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Engineered Rubber Aggregate Corporation

Two Unpaved Road Sections in Southern Manitoba Incorporating Tire Derived Aggregate Performance Evaluation

Prepared for:

Mr. Peter Schroedter
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R2Y 2E9

Project Number: 0186 003 00

Date: September 9, 2026



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Our File No. 0186 003 00

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Engineered Rubber Aggregate Corporation
1027 – 72 Quail Ridge Road
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R2Y 2E9

RE: Two Unpaved Road Sections in Southern Manitoba Incorporating Tire Derived Aggregate Performance Evaluation

TREK Engineering Inc. is pleased to submit our final report for the above-noted project.

Please contact the undersigned should you have any questions.

Sincerely,

TREK Engineering Inc.

Per:

Ken Skafffeld, M.Sc., P.Eng. FEIC
Senior Geotechnical Engineer

Encl.

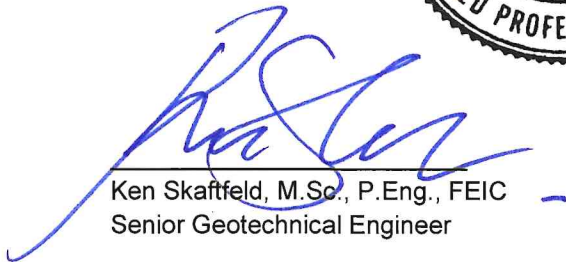
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Authorization Signatures

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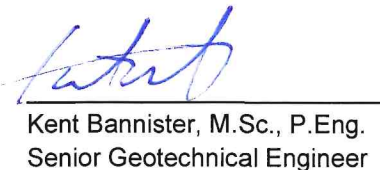

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1.0 Introduction

This report summarizes the results of a geotechnical investigation completed by TREK Engineering Inc. (TREK) to assess distressed roadway sections recently reconstructed with the addition of Tire Derived Aggregate (TDA). The road sections are located north of Winkler on Road 20 W and on 5th Avenue NE in Carman, Manitoba. The terms of reference for the investigation are included in our proposal to Peter Schroedter of Engineered Rubber Aggregate dated June 5, 2026. The scope of work includes a sub-surface investigation, laboratory testing, evaluation of most probable cause(s) of the distress, and the provision of recommendations for roadway repairs. Illustrations and photos in the body of this report are referred to as Figures. Detailed site plans and cross sections are attached at the end of the report as Drawings.

2.0 Background and Site Conditions

The Carman study area includes about 100 m of unpaved two-lane road within a commercial-industrial area along 5th Avenue NE, immediately east of Main Street North (PTH 13) as shown on Figure 1. There is a shallow ditch along the south side of the road with drainage to the west. Within the study area, there is about 30 m of roadway experiencing moderate rutting, referenced on Drawing 01 as the “problem area”. Rutting is shown on Figure 2.



Figure 1. Study area location (source Google Earth)



Figure 257. Rutting in problem area, view W

The Winkler study area site on Road 20 W is approximately 800 m north of the PTH 14 intersection, encompassing about 200 m of roadway (Figure 3). This two-lane rural road is unpaved with shoulders and a shallow ditch on the west side. It is the primary traffic route for septic tank trucks hauling to the town's

wastewater lagoons. Problem areas with moderate to severe rutting were identified at the north and south ends of the study area, with a minor problem area in between (Drawing 05). Rutting in the north problem area is shown on Figure 4.

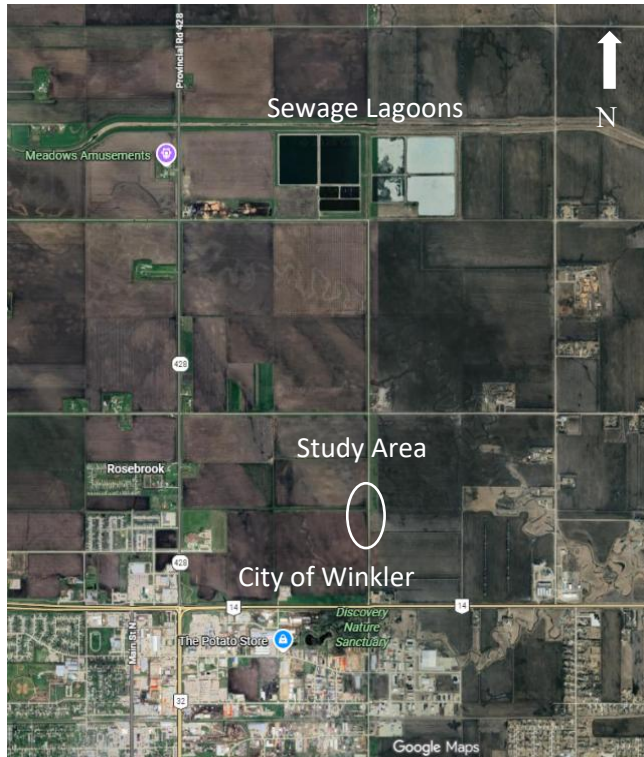


Figure 817. Winkler study area (source Google Earth)



Figure 1009. Rutting in N problem area

Sections of roadway within each study area were reconstructed in the summer of 2025 to address localized soft spots where long depressions in wheel paths (rutting) developed particularly after rainfall events, affecting trafficability. TREK did not provide design support and was not present on-site for this work. Representative photos provided by the client of the repair work are shown on Figures 5 and 6. TREK understands that reconstruction was carried out as follows:

1. The existing roadway was excavated over a width of approximately 7 m to a depth of approximately 2 m, centered on the roadway (referred to herein as the “cut”). Excavated material was windrowed adjacent to the cut.
2. Tire derived aggregate (TDA) was loosely placed directly on the subgrade within the cut in a 300 mm (12 inch) lift and compacted with seven passes of a track mounted excavator. A second 300 mm lift was placed in a similar fashion. The target degree of compaction was about 50% of the loose lift thickness (total thickness of approximately 300 mm).
3. The excavated material was placed in 300 mm lifts directly above the top lift of TDA and compacted with seven passes of the excavator. It is our understanding that the soil was very wet after significant rainfall.
4. A thin layer of sand and gravel fill or shale gravel was placed as a driving surface.



