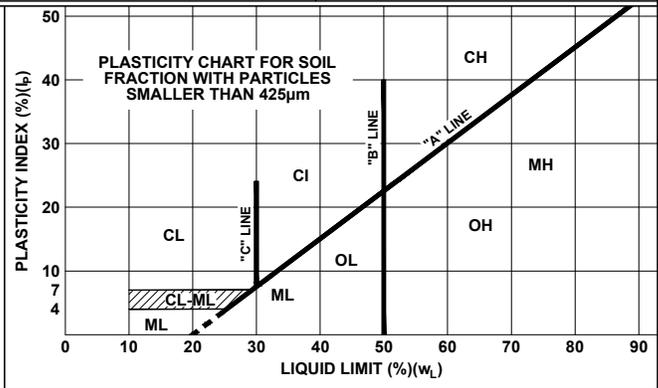
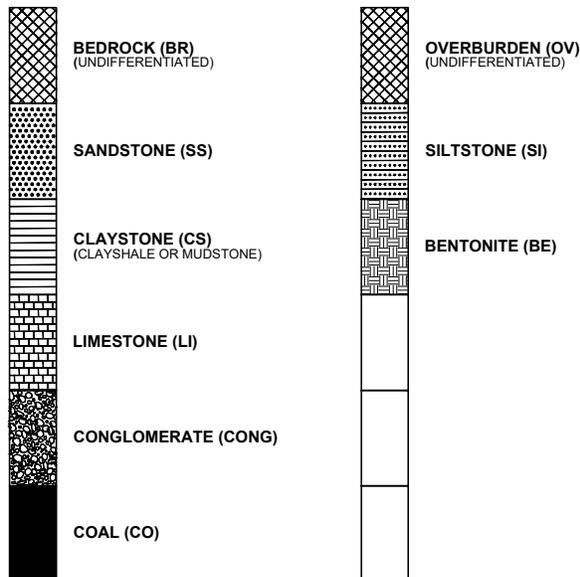
TERMS DESCRIBING QUANTITIES

'and'	35% to 50% of each size group
'sandy'	20% to 35%
'some'	10% to 20%
'trace'	Less than 10%
'mixture'	Soils containing three or more size groups within 20% of each other and each group greater than 10%

MODIFIED UNIFIED CLASSIFICATION SYSTEM FOR SOILS

(MODIFIED BY PFRA, 1985)

MAJOR DIVISION		GROUP SYMBOL	THURBER LOG SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA		
COARSE-GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN 75µm)	GRAVELS MORE THAN HALF COARSE GRAINS LARGER THAN 4.75mm	GW	▲ ▼ ▲ ▲ ▼ ▲ ▲ ▼ ▲	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4; C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$ NOT MEETING ALL GRADATION REQUIREMENTS FOR GW ATTERBERG LIMITS BELOW "A" LINE I_p LESS THAN 4 ATTERBERG LIMITS ABOVE "A" LINE I_p MORE THAN 7 $C_u = \frac{D_{60}}{D_{10}} > 6; C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$ NOT MEETING ALL GRADATION REQUIREMENTS FOR SW ATTERBERG LIMITS BELOW "A" LINE I_p LESS THAN 4 ATTERBERG LIMITS ABOVE "A" LINE I_p MORE THAN 7		
		GP	▲▲▲▲▲ ▲▲▲▲▲ ▲▲▲▲▲	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES			
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	▲▲▲▲▲ ▲▲▲▲▲ ▲▲▲▲▲		SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	
			GC	▲▲▲▲▲ ▲▲▲▲▲ ▲▲▲▲▲		CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
	SANDS MORE THAN HALF COARSE GRAINS SMALLER THAN 4.75mm	SW	● ● ● ● ● ● ● ● ● ● ● ● ● ● ●	WELL GRADED SANDS, GRAVELLY-SANDS, LITTLE OR NO FINES			
		SP	○○○○○ ○○○○○ ○○○○○	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES			
		SAND WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	○○○○○ ○○○○○ ○○○○○		SILTY SANDS, SAND-SILT MIXTURES	
			SC	○○○○○ ○○○○○ ○○○○○		CLAYEY SANDS, SAND-CLAY MIXTURES	
		Determine percentages of gravel and sand from grain size curve. Depending on percentages of fines (fraction smaller than 75µm) coarse grained soils are classified as follows: Less than 5% GW, GP, SW, SP More than 5% GM, GC, SM, SC Borderline cases requiring use of dual symbols					
		CLASSIFICATION IS BASED UPON PLASTICITY CHART (see below)					
FINE-GRAINED SOILS (MORE THAN HALF BY WEIGHT SMALLER THAN 75µm)	SILTS BELOW "A" LINE NEGLIGIBLE ORGANIC CONTENT	$w_L < 50\%$	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY			
		$w_L > 50\%$	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS			
	CLAYS ABOVE "A" LINE NEGLIGIBLE ORGANIC CONTENT	$w_L < 30\%$	CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS			
		$30\% < w_L < 50\%$	CI	INORGANIC CLAYS OF MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS			
		$w_L > 50\%$	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS			
	ORGANIC SILTS & CLAYS BELOW "A" LINE	$w_L < 50\%$	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW AND MEDIUM PLASTICITY			
		$w_L > 50\%$	OH	ORGANIC CLAYS OF HIGH PLASTICITY, ORGANIC SILTS			
	HIGHLY ORGANIC SOILS		Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOR OR ODOR, AND OFTEN FIBROUS TEXTURE		



MODIFIED UNIFIED CLASSIFICATION SYSTEM FOR SOILS

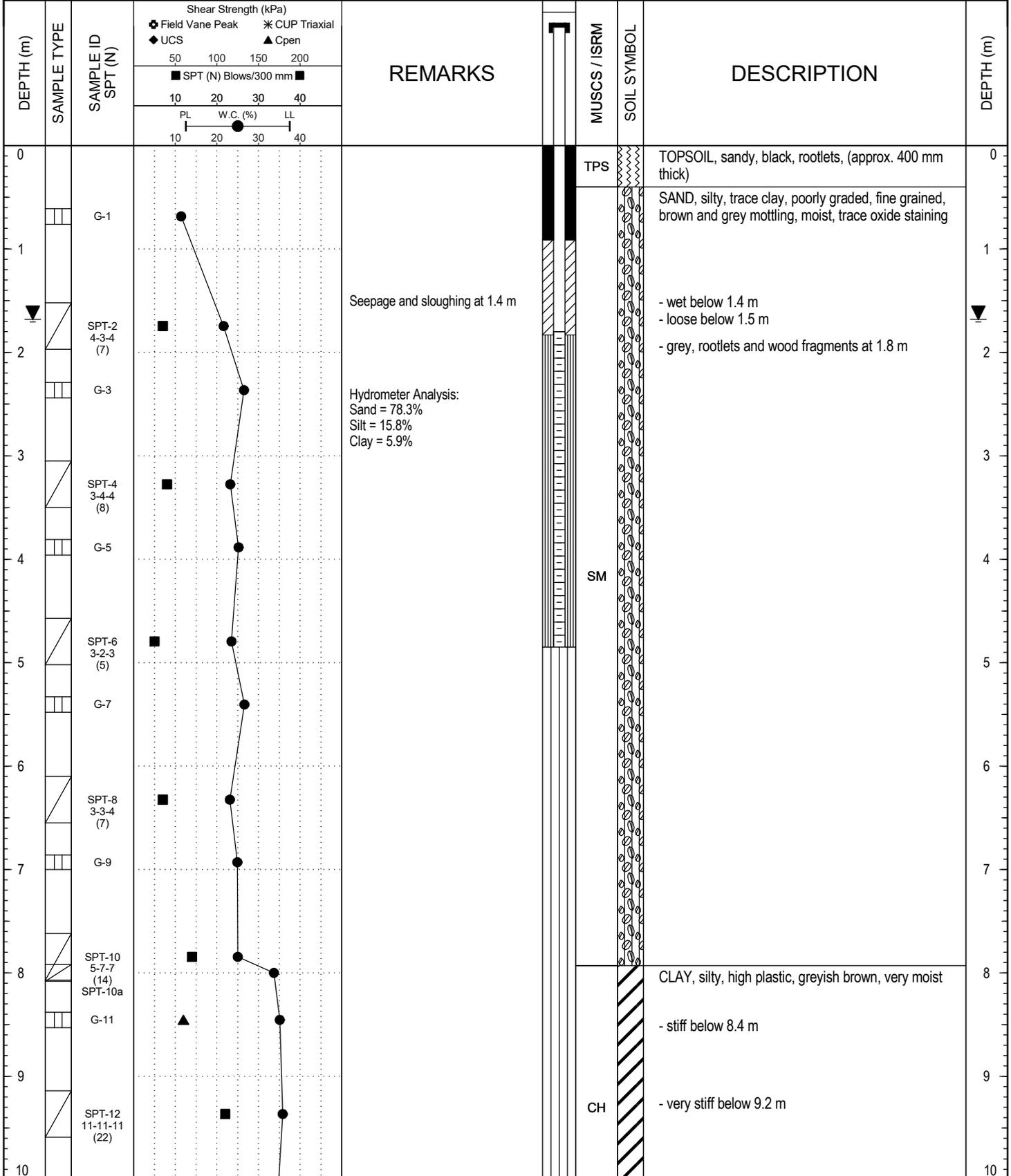
(MODIFIED BY PFRA, 1985)

CLIENT: 102139536 Saskatchewan Ltd.	PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3)	TEST HOLE NO: TH23-01
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PROJECT NO: 37139	UTM 13N NAD83, Northing: 5768447 m, Easting: 387142 m	ELEVATION: 500 m
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SAMPLE TYPE: <input type="checkbox"/> Grab Sample <input checked="" type="checkbox"/> Standard Penetration Test

BACKFILL TYPE: <input checked="" type="checkbox"/> Bentonite <input checked="" type="checkbox"/> Drill Cuttings <input type="checkbox"/> Slough



 THURBER ENGINEERING LTD.	DRILLING CO.: MARL Technologies	COMPILED BY: CHN	COMPLETION DEPTH: 10.7 m	
	RIG TYPE: Truck Mounted	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023	
	DRILL METHOD: Solid Stem Auger	INSPECTOR: XTA		
				Page 1 of 2

CLIENT: 102139536 Saskatchewan Ltd. PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3) TEST HOLE NO: TH23-01

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768447 m, Easting: 387142 m ELEVATION: 500 m

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough

DEPTH (m)	SAMPLE TYPE	SAMPLE ID SPT (N)	Shear Strength (kPa)		REMARKS	STANDPIPE	MUSCS / ISRM	SOIL SYMBOL	DESCRIPTION	DEPTH (m)
			Field Vane Peak ◆ UCS	* CUP Triaxial ▲ Cpen						
10		G-13	▲	●				CLAY (continued) - medium plastic, firm below 10.2 m	10	
11		G-14	▲	●				END OF HOLE at 10.7 m - sloughing to 1.8 m - 50 mm dia. PVC standpipe installed to 4.9 m - bottom 3.1 m machine slotted - backfilled with cuttings from 1.8 m to 0.9 m - backfilled with bentonite chips from 0.9 m to surface - stick-up 1.2 m - groundwater at 1.7 m at 06/June	11	
12									12	
13									13	
14									14	
15									15	
16									16	
17									17	
18									18	
19									19	
20									20	