Figure 2221. Placing first lift of TDA in cut
(photo courtesy of P. Schroedter)



Figure 2381. Placing first lift of soil cover over TDA
(photo courtesy of P. Schroedter)

The TDA used for road reconstruction can be classified as mainly “Type B”, with occasional oversized rubber pieces (personal communication, P. Schroedter). Type B TDA consists of the following particle size distribution by weight (ASTM D6270, 2008):

- Minimum of 90% with a maximum dimension, measured in any direction, of 300 mm,
- 100% with a maximum dimension, measured in any direction, of 450 mm,
- At least one sidewall shall be removed from the tread in each tire,
- Minimum of 75% passing (by weight) the 200 mm square sieve,
- Maximum of 50% passing the 75 mm square sieve,
- Maximum of 25% passing the 38 mm square sieve, and
- Maximum of 1% passing the 4.75 mm square sieve.

During and after the spring thaw in 2026, the rutting conditions redeveloped at the same locations within both study areas. The problems were exacerbated by a wet fall and start to the summer, including significant rainfall events in early June; rainfall amounts of 146 mm and 182 mm were recorded in Winkler and Carman on June 1st and June 4th respectively. Recent trends in July and early August are drier with localized thunderstorms, and it is our understanding that the rutting problems at the time of this report are much less pronounced.

3.0 Field Program

The field program consisted of an initial site reconnaissance to lay out test hole locations, a drilling and sampling program, and site surveys. The test holes were situated strategically to determine soil and groundwater conditions within and outside the problem areas for comparative purposes. With the same intent, holes were also advanced within the cut and immediately adjacent to the cut (Winkler site).

3.1 Sub-surface Investigation

The sub-surface investigation was completed on July 8, 2026 under the supervision of TREK personnel. Test holes were drilled by Bicycle Consulting Ltd. using a truck-mounted drill rig equipped with 125 mm diameter solid stem augers (Figures 7 and 8). Eight test holes were drilled and sampled at the locations shown in Drawings 01 and 05 to a depth of 3.1 m. The test holes were backfilled with auger cuttings to surface.



Figure 2941. Drill rig at Winkler Site



Figure 3133. Solid stem augers (Carman Site)

Sub-surface soils encountered during drilling were visually classified based on the ASTM standard practice for “Description and Identification of Soils (Visual-Manual Procedures)” (ASTM D2488) supplemented by laboratory testing and classification based on the ASTM standard practice for “Classification of Soils for Engineering Purposes (Unified Soil Classification System)” (ASTM D2487). TREK’s classification system includes some modifications from USCS based on local practice, as summarized on the explanatory pages attached to the sub-surface logs and to describe the TDA material. Disturbed auger cutting samples were

obtained at regular intervals. Undrained shear strength testing was performed in the field on the grab (auger cutting) samples using a Torvane and/or pocket penetrometer; results are provided on the test holes logs. Test hole locations and elevations and representative roadway cross-sections were surveyed using RTK GNSS equipment.

All samples retrieved during drilling were transported to TREK's testing laboratory in Winnipeg, Manitoba. Laboratory testing consisted of moisture content determination on all samples and grain size analysis (hydrometer method) on select samples. Laboratory test results are included in Appendix A.

Test-hole logs are attached describing the soil units encountered and other pertinent information such as test hole locations (UTM coordinates), elevation (geodetic), groundwater conditions, and a summary of the field and laboratory testing results.

4.0 Conditions Within and Outside of Problem Areas

The soil and groundwater conditions, moisture content profiles, and surveyed cross sections at the Carman and Winkler sites are discussed relative to the observed problem areas. To evaluate the most probable cause(s) of rutting, soil and groundwater conditions were evaluated:

- within the problem area and within the cut,
- within the problem area but outside of the cut,
- outside of the problem area and within the cut,
- outside of the problem area beyond the cut (background test holes).

Drawings 01 to 04 show test hole locations and roadway cross-sections at the Carman site. Drawings 05 to 07 show test hole locations and roadway cross-sections at the Winkler site. Where test holes coincide with the cross-sections, stick logs are shown to illustrate soil types and groundwater levels (where available). All interpretations of soil stratigraphy for the purposes of design should refer to the detailed information provided on the attached test hole logs. The groundwater observations made during drilling are short-term and should not be considered reflective of (static) groundwater levels at the site which would require monitoring over an extended period to determine. It is important to recognize that groundwater conditions may vary seasonally, annually, or because of construction activities.

4.1 Carman Site

4.1.1 Soil Stratigraphy

The locations of Test Holes 26-01 to 26-03 are shown on Drawing 01. Stick logs are shown on Drawings 02, 03 and 04. The cut is approximately 6 m wide and 100 m long (personal communication, P. Schroedter). A brief description of the soil stratigraphy and groundwater conditions encountered during drilling is summarized as follows:

Outside of problem area (TH 26-01), the general soil stratigraphy consists of about 0.3 m of sand and gravel traffic gravel overlying approximately 1.2 m of silty sand fill (with 6% clay), 0.5 m of native silty sand (with 6% clay), and native clay to the depth of exploration. The silty sand fill is wet below 1.5 m, as is the underlying silty sand.

East of the problem area and within cut (TH 26-02), the general soil stratigraphy consists of 0.15 m of sand and gravel traffic gravel overlying ~1.7 m of silty sand fill (with 14% clay) which was wet below 0.9 m depth, 0.4 m of TDA intermixed with wet silty sand (with 14% clay), and stiff clay to the depth of exploration – the native silty sand unit is absent. The fraction passing the 0.425 mm sieve from a sample of the silty sand fill (G3) has plastic and liquid limits of 20 and 23 respectively with a plasticity index of 3.

Problem area and within cut (TH 26-03), the general soil stratigraphy consists of about 0.15 m of traffic gravel overlying ~1.2 m of moist silty sand fill, 0.5 m of native silty sand, 0.4 m of TDA intermixed with wet silty sand, and stiff clay to the depth of exploration – the native silty sand unit is again absent.

4.1.2 Groundwater Conditions

Groundwater levels and sloughing (caving conditions) observed during drilling at the Carman site are summarized in Table 1.

Table 1. Summary of Observed Sloughing, Seepage, and Groundwater Levels – Carman Site

Test Hole	Depth of Sloughing (m)	Depth of Seepage (m)	Groundwater Level Below Grade After Drilling (m)	Comments
26-01	None observed	None observed	Dry at 3.0	Background test hole
26-02	None observed	1.8 – 2.3	0.9	Outside of problem area and within cut
26-03	None observed	1.4 – 1.8	0.9	Within problem area and within cut

4.2 Winkler Site

4.2.1 Soil Stratigraphy

The locations of Test Holes 26-04 to 26-07 are shown on Drawing 05. Stick logs are shown on Drawings 06 and 07. The cut is approximately 7 m wide and 200 m long (personal communication, P. Schroedter). A brief description of the soil stratigraphy and groundwater conditions encountered during drilling is summarized as follows:

North problem area and within cut (TH 26-04), the general sub-surface stratigraphy consists of 0.15 m of traffic gravel overlying ~1.2 m of moist sandy lean clay fill, 0.4 m of TDA intermixed with wet silty sand, and soft to firm wet sand lean clay to the depth of exploration.

Minor problem area and within cut (TH26-05), the general soil stratigraphy consists of 0.15 m of traffic gravel overlying ~1.2 m of moist sandy lean clay fill, 0.6 m of TDA intermixed with wet sandy silt, overlying 0.8 m of soft to firm wet native sandy lean clay, and stiff fat clay to the depth of exploration.

Minor problem area but outside cut (TH26-06), the general soil stratigraphy consists of 0.15 m of silty sand fill overlying ~1.6 m of firm, moist to wet sandy lean clay, and stiff fat clay to the depth of exploration.

South problem area and within the cut (TH 26-07), the general sub-surface stratigraphy consists of 0.15 m of traffic gravel overlying ~1.2 m of stiff to firm moist sandy lean clay fill (12% clay), 0.5 m of TDA

intermixed wet sandy silt (with 9% clay), and soft to firm wet sandy lean clay to the depth of exploration. The fraction passing the 0.425 mm sieve from a sample of the sandy lean clay fill (G2) has plastic and liquid limits of 20 and 30 respectively with a plasticity index of 10.

Outside problem area (TH26-08), the general sub-surface stratigraphy consists of 0.1 m of traffic gravel overlying ~1.1 m of moist silty sand fill and 1.8 m of moist to wet silty sand to the depth of exploration.

4.2.2 Groundwater Conditions

Groundwater levels and sloughing (caving conditions) observed during drilling at the Winkler site are summarized in Table 2.

Table 2. Summary of Observed Sloughing, Seepage, and Groundwater Levels – Winkler Site

Test Hole	Depth of Sloughing (m)	Depth of Seepage (m)	Groundwater Level Below Grade After Drilling (m)	Comments
26-04	None observed	1.4 – 1.8	Could not be measured	Within N problem area and within cut
26-05	None observed	1.4 – 2.0	Could not be measured	Within minor problem area and within cut
26-06	1.1 to 1.8 m	1.1 – 1.8	0.9 m	Within problem area and within cut
26-07	None observed	1.4 – 2.0	Could not be measured	Within S problem area and within cut

5.0 Potential Cause(s) of Roadway Distress

TREK's investigation has identified several potential causes or combination of causes leading to the observed roadway distress.

5.1 Moisture Content and Compaction of Fill Material

Both Carman and Winkler are situated in a region of the province covered by alluvial sediments overlying glaciolacustrine clay. Both study areas are situated within this geological setting and the main roadbed soil constituents are silty sand and/or sandy lean clay (alluvium). Both roadways were constructed using a cut and fill method whereby the existing fill material was reused. Based on our understanding of conditions at the time of compaction, it is believed that the moisture content of the soil at both sites would likely have been above the optimum moisture content (OMC) for compaction. The following observations and conclusions are based on TREK's experience supplemented by a recent technical paper that investigated the engineering characteristics of alluvial silty clay embankments under vehicle loads (Qiu et al, 2025).

The moisture content profiles for the Carman and Winkler sites are shown on Figure 9 (vs. depth) and 10 (vs. elevation) respectively. Similar data plots for the Winkler site are shown on Figures 11 and 12. Estimating the optimum moisture content during compaction for these soils is difficult without a standard Proctor test (which would require a bulk sample). In lieu of this test, we would estimate that the optimal moisture content would range from 8-12% for a silty sand (Carman site) and 9-15% for sandy lean clay (Winkler site) assuming the soil behaves more like a non-cohesive soil. However, there is about 10%

(Winkler) to 15% (Carman) clay-sized particles in the soil and this was (just) enough clay to show a measurable plastic limit of $\sim 20\%$ for both sites.

The above suggests that the compaction behaviour may lean towards the trend for fine grained soil which would have an OMC of about 2-3% below the plastic limit, or $\sim 17\%$. These estimates of optimum moisture content can be compared to the in-situ moisture content profiles above the water table which are about 5% higher than the range for non-cohesive soil (excluding the surface gravel) and at about OMC for soils where the soil mimics the compaction trend for fine grained soil. Backfill moisture contents greater than OMC would have reduced the ability to achieve adequate compaction, expected to be at or above 95% of Standard Proctor Maximum Dry Density (SPMDD) for best performance under traffic loading.

Qiu et al showed that the maximum vertical displacement along an unpaved roadway embankment constructed using alluvial silt is $\sim 105\%$ greater at 10% than at 8% moisture content (Figure 13). This is largely because the cohesion of the alluvial silt decreases with increasing moisture content. Also, the dynamic load under wetter conditions will produce higher pore water pressure, reduce the effective confining pressure, and accelerate deformation. This indicates that a high moisture content at the time of compaction has a significant impact on the mechanical behavior at shallow depths and every effort should be made to prevent infiltration of surface water (by crowning) and minimize wicking of groundwater from below.