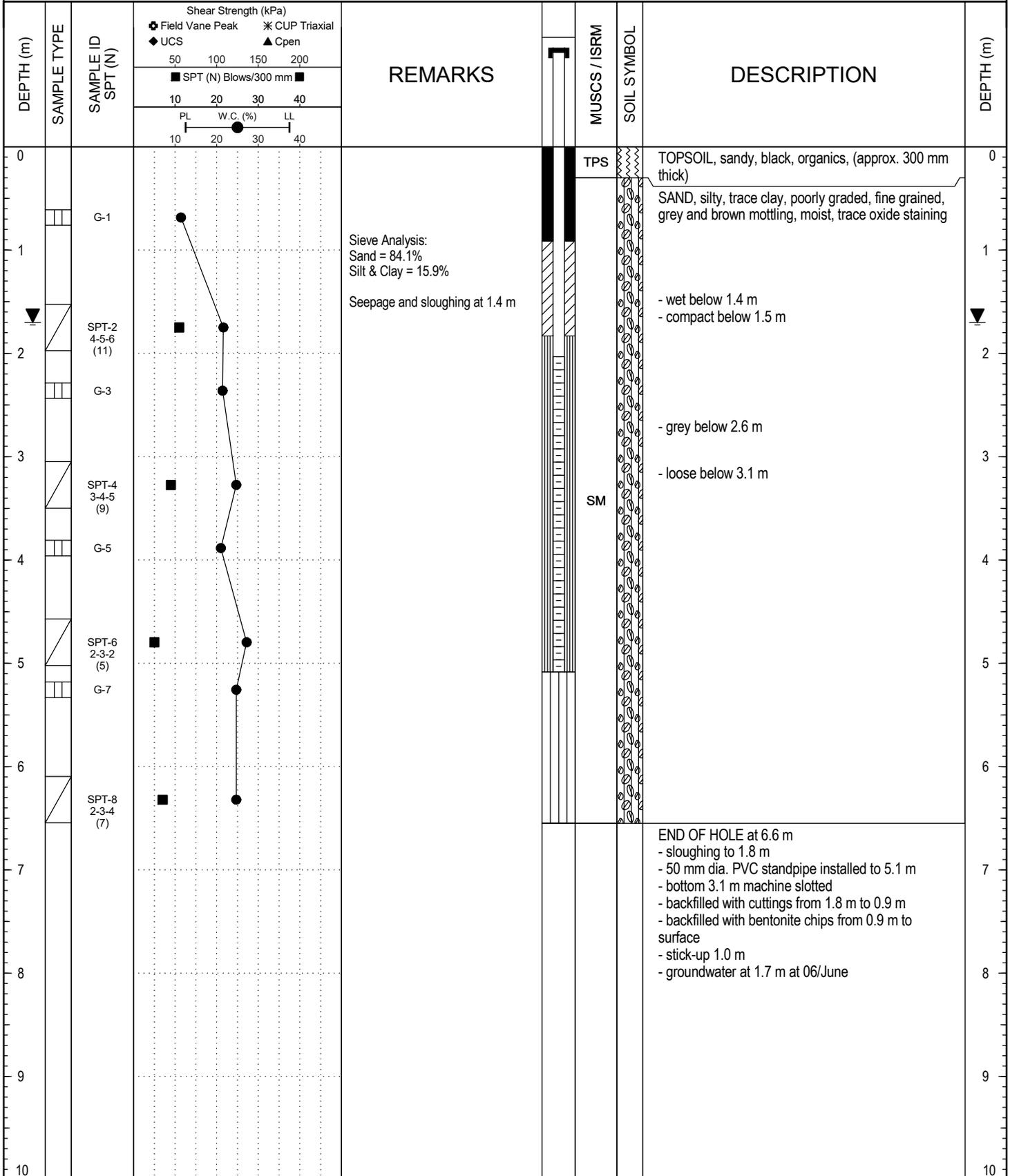
DRILLING CO.: MARL Technologies			
RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 10.7 m	
DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023	
INSPECTOR: XTA			

CLIENT: 102139536 Saskatchewan Ltd. PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3) TEST HOLE NO: TH23-02

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768424 m, Easting: 387238 m ELEVATION: 500 m

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough



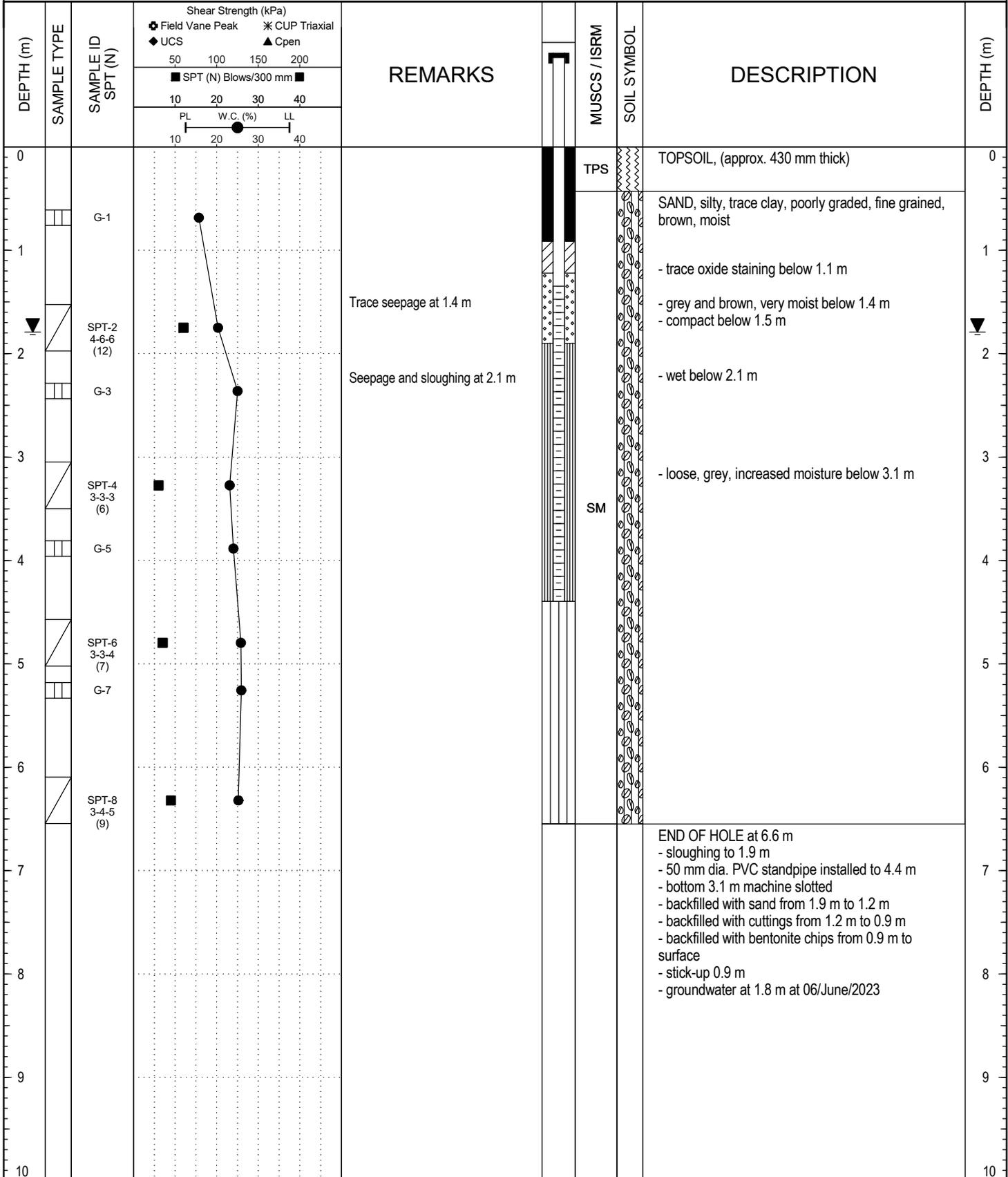
DRILLING CO.: MARL Technologies			
RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 6.6 m	
DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023	
INSPECTOR: XTA			

CLIENT: 102139536 Saskatchewan Ltd. PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3) TEST HOLE NO: TH23-03

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768426 m, Easting: 387354 m ELEVATION: 500 m

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Sand Slough



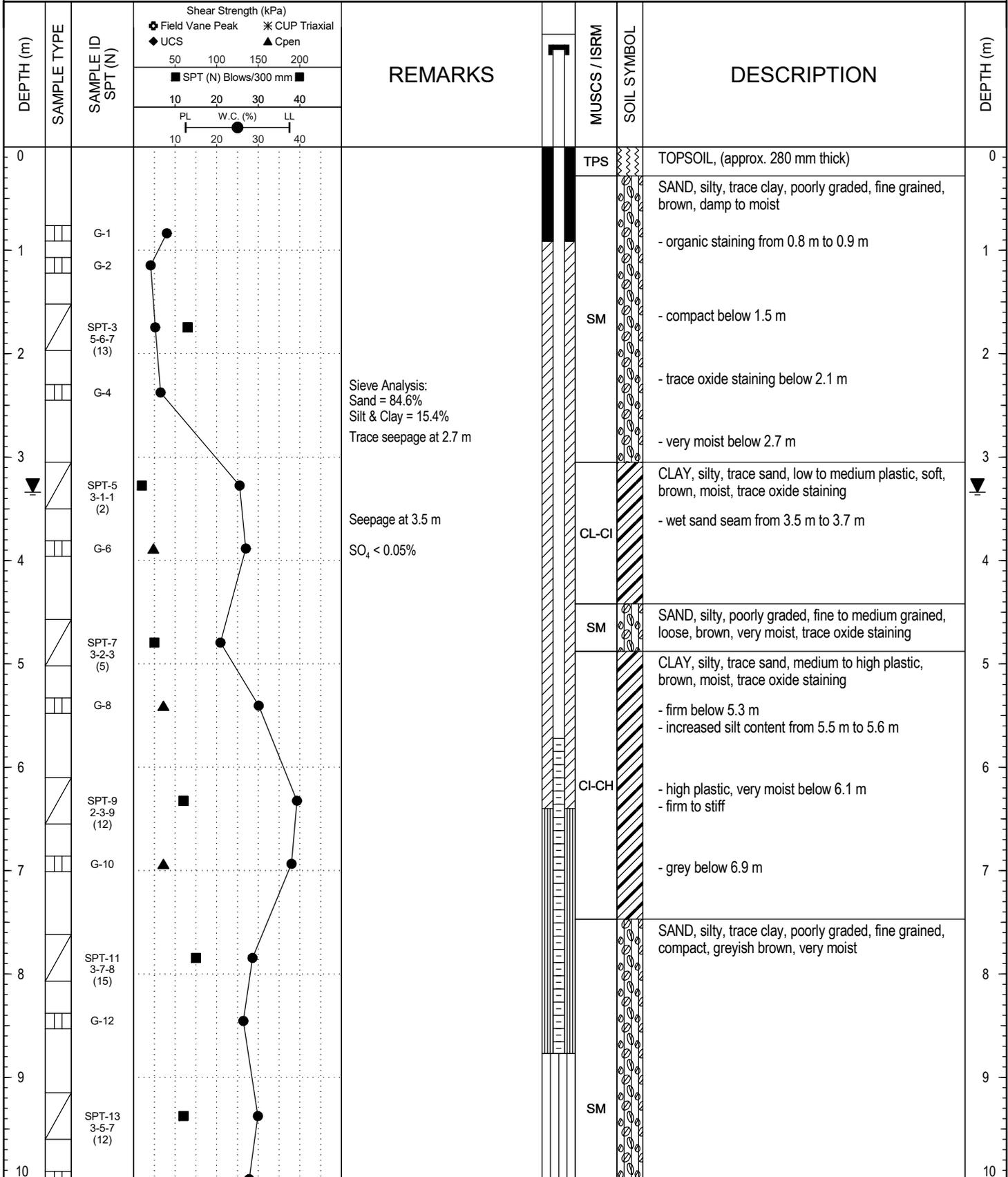
	DRILLING CO.: MARL Technologies		
	RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 6.6 m
	DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023
	INSPECTOR: XTA		Page 1 of 1

CLIENT: 102139536 Saskatchewan Ltd. PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3) TEST HOLE NO: TH23-04

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768438 m, Easting: 387481 m ELEVATION: 500 m

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough



	DRILLING CO.: MARL Technologies	COMPILED BY: CHN	COMPLETION DEPTH: 11.1 m
	RIG TYPE: Truck Mounted	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023
	DRILL METHOD: Solid Stem Auger	INSPECTOR: XTA	
	Page 1 of 2		

CLIENT: 102139536 Saskatchewan Ltd.	PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3)	TEST HOLE NO: TH23-04
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PROJECT NO: 37139	UTM 13N NAD83, Northing: 5768438 m, Easting: 387481 m	ELEVATION: 500 m
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SAMPLE TYPE: <input type="checkbox"/> Grab Sample	<input checked="" type="checkbox"/> Standard Penetration Test	
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BACKFILL TYPE: <input checked="" type="checkbox"/> Bentonite	<input checked="" type="checkbox"/> Drill Cuttings	<input type="checkbox"/> Slough
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DEPTH (m)	SAMPLE TYPE	SAMPLE ID SPT (N)	Shear Strength (kPa) + Field Vane Peak * CUP Triaxial ◆ UCS ▲ Cpen 50 100 150 200 ■ SPT (N) Blows/300 mm ■ 10 20 30 40 PL W.C. (%) LL 10 20 30 40	REMARKS	STANDPIPE	MUSCS / ISRM	SOIL SYMBOL	DESCRIPTION	DEPTH (m)
10		G-14						SAND (continued)	10
11		SPT-15 5-7-9 (16)						END OF HOLE at 11.1 m - sloughing to 6.4 m - 50 mm dia. PVC standpipe installed to 8.8 m - bottom 3.1 m machine slotted - backfilled with cuttings from 6.4 m to 0.9 m - backfilled with bentonite chips from 0.9 m to surface - stick-up 1.0 m - groundwater at 3.3 m at 06/June/2023	11
12									12
13									13
14									14
15									15
16									16
17									17
18									18
19									19
20									20