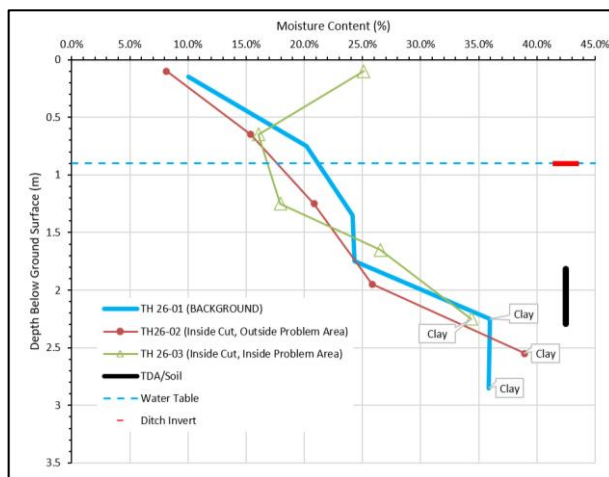


Figure 3262. Carman Site – Moisture content vs depth

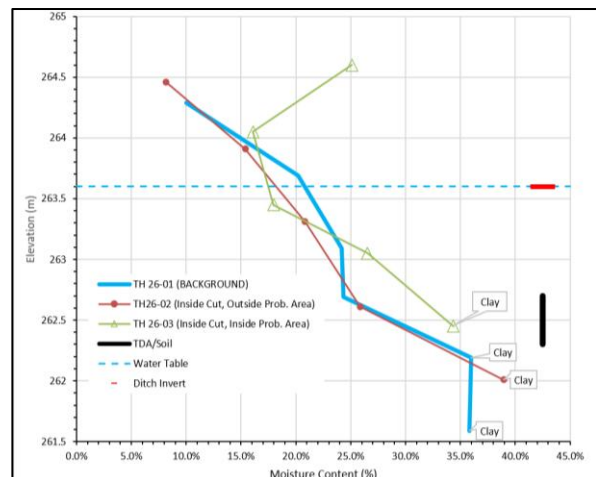


Figure 3261. Carman Site – Moisture content vs

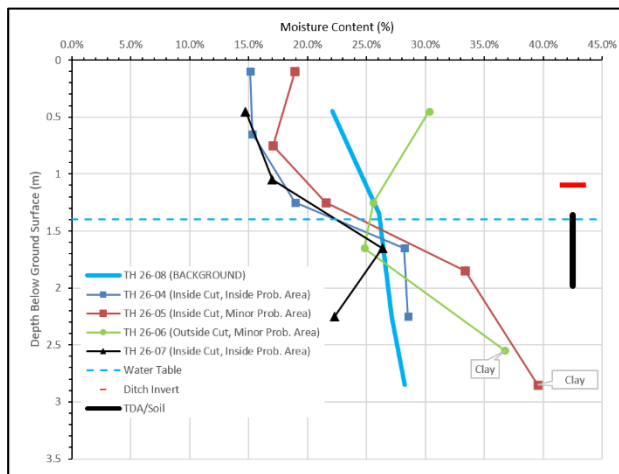


Figure 3360. Winkler Site – Moisture content vs depth

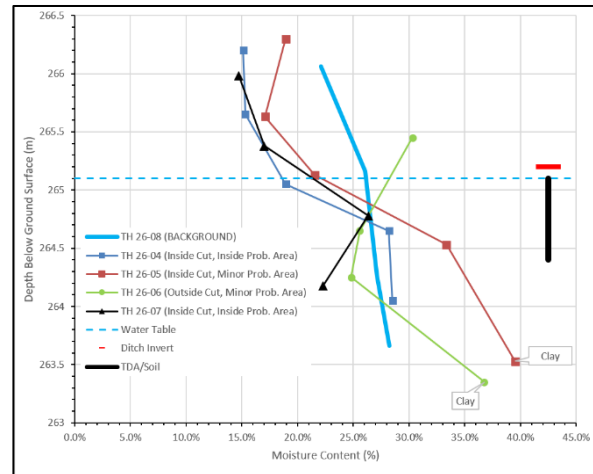


Figure 3392. Winkler Site – Moisture content vs

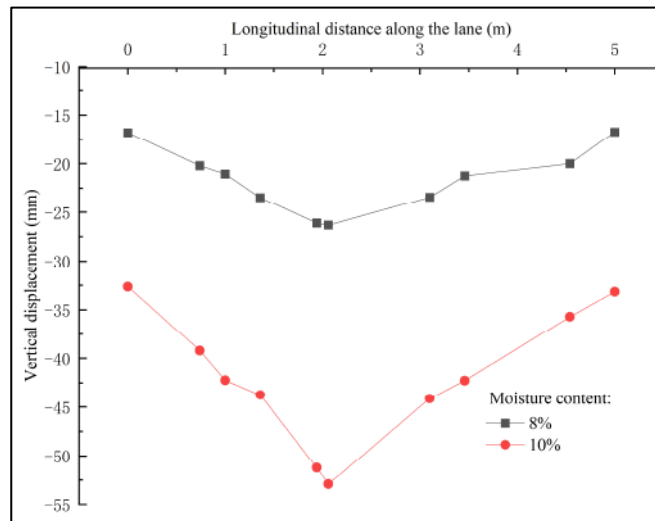


Figure 3326. Vertical displacement along travel lane (Qiu, et al, 2025)

5.2 Frost Heave

The soils used for road construction are considered highly frost susceptible. The Canadian Foundation Engineering Manual (CFEM, 2023) has adopted a widely used classification system (NCHRP 1-37A, Transportation Research Board 2004), where soils are listed in four categories, F1–F4, in approximate increasing order of frost susceptibility and loss of strength during thaw. All the roadway fill material at both sites would be classified as F4 and thus considered highly frost susceptible.