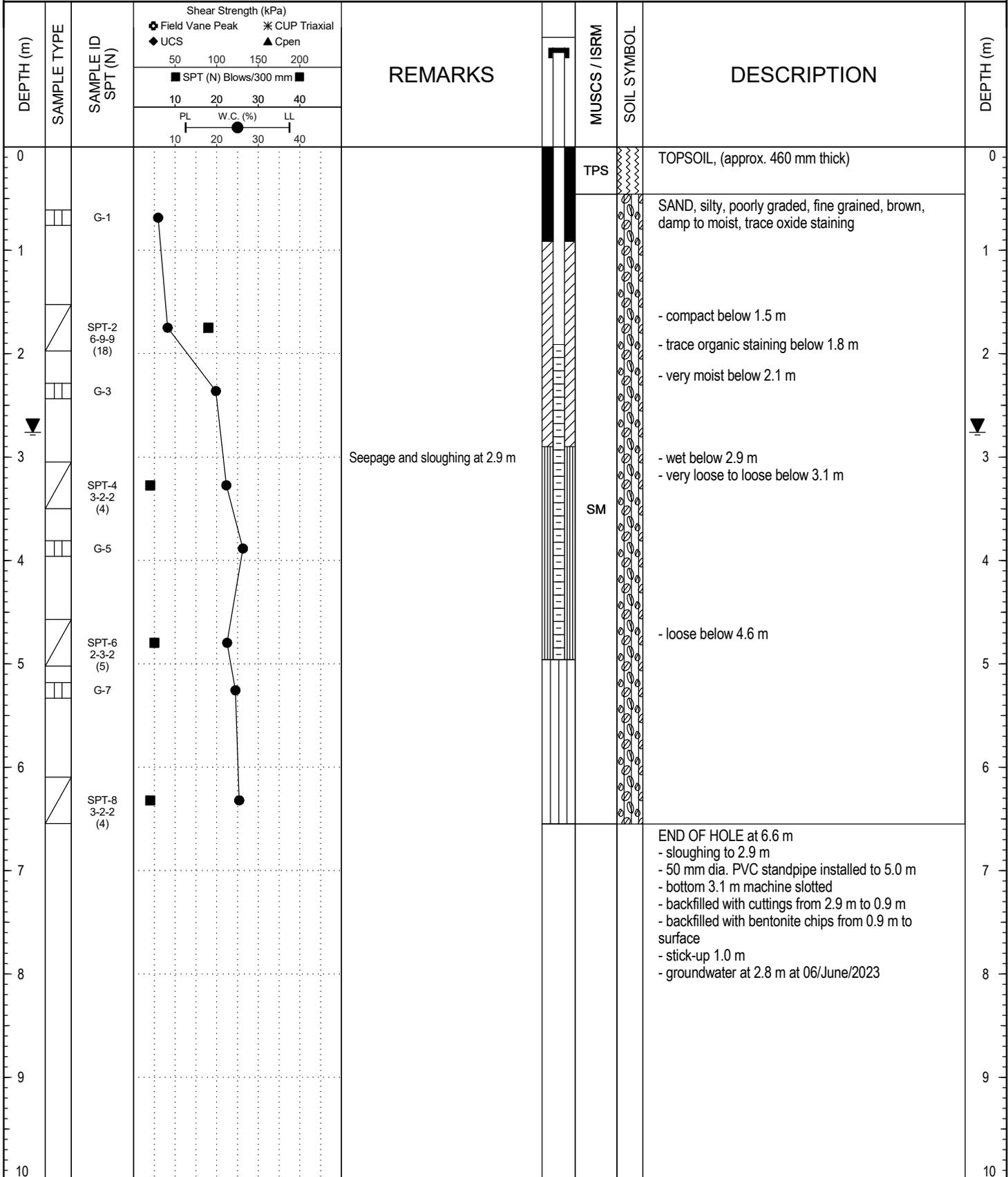
 THURBER ENGINEERING LTD.	DRILLING CO.: MARL Technologies		
	RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 11.1 m
	DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023
	INSPECTOR: XTA		Page 2 of 2

CLIENT: 102139536 Saskatchewan Ltd. PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3) TEST HOLE NO: TH23-05

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768370 m, Easting: 387196 m ELEVATION: 500 m

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough



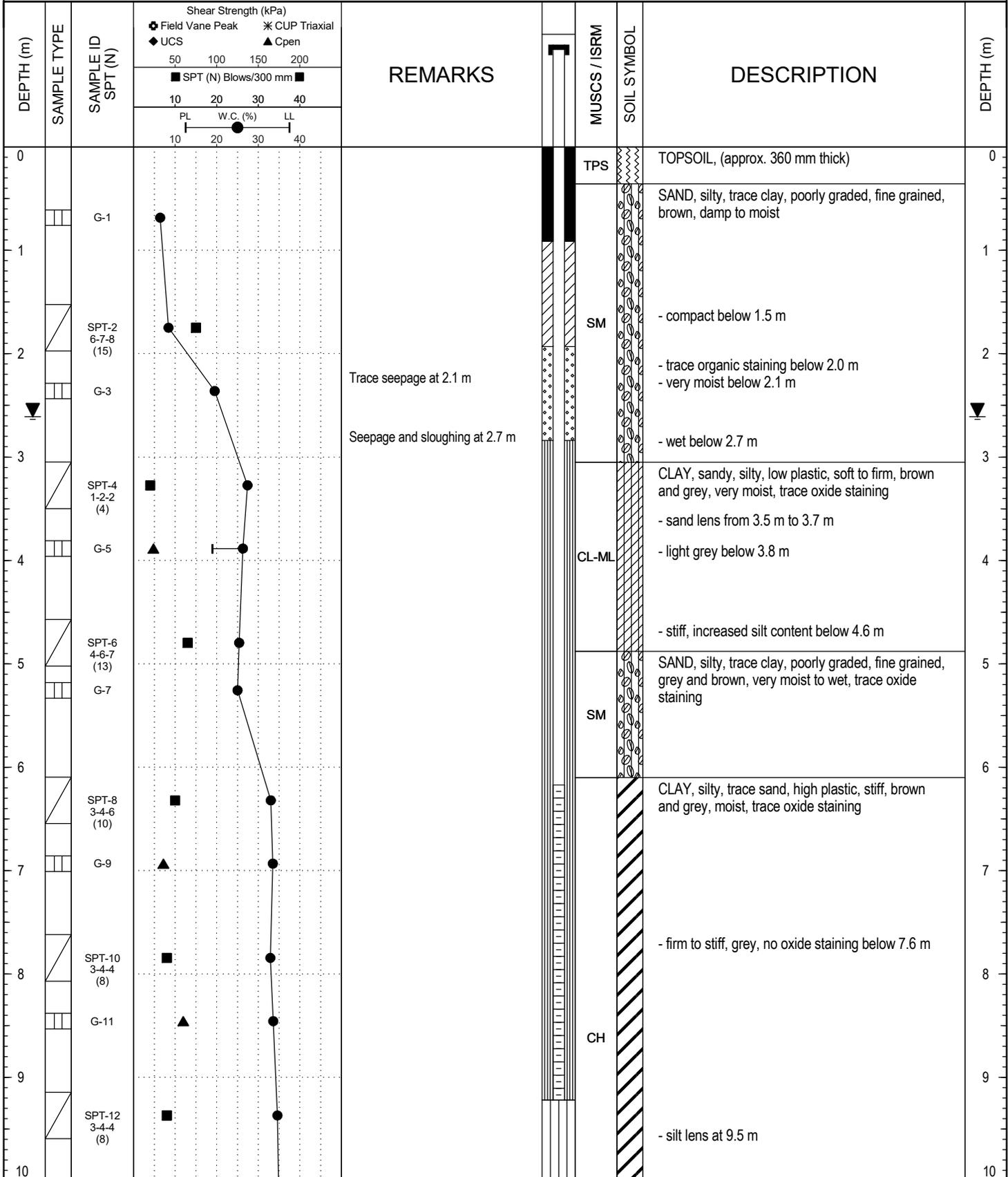
	DRILLING CO.: MARL Technologies		
	RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 6.6 m
	DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023
	INSPECTOR: XTA		Page 1 of 1

CLIENT: 102139536 Saskatchewan Ltd. PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3) TEST HOLE NO: TH23-06

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768334 m, Easting: 387322 m ELEVATION: 500 m

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Sand Slough



CLIENT: 102139536 Saskatchewan Ltd. PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3) TEST HOLE NO: TH23-06

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768334 m, Easting: 387322 m ELEVATION: 500 m

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Sand Slough

DEPTH (m)	SAMPLE TYPE	SAMPLE ID SPT (N)	Shear Strength (kPa)		REMARKS	STANDPIPE	MUSCS / ISRM	SOIL SYMBOL	DESCRIPTION	DEPTH (m)
			Field Vane Peak ◆ UCS	* CUP Triaxial ▲ Cpen						
10		G-13							CLAY (continued)	10
11		SPT-14 3-3-4 (7)	10	30					- firm below 10.7 m	11
12									END OF HOLE at 11.1 m - sloughing to 2.8 m - 50 mm dia. PVC standpipe installed to 9.2 m - bottom 3.1 m machine slotted - backfilled with sand from 2.8 m to 1.9 m - backfilled with cuttings from 1.9 m to 0.9 m - backfilled with bentonite chips from 0.9 m to surface - stick-up 1.0 m - groundwater at 2.6 m at 06/June/2023	12
13										13
14										14
15										15
16										16
17										17
18										18
19										19
20										20



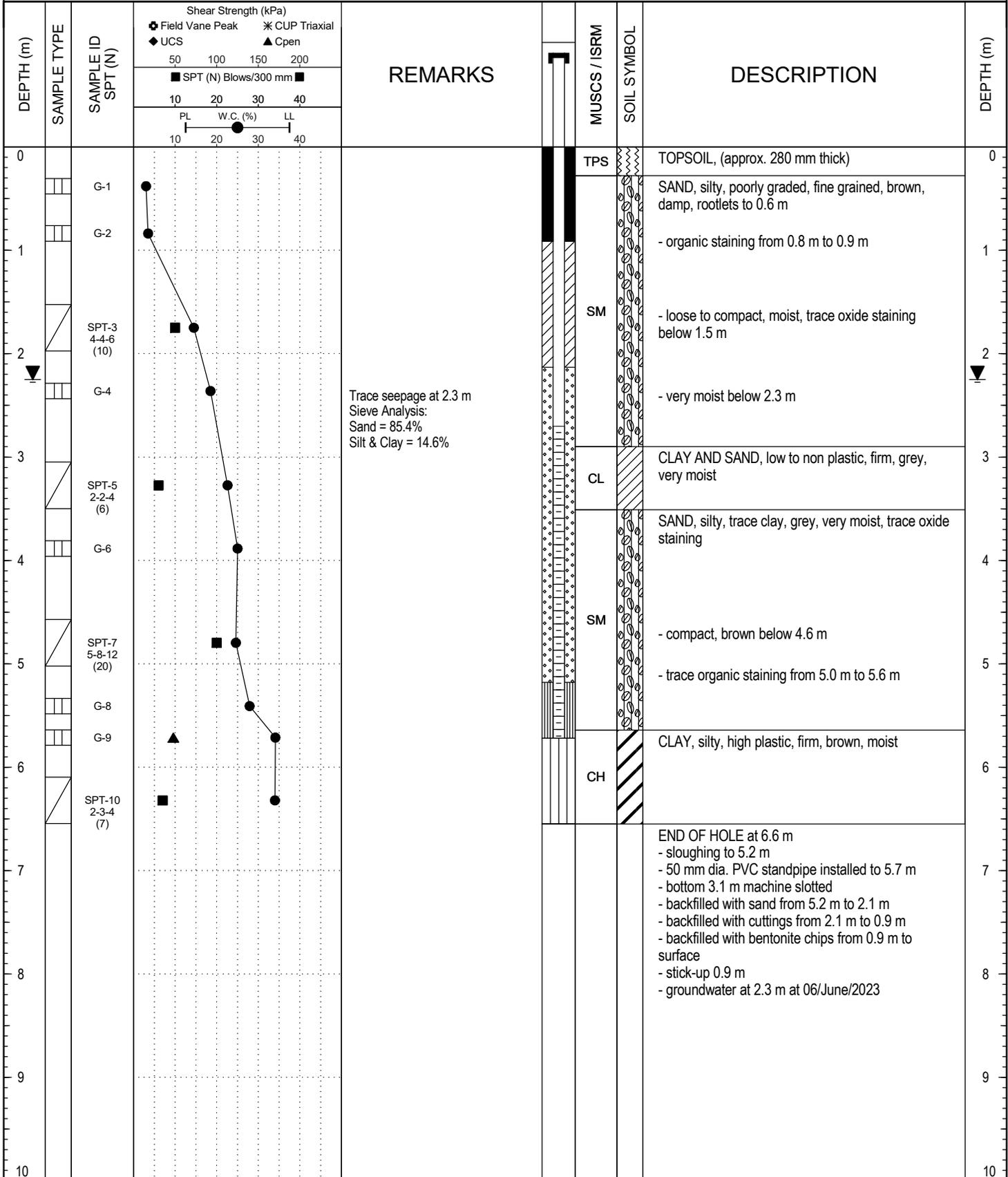
DRILLING CO.: MARL Technologies			
RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 11.1 m	
DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023	
INSPECTOR: XTA			

CLIENT: 102139536 Saskatchewan Ltd. PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3) TEST HOLE NO: TH23-07

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768327 m, Easting: 387469 m ELEVATION: 500 m

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Sand Slough



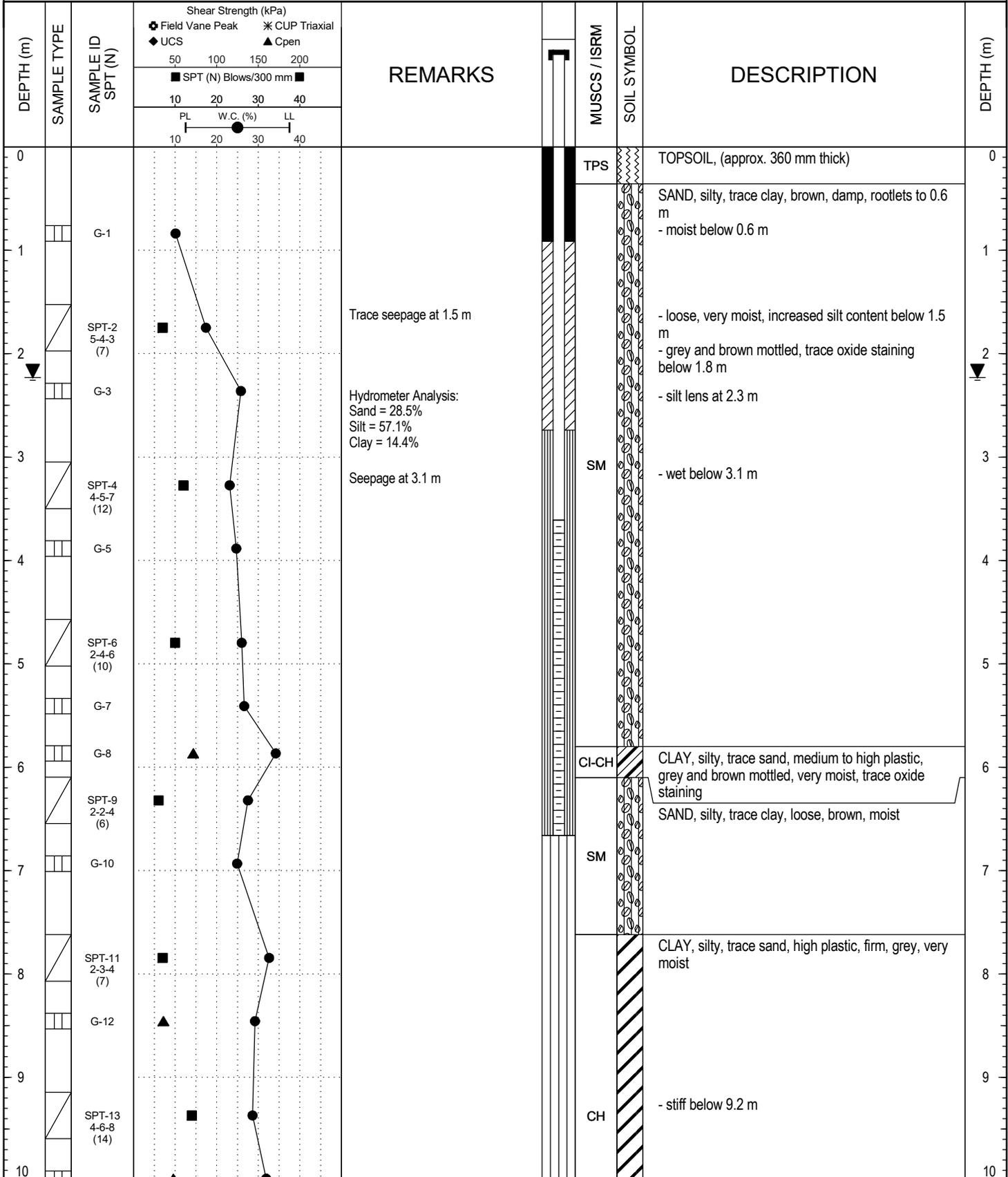
	DRILLING CO.: MARL Technologies		
	RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 6.6 m
	DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023
	INSPECTOR: XTA		Page 1 of 1

CLIENT: 102139536 Saskatchewan Ltd. PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3) TEST HOLE NO: TH23-08

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768196 m, Easting: 387264 m ELEVATION: 500 m

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough



CLIENT: 102139536 Saskatchewan Ltd. PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3) TEST HOLE NO: TH23-08

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768196 m, Easting: 387264 m ELEVATION: 500 m

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough

DEPTH (m)	SAMPLE TYPE	SAMPLE ID SPT (N)	Shear Strength (kPa)		REMARKS	STANDPIPE	MUSCS / ISRM	SOIL SYMBOL	DESCRIPTION	DEPTH (m)
			Field Vane Peak ◆ UCS	* CUP Triaxial ▲ Cpen						
10		G-14							CLAY (continued)	10
11		SPT-15 5-6-8 (14)	14						END OF HOLE at 11.1 m - sloughing to 2.7 m - 50 mm dia. PVC standpipe installed to 6.7 m - bottom 3.1 m machine slotted - backfilled with cuttings from 2.7 m to 0.9 m - backfilled with bentonite chips from 0.9 m to surface - stick-up 0.9 m - groundwater at 2.2 m at 06/June/2023	11
12										12
13										13
14										14
15										15
16										16
17										17
18										18
19										19
20										20



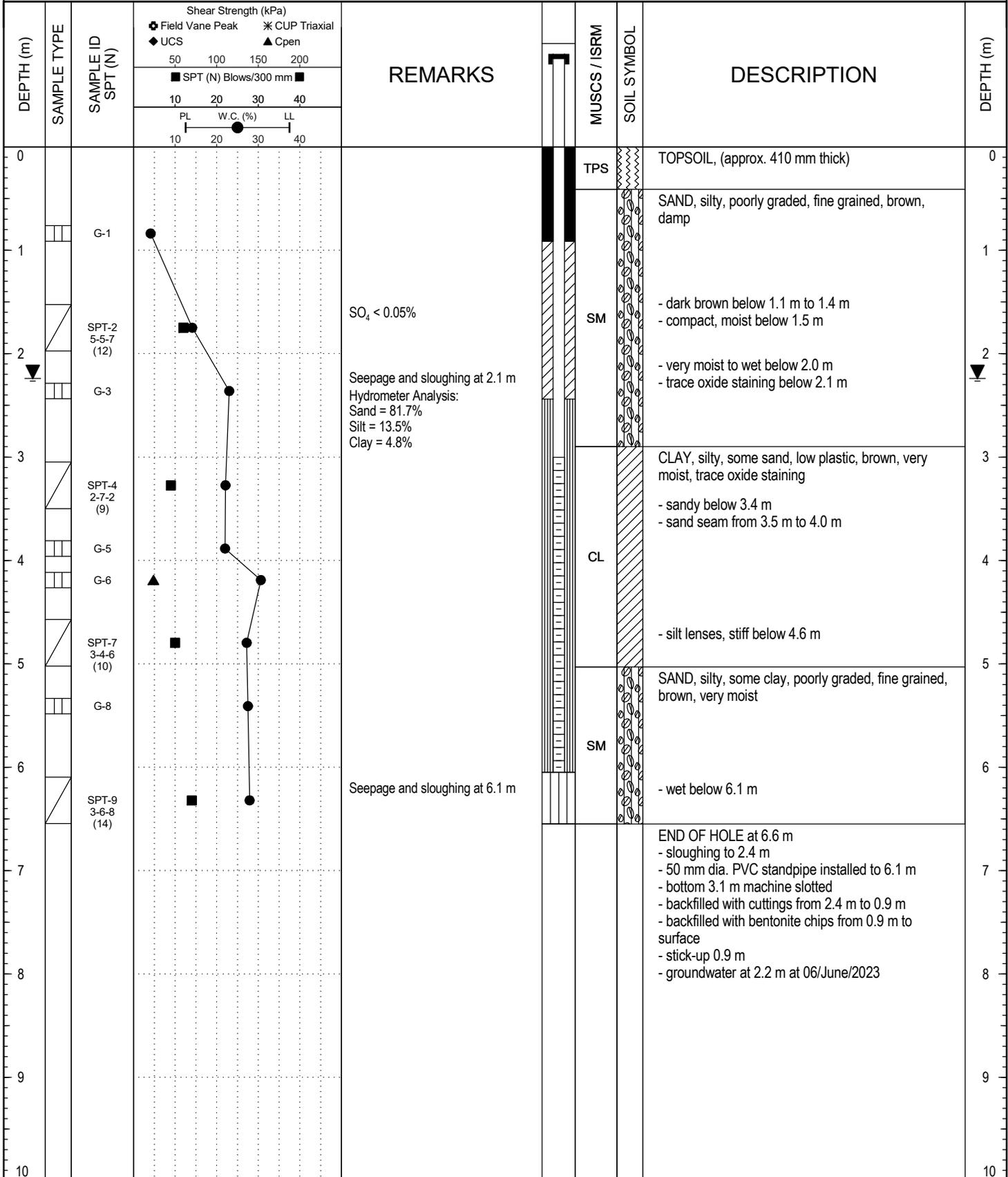
DRILLING CO.: MARL Technologies			
RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 11.1 m	
DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023	
INSPECTOR: XTA		Page 2 of 2	

CLIENT: 102139536 Saskatchewan Ltd. PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3) TEST HOLE NO: TH23-09

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768199 m, Easting: 387400 m ELEVATION: 500 m

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough



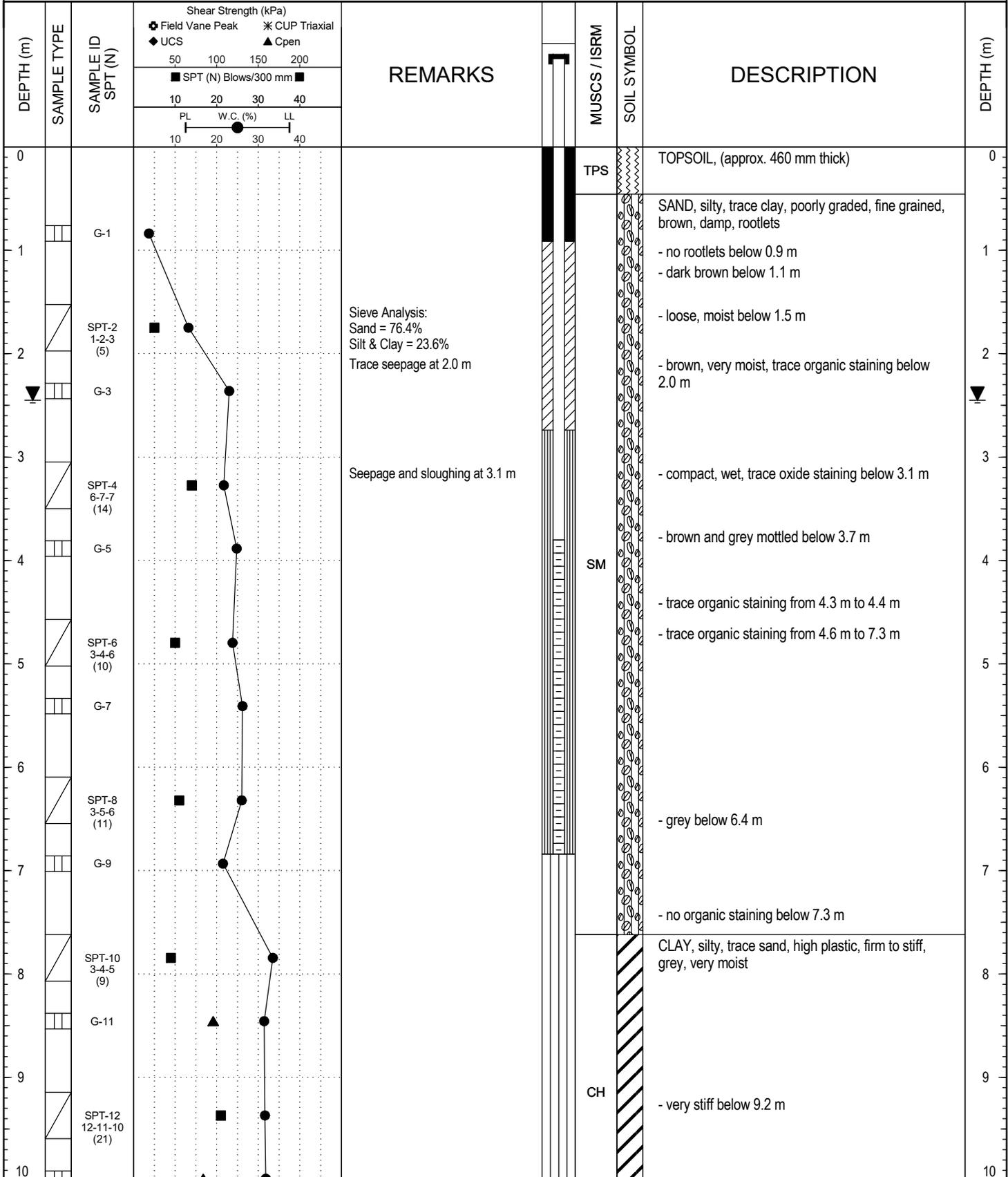
DRILLING CO.: MARL Technologies			
RIG TYPE: Truck Mounted	COMPILED BY: CHN	COMPLETION DEPTH: 6.6 m	
DRILL METHOD: Solid Stem Auger	REVIEWED BY: AJG	COMPLETION DATE: 5/17/2023	
INSPECTOR: XTA			

CLIENT: 102139536 Saskatchewan Ltd. PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3) TEST HOLE NO: TH23-10

PROJECT NO: 37139 UTM 13N NAD83, Northing: 5768187 m, Easting: 387502 m ELEVATION: 500 m