Frost heave occurs due to the formation of ice lenses. As soil freezes from the top down, water is drawn upwards through the pore spaces within the soil toward the freezing front leading to the formation of ice lenses. Soils with an F4 classification are highly frost susceptible because of the (small) capillary pore space

size. In the spring, thawing of the frozen ground (and ice lenses) occurs from the top down, trapping water on the still frozen subgrade below. This process (known as thaw weakening) results in a wet, weak upper subgrade that becomes subject to rutting from traffic loads. The development of ice lenses requires freezing temperatures, a source of water, and frost susceptible soil. All three conditions exist at the problem areas.

A capillary break is a layer of material with a pore space size large enough to prevent the continuation of capillary rise upwards to the freezing front. Providing a capillary break for a roadway reduces ice lens formation and subsequently frost heaving and thaw weakening. The material for capillary breaks should be free-draining (such as TDA) and unsaturated (above the water table). Field tests indicate a 100-125 mm layer of TDA can cut off capillary rise of sub-surface water and provide drainage of the overlying gravel for better roadway performance during the spring thaw (Oman, 2013). However, it is apparent that the TDA layer was partially or wholly saturated due to a high water table at the time of drilling. This condition, if it existed during the winter, would not serve as a capillary break. Also, the depth of the TDA layer relative to the shallow ditches would not provide roadway drainage.

5.3 Frost Penetration

ASTM D6270-17 states that TDA can be used as a 150-450 mm thick insulating layer to limit the depth of frost penetration beneath roads. This reduces frost heave in the winter and improves subgrade support during the spring thaw. However, due to the relatively large void space in Type B TDA (as compared with finer Type A TDA), the insulating value could be significantly reduced. Research by Kahn and Shalaby (2002) on a test embankment concluded that although the thermal conductivity of Type B TDA was five times lower than the thermal conductivity of clay, frost penetration depths were greater than in the natural ground; however, this was explained by the presence of snow cover on the natural ground. Based on the above, it is doubtful that the TDA layer provided a significant insulating effect.

5.4 Structural Support

TDA can be used as a structural support layer beneath roads constructed on weak ground by redistributing vertical stresses over a larger area and resisting deformation. For soft and unstable subgrade conditions, it should be used in conjunction with a geotextile separator and possibly a geogrid reinforcing layer. The depth of the TDA layer is an important consideration - placed too shallow, the elastic compression and rebound of the TDA fill may make the overlying soil layers difficult to compact. Placed too deep, the benefit of the layer in redistributing stresses can be greatly diminished. According to ASTM D6270-17, from 0.3 to 0.5 m of soil cover may be required for unpaved roads. Humphry (1997) and the Minnesota Department of Transportation (MnDOT) recommend a minimum of 0.45 m of soil cover for unpaved roads.

The top of the TDA layer at the Carman site is about 1.75 m below the road surface and directly on a very stiff clay subgrade. The top of the layer is about 0.9 m below the water table (ditch invert) at the time of drilling. The compaction condition of the silty sand above the TDA layer is more likely to be a greater contributor to the road distress since the TDA layer is not bridging a weak layer. Also at this depth, the TDA layer cannot act as a capillary break or drainage layer unless the water table drops by about 1.4 m.

The top of the TDA layer at the Winkler site is about 1.4 m below the road surface and about the same depth (and elevation) as the water table and west ditch invert. It is sandwiched in the sandy lean clay layer one metre or more above a stiff clay layer. At this depth, it is questionable as to how much structural support would be provided; the compactness condition of the overlying sandy lean clay may be a greater contributor to roadway distress. Also at this depth, the TDA layer cannot act as a capillary break or drainage layer unless the water table drops by about 1.2 m.

ASTM also recommends that in applications where pavement will be placed over the TDA, the TDA should be completely wrapped in a layer of non-woven geotextile to minimize infiltration of soil particles into the void spaces between the TDA - *it is not clear as to the rationale for not including unpaved roads in this recommendation*. To prevent infiltration of surrounding soil, Harkins, 2008 recommends that TDA fill should be completely wrapped in an AASHTO M 288 Class 2 separation geotextile – *no differentiation is made between paved and unpaved roads*. Exclusion of a geotextile separator at both sites appears to have led to infiltration of fines into the TDA layers. Assuming a void ratio of 1.25 after compaction (McCartney, 2021), the volume of voids may be about equal to the volume of rubber solids, or in terms of layer thickness, about half the layer would be void space. Infiltration of soil particles into the void space could result in a proportional loss of subgrade or cover thickness; this could propagate into subsidence of the road surface, loss of crown, and ponding of water.

6.0 Conclusions and Recommendations

6.1 Conclusions

- The performance of the roadway is almost entirely reliant on the condition of the backfill above the TDA which was likely placed wet of optimum, a condition which would have compromised the achievable degree of compaction.
- The existing roadway backfill (silty sand and sandy lean clay) is highly frost susceptible and subject to frost action (ice lenses/heaving) and thaw softening in the spring.
- The roadbed material will remain susceptible to weakening due to wetting (precipitation) unless the material is recompacted or amended (lime or cement stabilization).
- The TDA layer at the Winkler site appears to be acting as a drain for the overlying backfill although it would likely need to be almost entirely filled with water before it could drain towards the adjacent ditch.
- The TDA layers are below the water table at the time of the investigation.
- The TDA layers are lower than the ditch inverts with no opportunity for gravity drainage.
- There is no readily apparent reason as to why the road distress has only occurred in isolated sections.
- The silt content of the backfill may play a role in the development of problem areas; background test holes at both sites tended to be graded towards a silty sand rather than a sandy silt (lean clay). In Carman, TH 26-01 (background hole) had 32-35% sand compared to ~ 25% sand in the problem area (TH 26-02). In Winkler, the background hole (TH-26-08) had ~25-26% sand with trace gravel while TH26-07 in the problem area had ~ 20% sand.