SAMPLE TYPE: Grab Sample Standard Penetration Test

BACKFILL TYPE: Bentonite Drill Cuttings Slough



	DRILLING CO.: MARL Technologies			
	RIG TYPE: Truck Mounted		COMPILED BY: CHN	COMPLETION DEPTH: 10.7 m
	DRILL METHOD: Solid Stem Auger		REVIEWED BY: AJG	COMPLETION DATE: 5/18/2023
	INSPECTOR: XTA		Page 1 of 2	

CLIENT: 102139536 Saskatchewan Ltd.	PROJECT: Corman Park Proposed Subdivision (13-34-35-5-W3)	TEST HOLE NO: TH23-10
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PROJECT NO: 37139	UTM 13N NAD83, Northing: 5768187 m, Easting: 387502 m	ELEVATION: 500 m
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SAMPLE TYPE: <input type="checkbox"/> Grab Sample <input checked="" type="checkbox"/> Standard Penetration Test

BACKFILL TYPE: <input checked="" type="checkbox"/> Bentonite <input checked="" type="checkbox"/> Drill Cuttings <input type="checkbox"/> Slough

DEPTH (m)	SAMPLE TYPE	SAMPLE ID SPT (N)	Shear Strength (kPa) ◆ Field Vane Peak * CUP Triaxial ◆ UCS ▲ Cpen 50 100 150 200 10 20 30 40 ■ SPT (N) Blows/300 mm ■ PL W.C. (%) LL 10 20 30 40	REMARKS	STANDPIPE	MUSCS / ISRM	SOIL SYMBOL	DESCRIPTION	DEPTH (m)
10		G-13						CLAY (continued)	10
11		G-14	▲ ●					END OF HOLE at 10.7 m - sloughing to 2.7 m - 50 mm dia. PVC standpipe installed to 6.8 m - bottom 3.1 m machine slotted - backfilled with cuttings from 2.7 m to 0.9 m - backfilled with bentonite chips from 0.9 m to surface - stick-up 0.9 m - groundwater at 2.5 m at 06/June/2023	11
12									12
13									13
14									14
15									15
16									16
17									17
18									18
19									19
20									20

 THURBER ENGINEERING LTD.	DRILLING CO.: MARL Technologies	COMPILED BY: CHN	COMPLETION DEPTH: 10.7 m	
	RIG TYPE: Truck Mounted	REVIEWED BY: AJG	COMPLETION DATE: 5/18/2023	
	DRILL METHOD: Solid Stem Auger	INSPECTOR: XTA		
				Page 2 of 2



THURBER ENGINEERING LTD.

APPENDIX C

Laboratory Test Results

Client: 102139536 SASKATCHEWAN LTD.

Date Tested: 25-May-23

Project: RM OF CORMAN PARK SUBDIVISION

Project No: 37139

Tested By: GB

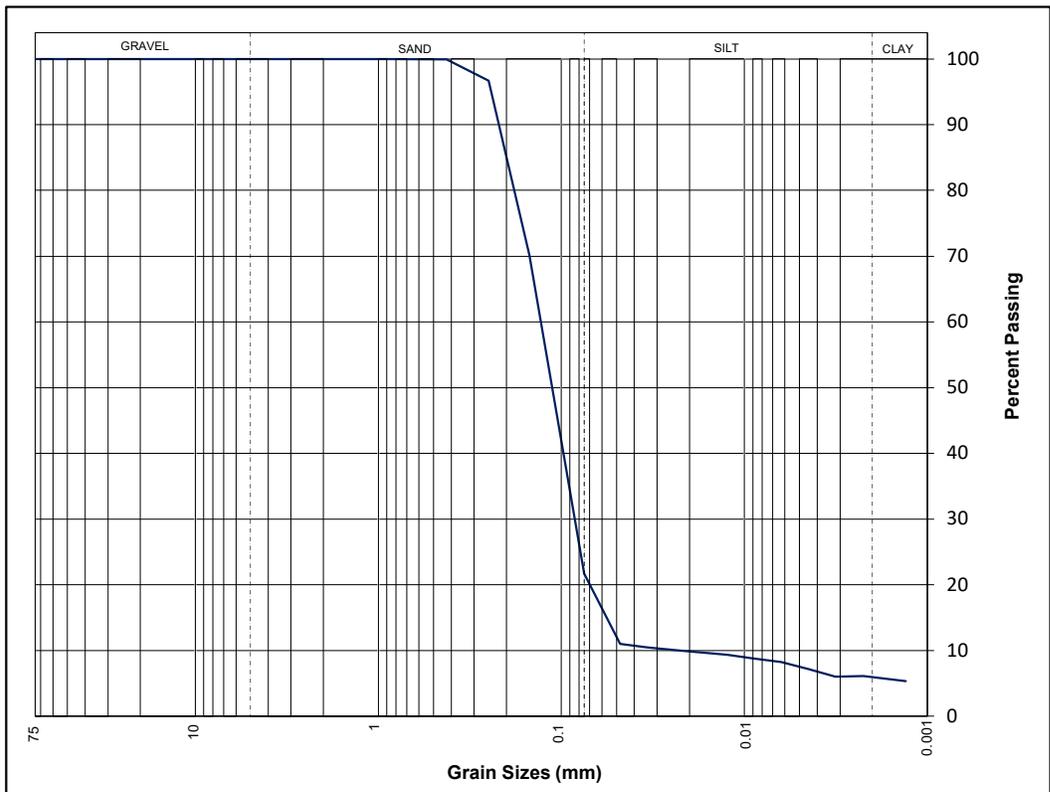
Test Hole: 23-1

Sample No.: 3

Depth: 2.3 m

Sample Description: SAND, some silt, trace clay, poorly graded, fine grained, wet, grey

Sieve Size (mm)	Percent Finer
100.0	100.0
75.0	100.0
62.5	100.0
50.0	100.0
37.5	100.0
25.0	100.0
19.0	100.0
12.5	100.0
9.5	100.0
4.75	100.0
2.00	100.0
0.850	100.0
0.425	99.9
0.250	96.7
0.150	70.1
0.075	21.7
0.048	11.0
0.034	10.5
0.022	9.9
0.012	9.4
0.009	8.8
0.006	8.3
0.004	7.2
0.003	6.1
0.002	6.1
0.001	5.3



Distribution	
Cobbles	0.0 %
Gravel	0.0 %
Sand	78.3 %
Silt	15.8 %
Clay	5.9 %

Coefficients	
D10	0.023
D30	0.088
D60	0.134
Cu	5.7
Cc	2.4

Atterberg Limits	
LL	%
PL	%
PI	%

USC	
SM	

Remarks:

Checked By: AJG

Client: 102139536 SASKATCHEWAN LTD.

Project No.: 37139

Project: RM OF CORMAN PARK SUBDIVISION

Date: 25-May-23

Date Sampled: 17-May-23

Sampled By: XTA

Tested By: JDS

Test Hole: 23-2

Sample No.: 1

Depth: 0.8 m

Specification: -

Unified Class: SM

Test Method: ASTM C 136

Sample Description: SAND, some silt, poorly graded, fine grained, damp, brown



Sieve No.	Opening (mm)	Percent Passing	Gradation Limits	
			Max	Min
1"	25.4	100.0		
3/4"	19.1	100.0		
1/2"	12.7	100.0		
3/8"	9.5	100.0		
4	4.75	100.0		
10	2.00	100.0		
20	0.85	100.0		
40	0.425	100.0		
60	0.250	95.8		
100	0.150	37.2		
200	0.075	15.9		

Grain Size Distribution	
Gravel:	0.0 %
Sand:	84.1 %
Fines:	15.9 %

Silt and Clay	
Silt	-
Clay	-
Total Fines:	

Moisture Content
As Received: 11.5%

Percent Crush: -
Faces Counted: -

Comments:

Checked By: AJG

The testing services reported here have been performed in accordance with the applicable ASTM/CSA Standards and are for the sole use of the designated client only.

This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability.

Engineering interpretation will be provided by Thurber upon request.

Client: 102139536 SASKATCHEWAN LTD.

Project No.: 37139

Project: RM OF CORMAN PARK SUBDIVISION

Date: 25-May-23

Date Sampled: 17-May-23

Sampled By: XTA

Tested By: JDS

Test Hole: 23-4

Sample No.: 4

Depth: 2.3 m

Specification: -

Unified Class: SM

Test Method: ASTM C 136

Sample Description: SAND, some silt, poorly graded, fine grained, moist, brown



Sieve No.	Opening (mm)	Percent Passing	Gradation Limits	
			Max	Min
1"	25.4	100.0		
3/4"	19.1	100.0		
1/2"	12.7	100.0		
3/8"	9.5	100.0		
4	4.75	100.0		
10	2.00	100.0		
20	0.85	100.0		
40	0.425	99.4		
60	0.250	73.2		
100	0.150	29.8		
200	0.075	15.4		

Grain Size Distribution	
Gravel:	0.0 %
Sand:	84.6 %
Fines:	15.4 %

Silt and Clay	
Silt	-
Clay	-
Total Fines:	

Moisture Content
As Received: 6.9%

Percent Crush: -
Faces Counted: -

Comments:

Checked By: AJG

The testing services reported here have been performed in accordance with the applicable ASTM/CSA Standards and are for the sole use of the designated client only.

This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability.

Engineering interpretation will be provided by Thurber upon request.

Client: 102139536 SASKATCHEWAN LTD.

Project No.: 37139

Project: RM OF CORMAN PARK SUBDIVISION

Date: 25-May-23

Date Sampled: 17-May-23

Sampled By: XTA

Tested By: JDS

Test Hole: 23-7

Sample No.: 4

Depth: 2.3 m

Specification: -

Unified Class: SM

Test Method: ASTM C 136

Sample Description: SAND, some silt, poorly graded, fine grained, moist, brown



Sieve No.	Opening (mm)	Percent Passing	Gradation Limits	
			Max	Min
1"	25.4	100.0		
3/4"	19.1	100.0		
1/2"	12.7	100.0		
3/8"	9.5	100.0		
4	4.75	100.0		
10	2.00	100.0		
20	0.85	100.0		
40	0.425	99.7		
60	0.250	72.3		
100	0.150	29.0		
200	0.075	14.6		

Grain Size Distribution	
Gravel:	0.0 %
Sand:	85.4 %
Fines:	14.6 %

Silt and Clay	
Silt	-
Clay	-
Total Fines:	

Moisture Content
As Received: 19.2%

Percent Crush: -
Faces Counted: -

Comments:

Checked By: AJG

The testing services reported here have been performed in accordance with the applicable ASTM/CSA Standards and are for the sole use of the designated client only.

This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability.

Engineering interpretation will be provided by Thurber upon request.

Client: 102139536 SASKATCHEWAN LTD.

Date Tested: 25-May-23

Project: RM OF CORMAN PARK SUBDIVISION

Project No: 37139

Tested By: GB

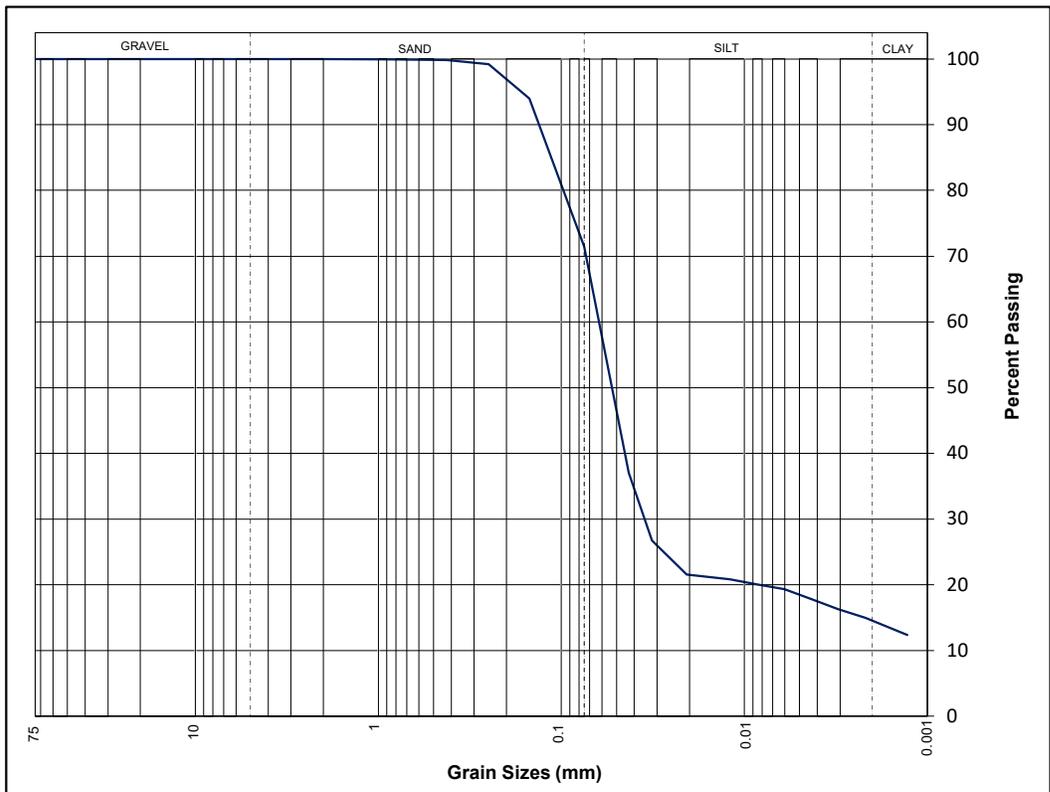
Test Hole: 23-8

Sample No.: 3

Depth: 2.3 m

Sample Description: SILT, sandy, some clay, low plastic, moist, brown

Sieve Size (mm)	Percent Finer
100.0	100.0
75.0	100.0
62.5	100.0
50.0	100.0
37.5	100.0
25.0	100.0
19.0	100.0
12.5	100.0
9.5	100.0
4.75	100.0
2.00	100.0
0.850	99.9
0.425	99.8
0.250	99.2
0.150	94.0
0.075	71.5
0.043	37.1
0.032	26.7
0.021	21.6
0.012	20.8
0.009	20.1
0.006	19.3
0.004	17.8
0.003	16.3
0.002	14.9
0.001	12.4



Distribution	
Cobbles	0.0 %
Gravel	0.0 %
Sand	28.5 %
Silt	57.1 %
Clay	14.4 %

Coefficients	
D10	
D30	
D60	
Cu	
Cc	

Atterberg Limits	
LL	%
PL	%
PI	%

USC	

Remarks:

Checked By: AJG

Client: 102139536 SASKATCHEWAN LTD.

Date Tested: 25-May-23

Project: RM OF CORMAN PARK SUBDIVISION

Project No: 37139

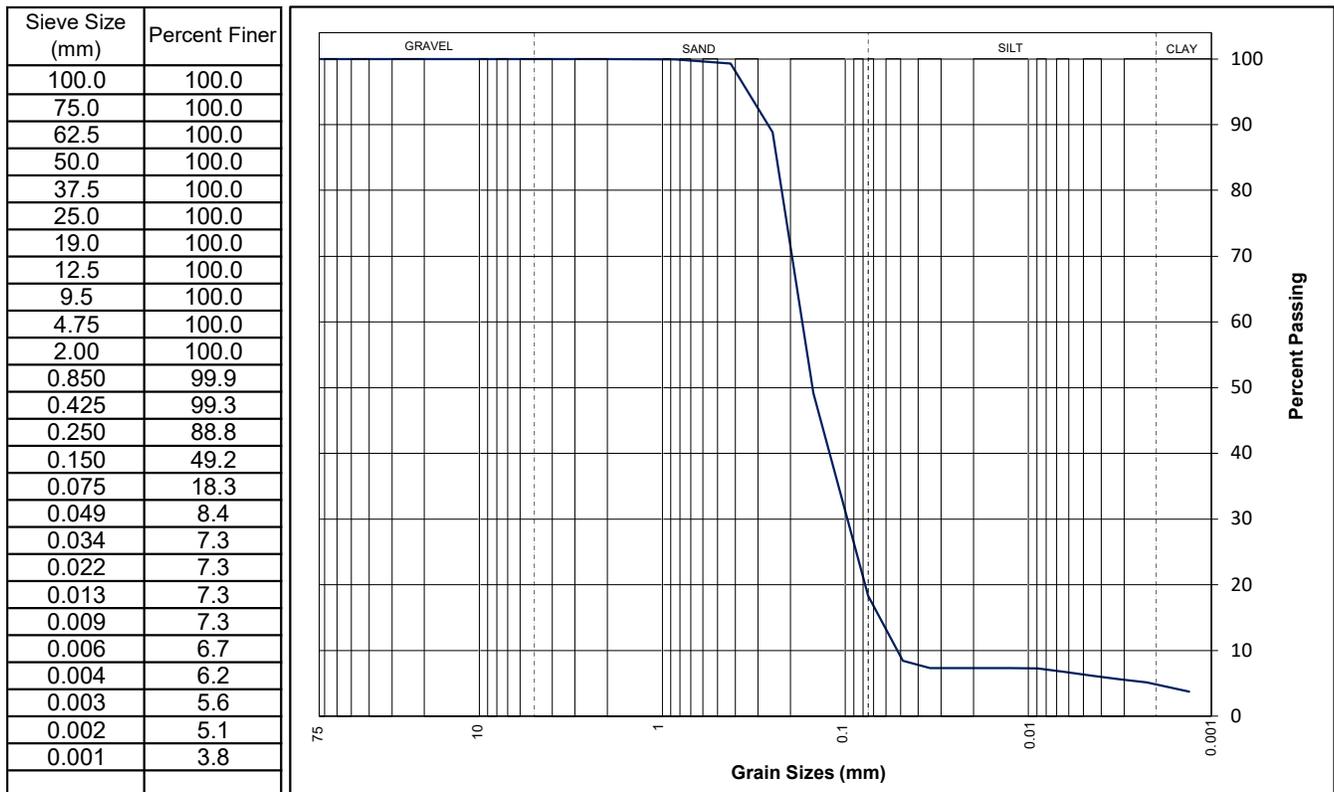
Tested By: GB

Test Hole: 23-9

Sample No.: 3

Depth: 2.3 m

Sample Description: SAND, some silt, trace clay, poorly graded, fine grained, damp, brown



Distribution	
Cobbles	0.0 %
Gravel	0.0 %
Sand	81.7 %
Silt	13.5 %
Clay	4.8 %

Coefficients	
D10	0.053
D30	0.103
D60	0.177
Cu	3.4
Cc	1.1

Atterberg Limits	
LL	%
PL	%
PI	%

USC
SM

Remarks:

Checked By: AJG

Client: 102139536 SASKATCHEWAN LTD.

Project No.: 37139

Project: RM OF CORMAN PARK SUBDIVISION

Date: 25-May-23

Date Sampled: 17-May-23

Sampled By: XTA

Tested By: JDS

Test Hole: 23-10

Sample No.: 2

Depth: 1.5 m

Specification: -

Unified Class: SM

Test Method: ASTM C 136

Sample Description: SAND, silty, well graded, fine grained, moist, brown



Sieve No.	Opening (mm)	Percent Passing	Gradation Limits	
			Max	Min
1"	25.4	100.0		
3/4"	19.1	100.0		
1/2"	12.7	100.0		
3/8"	9.5	100.0		
4	4.75	100.0		
10	2.00	100.0		
20	0.85	100.0		
40	0.425	99.8		
60	0.250	81.2		
100	0.150	38.5		
200	0.075	23.6		

Grain Size Distribution	
Gravel:	0.0 %
Sand:	76.4 %
Fines:	23.6 %

Silt and Clay	
Silt	-
Clay	-
Total Fines:	

Moisture Content
As Received: 10.2%

Percent Crush: -
Faces Counted: -

Comments:

Checked By: AJG

The testing services reported here have been performed in accordance with the applicable ASTM/CSA Standards and are for the sole use of the designated client only.

This report constitutes a testing service only and does not represent any results interpretation or opinion regarding specification compliance or material suitability.

Engineering interpretation will be provided by Thurber upon request.



THURBER ENGINEERING LTD.

APPENDIX D

Recommended Construction Procedures



RECOMMENDED CONSTRUCTION PROCEDURES

The following construction procedures are considered to represent good practice and are to be read in conjunction with the text of this report.

1. PROOF ROLLING

- 1.1 Proof rolling is a method of detecting soft areas in a subgrade for fill, pavement, floors, or foundations. The intent is to detect softened areas not revealed by the test holes or visual examination of the site surface and is used where normal scarification and compacting procedures would not be successful in detecting and eliminating soft areas. It is usually accomplished with the use of heavy 130 to 220 kN (15-25 ton) compaction equipment with high contact wheel pressures on independent axles, although heavily loaded single axle trucks will provide the equivalent result.
- 1.2 The procedure requires two complete passes with the heavy equipment in one direction and then a second series of two passes made at right angles to the first series.
- 1.3 While the passes are being made, any softened, rutted, or displaced areas detected should be examined and either recompact with additional fill or the existing material removed and replaced with better quality material.

2. EXCAVATED FOUNDATIONS

- 2.1 Excavation close to foundation level should be done carefully to avoid disturbance of the soil. It is essential to prevent the soil at foundation level from deterioration due to excessive drying or becoming wet from surface or seepage water. Good drainage both during and after construction is essential.
- 2.2 Sumps, if required, should be located well away from the foundation area. Softened or overdried soil must be removed and replaced by lean mix concrete or by extending the foundations.
- 2.3 The foundation must be kept from freezing both during and after construction. Foundation concrete should not be placed on or against frozen soil.



3. BACKFILLING

- 3.1 Backfill around foundations should be placed in such a manner so as to prevent settlement and to be relatively impervious near the surface so that water does not pond against foundations nor be allowed to seep into the soil.
- 3.2 Backfill should not be placed until the structure has sufficient strength to withstand the earth pressures resulting from placement and compaction.
- 3.3 All backfill around grade beams, foundation walls, etc. must be carefully and uniformly compacted. The backfill should be placed in even layers and no frozen nor organic material should be incorporated into the fill. All lumps of material must be broken down or squeezed together during placing and compaction.
- 3.4 The final grade (allowing for some settlement of the backfill) should shed water away from the structure.
- 3.5 During construction, precautions should be taken to prevent water ponding in grade beam excavations thereby acting as a source of water to soften the soil under the floor slab area or providing a source of water for frost action if the building is not heated during freezing weather.

APPENDIX K

CORRESPONDENCE WITH SASKENERGY

From: [riley.ness](#)
To: [Maggie.Schwab](#)
Subject: Fwd: Natural Gas Facility Installation – WR 361868, Clarence Ave S Grasswood
Date: Friday, February 16, 2024 10:46:17 AM

Sent from my iPhone

Begin forwarded message:

From: SaskEnergy Customer Connect <jira@saskenergy.com>
Date: February 16, 2024 at 10:44:05 AM CST
Subject: Natural Gas Facility Installation – WR 361868, Clarence Ave S Grasswood
Reply-To: no-reply@saskenergy.com

Dear 102139536 Sask LTD :

Regarding: Clarence Ave S Grasswood

SaskEnergy is preparing for the installation of your natural gas service and is excited to provide you with the benefits of natural gas.

Once SaskEnergy receives the signed proposed route of service drawing, any approvals that may be required for the work to begin will be submitted by SaskEnergy to the appropriate stakeholders. Approvals may include, but are not limited to, the following:

- <!--[if !supportLists]-->• <!--[endif]-->Municipal approvals (RM, city and/or town)
- <!--[if !supportLists]-->• <!--[endif]-->Easement approvals
- <!--[if !supportLists]-->• <!--[endif]-->Crossing approvals (highway, railway, utility or other third party)
- <!--[if !supportLists]-->• <!--[endif]-->Environmental/heritage approvals

Depending on the type of approvals required, the start of the project could be delayed. Easement, highway, or railway crossing approvals can take, in some instances, several months to obtain.

Also, depending on the payment option selected, down payment or payment in full may be required prior to installation scheduling. Prompt payment once invoice is received is recommended to avoid scheduling delays.

After obtaining all approvals and payment (if applicable) your file will be added to SaskEnergy's schedule of upcoming construction projects. Installation timelines vary by area and time of year. They could be approximately two months or more from the time the file is placed on the schedule.

To prepare for the service installation, please ensure you have met all of the conditions in the Site Readiness Checklist below (if applicable). **An email notification will be provided once your file has been added to SaskEnergy's schedule of upcoming construction projects.**

Site Readiness Checklist

1. In order for SaskEnergy to secure the natural gas bracket, you must have installed at a minimum a 24" x 10" pressure treated board that does not contravene any natural gas codes.
2. You must maintain a 1 meter (3 ft.) clearance around the natural gas service regulator from any appliance or moisture exhaust vents, doors, opening windows and sources of ignition, and a 3 meter (10 ft) clearance from any mechanical air intakes. Further information can be accessed from your mechanical contractor and in applicable code publications.
3. The area is backfilled and the site is to within 150 mm (6") of finished grade.
4. Utility access within the site must meet the following requirements:
 - a. Access is required for equipment to get into the yard where the work needs to occur (trencher, mini hoe etc.), clear of buildings, fences, decks etc.
 - b. A clear path is maintained for the trench route from the metering points to the takeoff points. The width needs to be enough to operate small trenchers and mini hoes at a minimum in ideal soil conditions and larger equipment when frozen or rocky conditions exist. The trench is to be at least 0.6 meters (2 ft.) off of the parallel property line (for fencing). Further width is often required at surface to slope trench during installation for safe trenching rules. This will require approximately 2 meters (6.5 ft.) clear access along the property line to the meter (electric or gas) boards to allow for construction of the facilities.
5. The trench is from the tie-in point to the meter location(s) (typically the closest corner from the tie-in point to the house). This service route must be clear of debris or obstructions, such as dirt piles and lumber.
6. SaskEnergy reserves the right to determine the meter location due to physical impediments that may restrict access for personnel and equipment. Alternate meter locations must be pre-approved prior to construction.
7. The natural gas trench must be at least 1 meter (3 ft.) in distance from the SaskPower trench.
8. Locates of customer owned facilities must be completed by the customer prior to installation of the natural gas service line, so that markers are in place during the installation.
9. To facilitate compliance with The Occupational Health and Safety (Prime Contractor) Regulations, the customer shall be responsible for:
 - a. Providing SaskEnergy with temporary workspace, under the sole control of SaskEnergy, fifteen (15) meters from the existing and any proposed pipeline route on either side, or such other distance as SaskEnergy may reasonable direct, cordon off or barricade for the duration of the work; and
 - b. Ensuring that all construction and other work remains outside of his temporary workspace until completion of the work, unless otherwise agreed by SaskEnergy.