6.2 Recommendations

- Where possible, the TDA should be placed above the anticipated water table and above the invert of adjacent ditches.
- The final cover over TDA should be a minimum of 0.6 m.
- It is necessary to strictly control the moisture content and degree of compaction during placement and compaction of alluvial soils (sandy lean clays/silty sands) in roadbeds.
- The thickness of the gravel surface layer should be designed based on the condition of the roadbed and anticipated traffic loading.
- The use of TDA in alluvial soils can aid in stabilizing a weak subgrade soil but the TDA should be completely encapsulated in a non-woven geotextile to prevent the migration of fines into the pore spaces. The filtration properties of the geotextile should be compatible with the gradation of the surrounding soil.
- The inclusion of a geogrid should be considered for very weak subgrade soils.
- The TDA should be placed in 0.3 m lifts with up to 0.6 m for the first lift if bridging soft ground. A target compaction of 50% reduction in layer thickness is reasonable for each lift with a total compacted thickness of about 0.5 m.
- Full-width reconstruction is recommended or, if only reconstructing the traffic lanes, horizontal drains should be provided to prevent saturation of the TDA layer.
- Test holes should be drilled to determine soil and groundwater conditions in advance of construction and surveyed cross-sections should be taken to finalize a design suitable to the site.
- Soft shale gravel should be avoided especially where heavy loads are expected as it can rapidly break down into powder or clay and soften when wetted.

7.0 Proposed Repair Strategy

Based on the cross sections at each site, repairing the problem areas with a layer of TDA to bridge the existing backfill and provide positive drainage to the ditch is likely possible. This may require a small raise in the top of road along 5th Ave. NE in Carman to achieve a minimum cover of 0.5 m over the TDA (unless it is possible to lower the ditch invert). In general, this strategy would involve the following:

- Leaving the existing TDA layers in place.
- Excavating the roadway (preferably full width) to a depth of about 900 mm (plus an allowance for traffic gravel). Material should be windrowed for future use or hauled off site.
- Placing a new layer of TDA, encapsulated in a non-woven geotextile - the compacted layer thickness should be 300 mm.
- Placing and compacting a 0.5 m thick layer of excavated material (or imported fill) using vibratory equipment (smooth steel vibratory drum). The material should be moisture conditioned as required to within 2% of optimum moisture content determined from Standard Proctor testing.
- Placing and compacting the necessary thickness and type of traffic gravel.

8.0 Closure

The geotechnical information provided in this report is in accordance with current engineering principles and practices (Standard of Practice). The findings of this report were based on information provided (field investigation and laboratory testing). Soil conditions are natural deposits that can be highly variable across a site. If sub-surface conditions are different than the conditions previously encountered on-site or those presented here, we should be notified to adjust our findings if necessary.

All information provided in this report is subject to our standard terms and conditions for engineering services, a copy of which is provided to each of our clients with the original scope of work or standard engineering services agreement. If these conditions are not attached, and you are not already in possession of such terms and conditions, contact our office and you will be promptly provided with a copy.

This report has been prepared by TREK Engineering Inc. (the Consultant) for the exclusive use of Engineered Rubber Aggregate Corporation (the Client) and their agents for the work product presented in the report. Any findings or recommendations provided in this report are not to be used or relied upon by any third parties, except as agreed to in writing by the Client and Consultant prior to use.

List of References

ASTM D6270-08. Standard Practice for Use of Scrap Tires in Civil Engineering Applications.

Harkins, J.M., Wilson, T. (2008). Guidance Manual for Engineering Uses of Scrap Tires. Geosyntec Consultants Project No. ME0012-11, Prepared for Maryland Dept. of the Environment and Maryland Environmental Service.

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Oman, M. (2013). Use of Tire Derived Products (TDP) in Roadway Construction. Research Project 2013-20, Minnesota Department of Transportation Research Services Office of Policy Analysis, Research and Innovation.

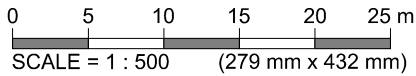
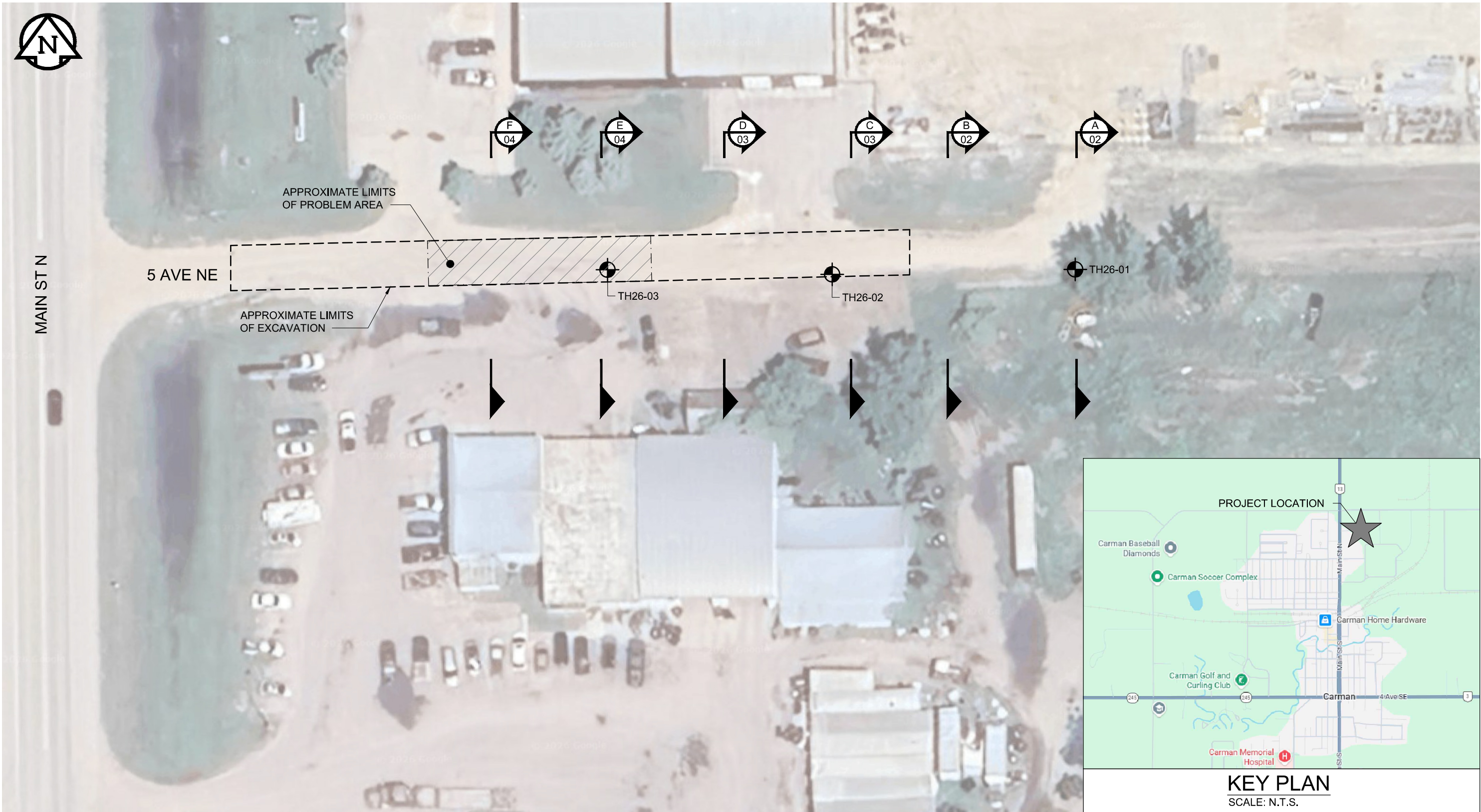
Qiu, T.; Chen, J.; Zhang, Y.; Shen, J.; Yue, X. Study on the Engineering Characteristics of Alluvial Silty Sand Embankment Under Vehicle Loads. Buildings 2025, 15, 1375.
<https://doi.org/10.3390/buildings15081375>

Khan, R.A.; Shalaby, A. (2002). Performance of Road Base Constructed With Shredded Rubber Tires. Annual Conference of the Canadian Society for Civil Engineering, Montréal, Québec, Canada, June 5-8, 2002.

Drawings



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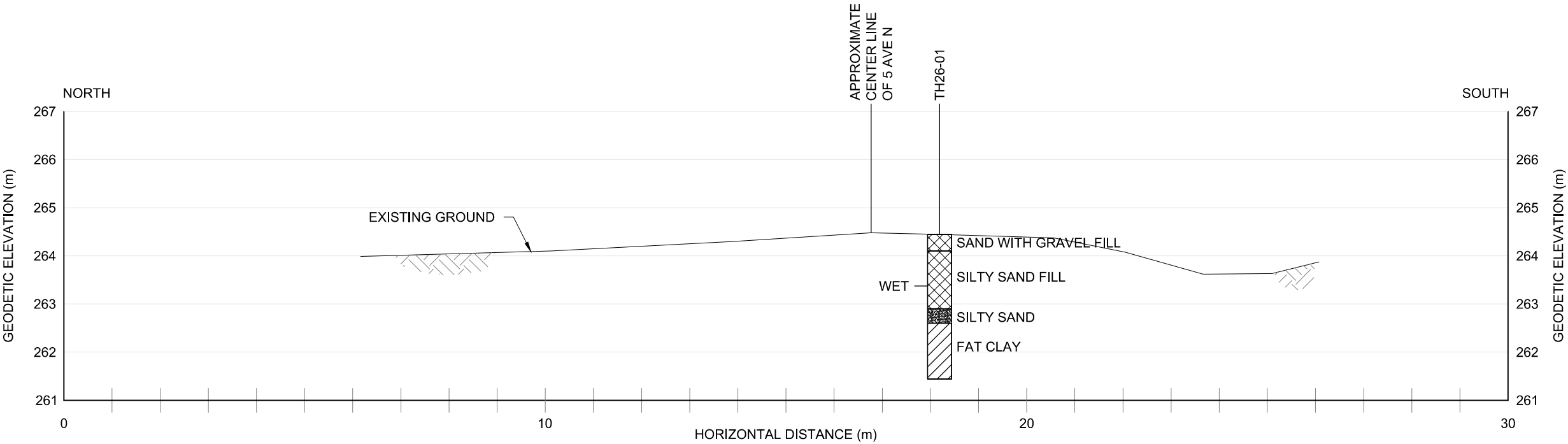
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- TEST HOLE (TREK, 2026)
- APPROXIMATE LIMITS OF EXCAVATION
- APPROXIMATE LIMITS OF PROBLEM AREA

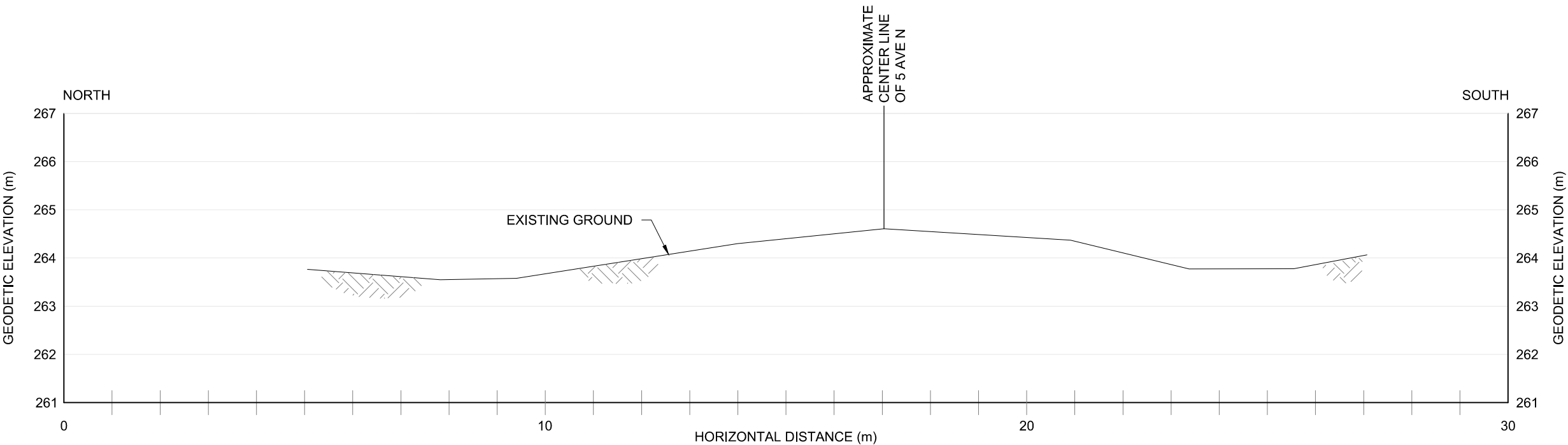
- NOTES:**
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 2. TEST HOLE LOCATIONS WERE RECORDED USING TRIMBLE GNSS.