If you have any questions or require additional information, contact 1-888-700-0427 (Option #2).

We look forward to serving you.



SaskEnergy Customer Service Team

APPENDIX L

PUBLIC CONSULTATION INFORMATION

Proposed Subdivision at Clarence Avenue and Grasswood Road
LS 13-34-35-5 W3M
RM of Corman Park, SK

March 1, 2024

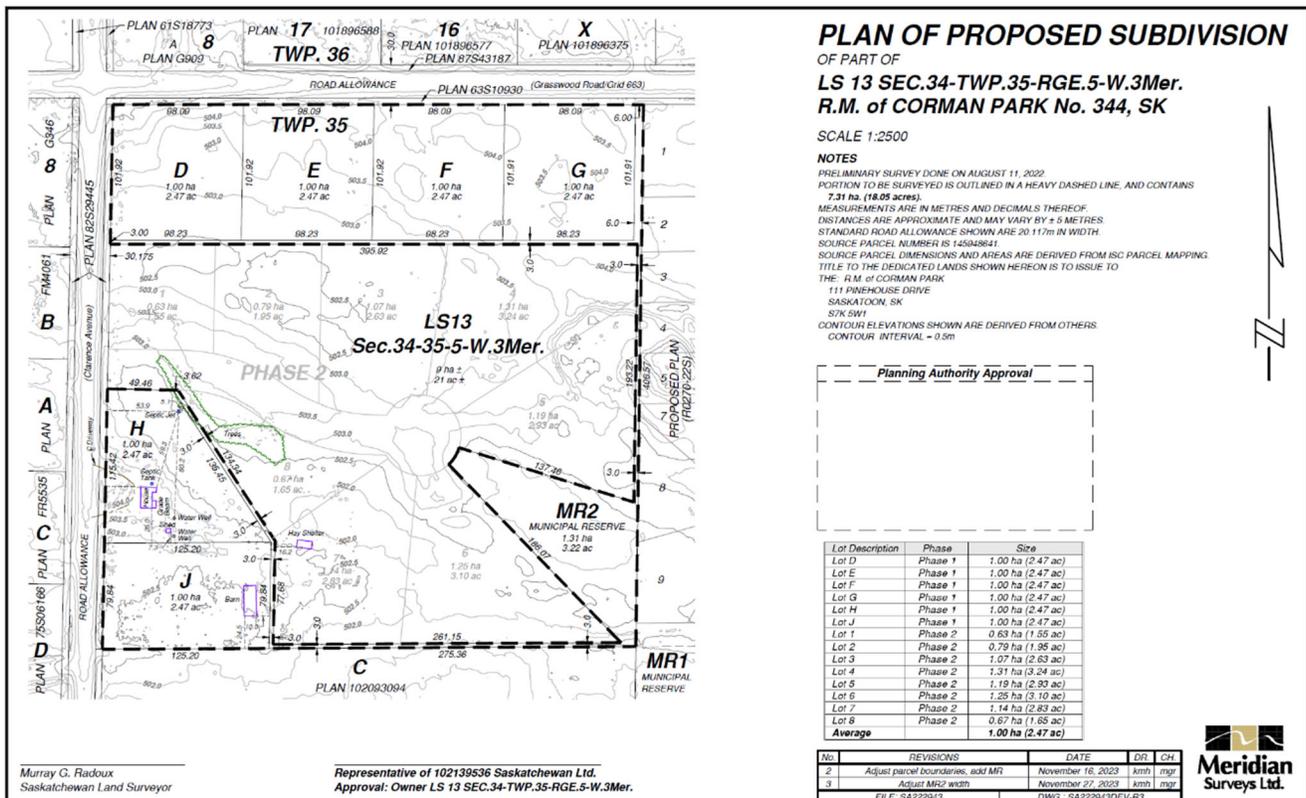
Dear Recipient,

As part of the development review process, we are providing preliminary details of a proposed country residential development located on 16.1 ha (40 acres) of land at the southeast intersection of Clarence Avenue and Grasswood Road. Phase 1 of the development will include 6 residential lots generously sized at 1.00 ha (2.47 acres) each. Phase 2 of the development will include 8 residential lots at an average of 1.00 ha (2.47 acres). A summary of the lot sizing for the complete development is provided below.

Further details will be provided as required by the development approval process, and as necessary, based on community feedback. We recognize the importance of keeping the community informed about developments within the area. In the meantime, please feel free to contact us by email at 536SaskLtd@gmail.com for additional information or to provide comments with respect to the planned development. We value your feedback and look forward to hearing from you.

Sincerely,

102139536 Saskatchewan Ltd.



Proposed Subdivision at Clarence Avenue and Grasswood Road
LS 13-34-35-5 W3M
RM of Corman Park, SK

August 14, 2024

Dear Property Owner,

The intent of this letter is to inform you of an application for subdivision and rezoning in the RM of Corman Park entitled **Poplar Point**. The Development is located at:

- **LSD 13, Section 34, Township 35, Range 05, W3M**

The proposed development is located immediately east of Clarence Avenue, south of Grasswood Road and encompasses approximately 40 acres of land. We have included a map in this letter showing the location of the proposed development (See Map 1 on reverse).

The Developer wishes to consult with neighbours and receive feedback regarding the proposed development. Following the public consultation, all feedback will be included in a presentation to RM Council, in conjunction with the Comprehensive Development Review, where all matters of land use integration, environmental and social considerations, and engineering infrastructure will be addressed.

Poplar Point features 13 residential lots ranging in size from 0.63 ha (1.55 acres) to 1.36 ha (3.36 acres), with an average lot size of 1.0ha (2.5 acres). Poplar Point will be developed over two phases (see Map 2). The Developer intends to continue a proposed walking/cycling path through this development to reduce pedestrian and bicycle traffic on Grasswood Road.

The proposed development will be serviced to the RM of Corman Park's standards. Water supply in the development includes a potable water connection to residences for domestic purposes. A hydrogeological study concluded that wastewater generated at residential lots, including any replacement systems, must be managed through NSF 245 standard systems. The Saskatchewan Health Authority and RM of Corman Park endorsed the use of these systems. Alternatively, connections to regional wastewater systems may be considered.

A Traffic Impact Assessment concluded that the very low traffic volume that would be generated by this proposed development would not impact the operations on Grasswood Road and at the intersection of Clarence Avenue, nor to traffic operations along Grasswood Road both east-bound and west-bound.

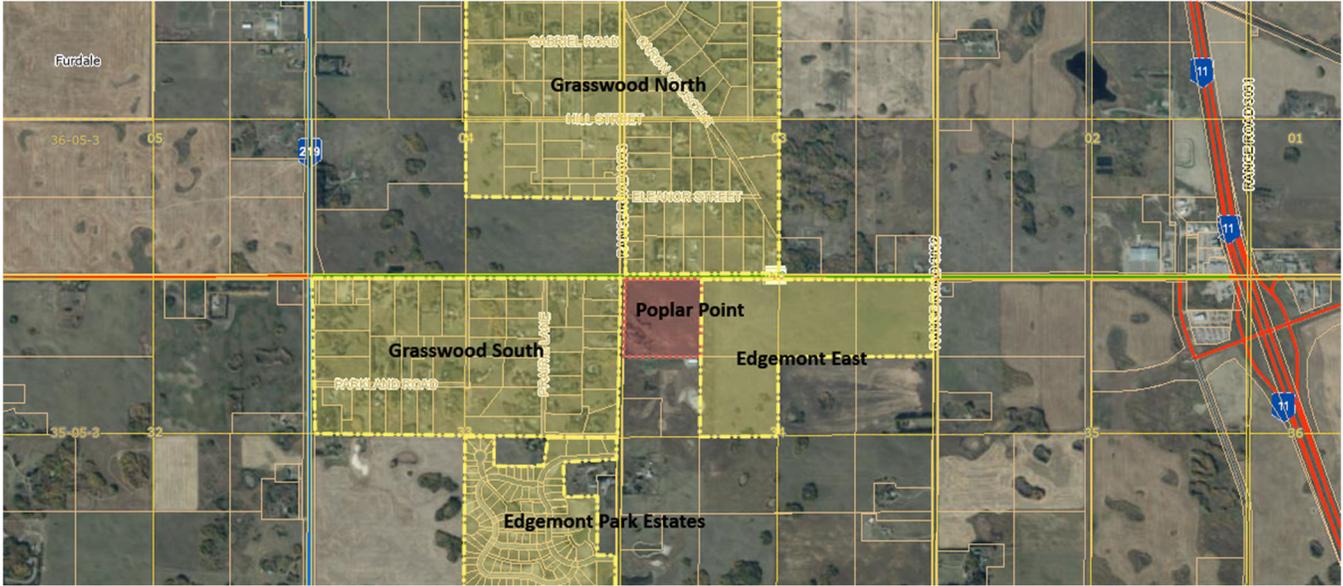
All site drainage will be contained within the boundaries and directed to a basin at the southeast corner of the development site.

This letter is intended to provide neighbours with an opportunity to ask general questions, discuss potential concerns, possible solutions to those concerns. Please provide your feedback by September 15, 2024.

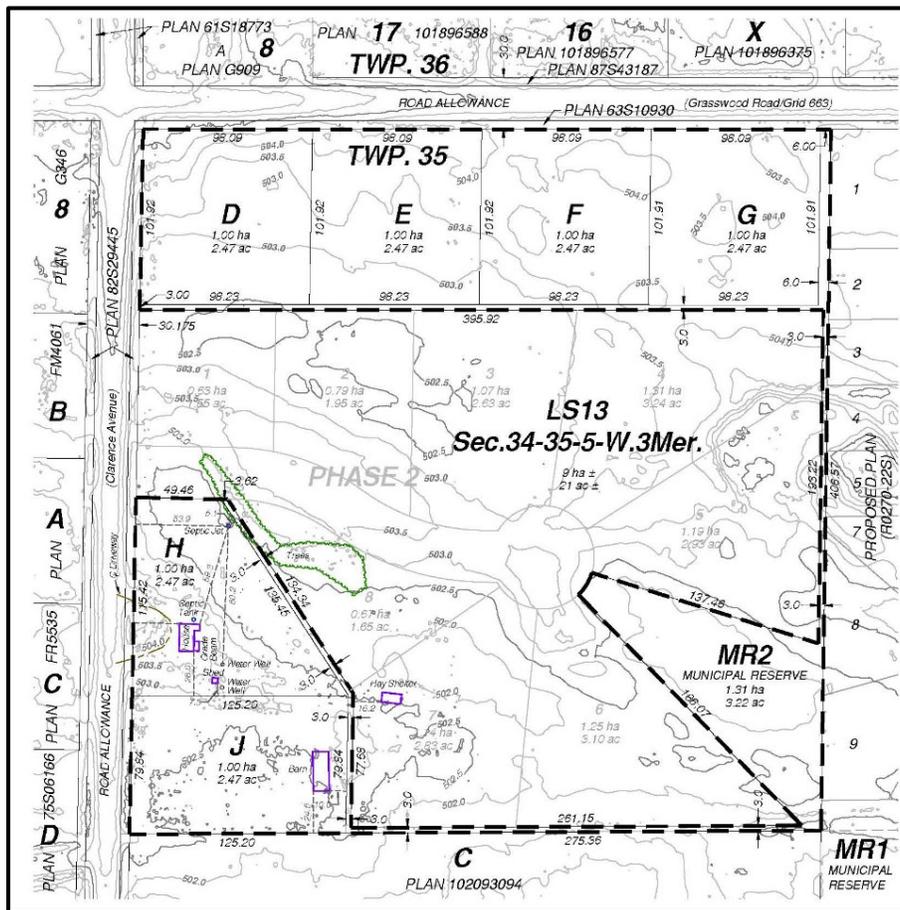
We value your feedback and look forward to hearing from you.

Sincerely,

102139536 Saskatchewan Ltd.



Map 1 – Location of Proposed Poplar Point Development



Map 2 – Layout of Proposed Poplar Point Development



Bia de Freitas <536saskltd@gmail.com>

Re: Subdivision Clarence and Grasswood.

1 message

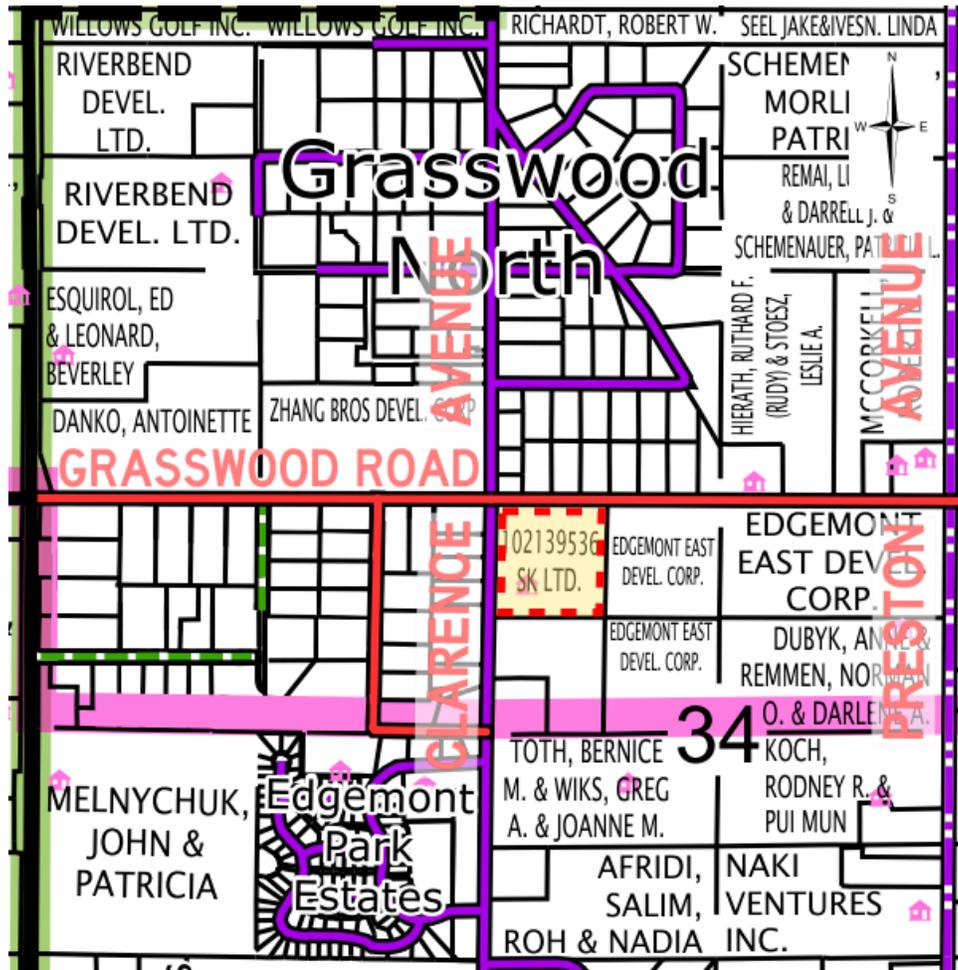
102139536 Sask Ltd. <536saskltd@gmail.com>
To: Dale Stephenson <dstephen15@shaw.ca>

Sun, Mar 17, 2024 at 12:33 PM

Hello Dale,

Thank-you for taking the time to review the subdivision information letter.

The subdivision is the 40 acres southeast of the 4-way intersection on Grasswood Road and Clarence Avenue.



If you have any additional questions please let us know.

Sincerely,

Bia de Freitas
On behalf of 102139536 Saskatchewan Ltd.

On Fri, Mar 8, 2024 at 9:35 AM Dale Stephenson <dstephen15@shaw.ca> wrote:

You indicate the proposed development is on the SE corner and it appears from the little map that it's the SW corner. Looks like it's part of that 80 acre hay field. Thanks

9/20/24, 1:02 PM

Gmail - Re: Subdivision Clarence and Grasswood.

Sent from [Mail](#) for Windows



Bia de Freitas <536saskltd@gmail.com>

Re: Proposed Subdivision at Clarence and Grasswood Road

1 message

102139536 Sask Ltd. <536saskltd@gmail.com>
To: Evan Pachal <evan3961@gmail.com>

Sun, Mar 17, 2024 at 12:40 PM

Hello Evan and Jana,

Thank-you for taking the time to review the subdivision information letter. We understand that development in the area is generally not well received, and do not expect unanimous support from the community.

Your feedback - positive or negative - is appreciated regardless. We are committed to keeping the community members informed about developments within the area.

Sincerely,

Bia de Freitas
On behalf of 102139536 Saskatchewan Ltd.

On Fri, Mar 8, 2024 at 4:37 PM Evan Pachal <evan3961@gmail.com> wrote:

Hello!

We are definitely opposed to this development proposal!!!!

I'm sure the RM of Corman Park will ram it down our throats anyways!!!

Sincerely,

Evan and Jana Pachal
98 Eldorado Lane
Casa Rio SK S7T 1B6**Evan Pachal, iSask Mortgage Brokers Inc.**
Cell: [306-612-1142](tel:306-612-1142)
Fax: [1-866-374-1991](tel:1-866-374-1991)
[517 4th Avenue N, Saskatoon, SK, S7K 2M5](https://www.ivanpachal.com)

Mortgage Brokerage License # 316176

Purchase | Refinances | Renewals | Pre-Approvals



Bia de Freitas <536saskltd@gmail.com>

Re: Proposed land development LS 13-34-35-5 W3M

1 message

102139536 Sask Ltd. <536saskltd@gmail.com>
To: Daryl Fourney <darylfourney@hotmail.com>
Cc: "jsaleski@rmcormanpark.ca" <jsaleski@rmcormanpark.ca>

Sun, Mar 17, 2024 at 12:43 PM

Hello Daryl,

Thank you for taking the time to review the subdivision information letter. We understand that development in the area is generally not well received, and do not expect unanimous support from the community.

Your concerns are valid and have been addressed as part of the subdivision development process with the RM.

Your feedback - positive or negative - is appreciated regardless. We are committed to keeping community members informed about the developments within the area.

Sincerely,

Bia de Freitas
On behalf of 102139536 Saskatchewan Ltd.

On Sun, Mar 10, 2024 at 3:24 PM Daryl Fourney <darylfourney@hotmail.com> wrote:

Dear 102139536 Sask Ltd and Mr Saleski

We are residents on Gabriel Road in the Hamlet of Grasswood.

We are not in favour of the proposed development, which we received by mail, dated March 1, 2024

There are several reasons for this, the main one being the already overburdened narrow Clarence Avenue access to the city. More and more traffic are using this road.

These additional acreages will also affect groundwater access and quality.

Corman Park school is bursting at the seams with students. The RM needs to work with the school division to build a large new elementary school and a separate high school for Corman Park acreages

Lastly, we are concerned with the ever expanding subdivision of land in the area. We are losing our rural/semi rural way of life. Acreages in this area should not be allowed to be smaller than 5 acres.

Daryl Fourney
630 Gabriel Road, Grasswood

Sent from my iPhone



Bia de Freitas <536saskltd@gmail.com>

Re: Inquire about lots on potential subdivision application (SW intersection of clarence and grasswood road)

1 message

102139536 Sask Ltd. <536saskltd@gmail.com>
To: Bryce hipfner <bryce.hipfner@hotmail.com>

Sun, Mar 17, 2024 at 12:47 PM

Hello Bryce,

Thank-you for taking the time to review the subdivision information letter.

Lot pricing has not been established. We are currently working through the approval stages. Once all costing has been accounted for, we will look to establish pricing for the lots.

Please feel free to touch base every couple months for updates.

Regards,

Bia de Freitas
On behalf of 102139536 Saskatchewan Ltd.

On Wed, Mar 13, 2024 at 12:41 PM Bryce hipfner <bryce.hipfner@hotmail.com> wrote:

Hello,

Just inquiring to see if you have pricing yet for the lots you are proposing SW corner of clarence and grasswood road, just received proposed subdivision and am looking for a lot in the area

Thanks



Bia de Freitas <536saskltd@gmail.com>

Re: Proposed Clarence & Grasswood Subdivision

1 message

102139536 Sask Ltd. <536saskltd@gmail.com>
To: Jason Bellina <drwu@sasktel.net>

Sun, Mar 17, 2024 at 12:52 PM

Hello Jason,

Thank-you for taking the time to review the subdivision information letter. The letter was mailed to land owners within a one mile radius of the development. The intent was to provide information about the subdivision.

We will reach out to DRWU if we require your assistance/service.

Regards,

Bia de Freitas
On behalf of 102139536 Saskatchewan Ltd.

On Fri, Mar 15, 2024 at 1:27 PM Jason Bellina <drwu@sasktel.net> wrote:

Good afternoon,

We received your letter regarding the proposed subdivision at Clarence and Grasswood road. I'm just wondering if you were wanting to get water from us for this project or were just informing us that you were going ahead with the project? Have you found a water supplier for this project yet?

Jason Bellina, Administrator

Dundurn Rural Water Utility

PO Box 442

401 2nd Street

Dundurn SK S0K 1K0

Ph: 306-492-2566

Fax: 306-492-2564

Cell: 306-381-3555

drwu@sasktel.net

web-site: dundurnruralwater.ca



Bia de Freitas <536saskltd@gmail.com>

Re:

1 message

102139536 Sask Ltd. <536saskltd@gmail.com>
To: ron.thorstad@shaw.ca
Cc: Kristie Muzyka <kmuzyka@rmcormanpark.ca>

Tue, Apr 2, 2024 at 2:37 PM

Hello Ron and Joyce,

Thank you for taking the time to review the subdivision information letter.

We have a contract with Lost River Water Co. for the water supply.

If you have any additional questions please let us know.

Sincerely,

Bia de Freitas

c/o 536 Sask Ltd.

On Tue, Apr 2, 2024 at 3:14 PM <ron.thorstad@shaw.ca> wrote:

We recently returned from Arizona and found your March 1 letter re your proposed development on LSD 13-34-35-3. I am curious as to your plans as to water, We applied for a subdivision approval of our 9.3 acre parcel in 2023 and were advised by Corman Park it could not proceed due to their Bylaw not allowing any subdivisions unless potable water was available via a public water utility. Public Works apparently decided no additional water was available from Grasswood Water Utility, notwithstanding that we had paid a portion of the capital cost of the infrastructure when built in the 1990's. This apparently has something to do with the water allocation from Sask. Water Corp.

It seems strange that we can not subdivide but you apparently can so must have access to our water system. When I questioned Corman Park Planning as to this inconsistency, I was told to ask you where you were getting your water. It seems strange that topic has not come up in your discussions with them if you are as far along in your plans as it appears.

Thank you for your anticipated response.

Ron

Ron and Joyce Thorstad

625 Gabriel Road

Grasswood,Sk

S7T 1A9

306 955-1127



Virus-free.www.avast.com



Bia de Freitas <536saskltd@gmail.com>

Re: 102139536 land development

1 message

102139536 Sask Ltd. <536saskltd@gmail.com>
To: Janet Rawlyk <jrawlyk@gmail.com>

Fri, Sep 20, 2024 at 1:01 PM

Hello Janet,

Thank-you for taking the time to review the subdivision information letter. We understand that development in the area is generally not well received, and do not expect unanimous support from the community.

Your feedback - positive or negative - is appreciated regardless. We are committed to keeping the community members informed about developments within the area.

Sincerely,

Bia de Freitas
On behalf of 102139536 Saskatchewan Ltd.

On Wed, Sep 11, 2024 at 8:17 AM Janet Rawlyk <jrawlyk@gmail.com> wrote:

Hello

We are not in favour of this development.

Too much traffic on Clarence Avenue already.

Sincerely
Janet Rawlyk
Grasswood resident

Sent from my iPhone

APPENDIX M

**CORRESPONDENCE WITH PRAIRIE SPIRIT SCHOOL
DIVISION**

From: [Teresa Korol](#)
To: [Maggie Schwab](#); [Brenda Erickson](#); [Bob Bayles](#)
Subject: RE: Proposed development - RM of Corman Park
Date: Monday, February 5, 2024 3:03:35 PM

Good afternoon Maggie

I have reviewed the location of the proposed subdivision with our attendance area boundaries and can confirm that it will be in the South Corman Park School area for elementary school and the current high school will be Clavet Composite School.

We are prepared to accommodate the increases in enrolment at our schools and are making long term plans to continue to grow our schools as the land developments continue in this area.

If you require additional information please contact me.

Teresa Korol CPA,CMA

Facilities Manager, [Prairie Spirit School Division](#)

Box 809 | 523 Langley Avenue, Warman, SK S0K 4S0

T 306.683.2917 | **Learners for life**

From: Maggie Schwab <mschwab@crosbyhanna.ca>

Sent: Wednesday, January 31, 2024 8:51 AM

To: Brenda Erickson <brenda.erickson@spiritsd.ca>; Teresa Korol <teresa.korol@spiritsd.ca>; Bob Bayles <bob.bayles@spiritsd.ca>

Subject: Proposed development - RM of Corman Park

Some people who received this message don't often get email from mschwab@crosbyhanna.ca. [Learn why this is important](#)

CAUTION: This email originated from outside of Prairie Spirit. Exercise caution when viewing attachments, clicking links or responding to requests.

Good Morning,

We (Crosby Hanna & Associates) have been retained by a Developer who is looking to rezone and subdivide some land south of the City of Saskatoon in the RM of Corman Park, at the corner of Clarence Avenue Grasswood Road (development concept attached).

As a part of the rezoning requirements set out by the RM, we need to ensure that there is capacity in the school division to accommodate any potential students who may reside in this development.

The proposed development is located in the NW quarter of Section 34, Township 35, Range 05, W3M and consists of 13 lots. Could you please provide me with an email confirming that the Prairie Spirit School Division has capacity to accommodate any future students that could reside at this development?

Should you have any questions, please do not hesitate to contact me.

Kindest regards,

Maggie Schwab, RPP, MCIP

CROSBY HANNA & ASSOCIATES

407C 1st Ave N, Saskatoon, SK S7K 1X5

t : 306.665.3441

c : 306.227.6617

e : mschwab@crosbyhanna.ca

www.crosbyhanna.ca