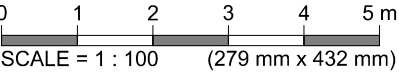
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CROSS SECTION A

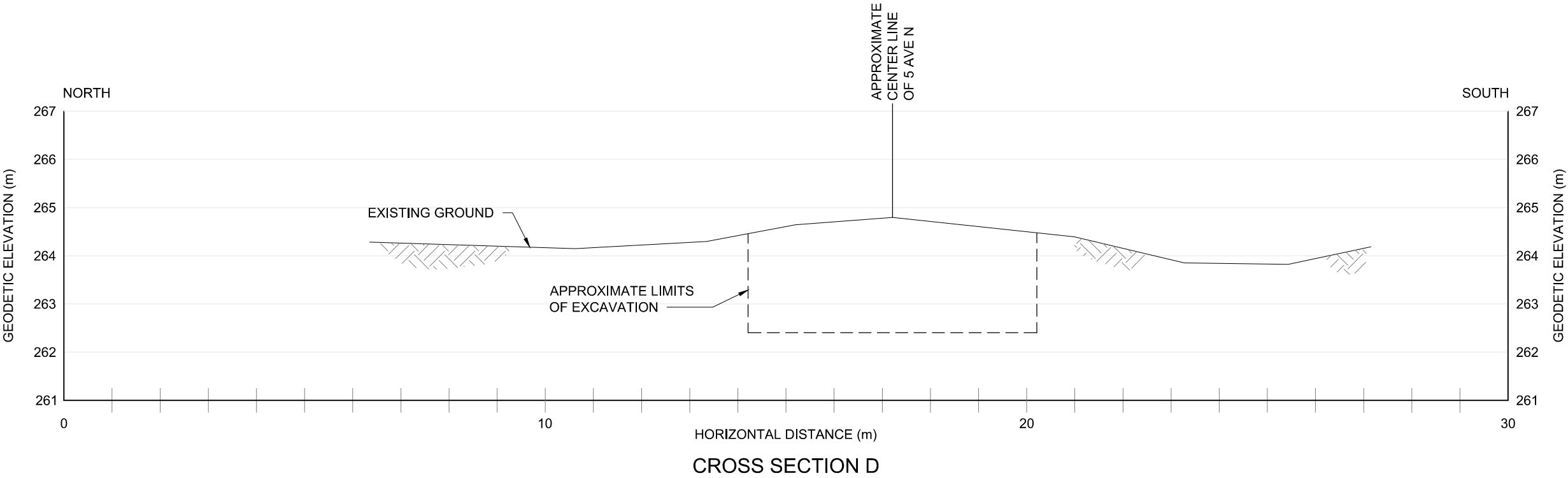
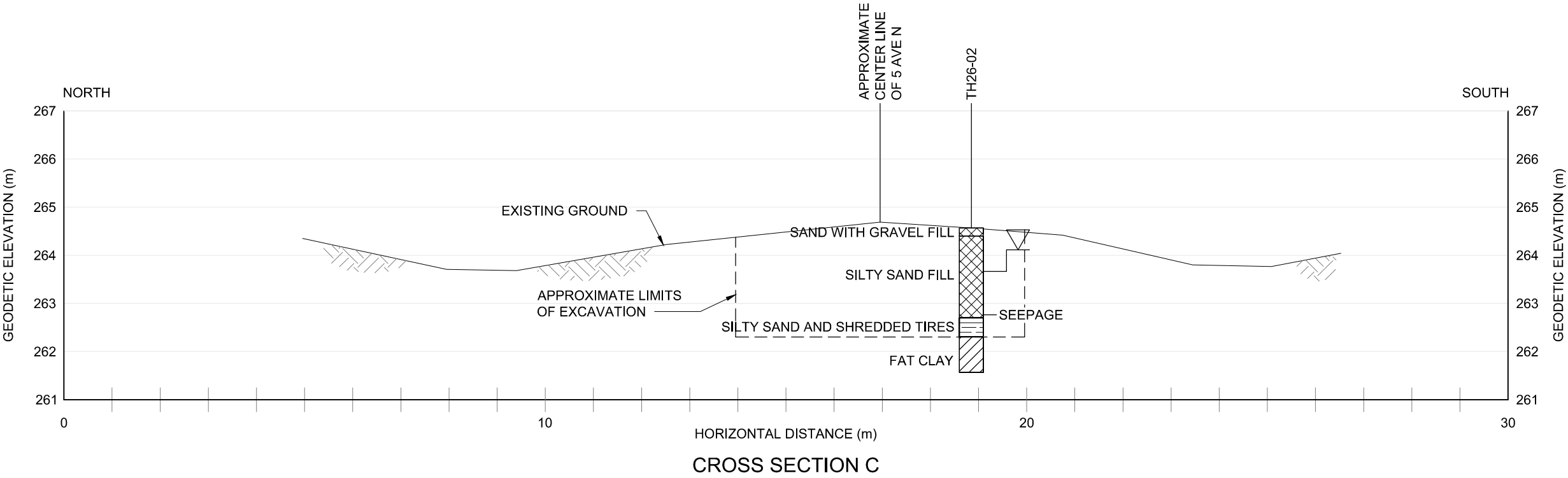


CROSS SECTION B





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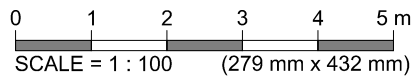
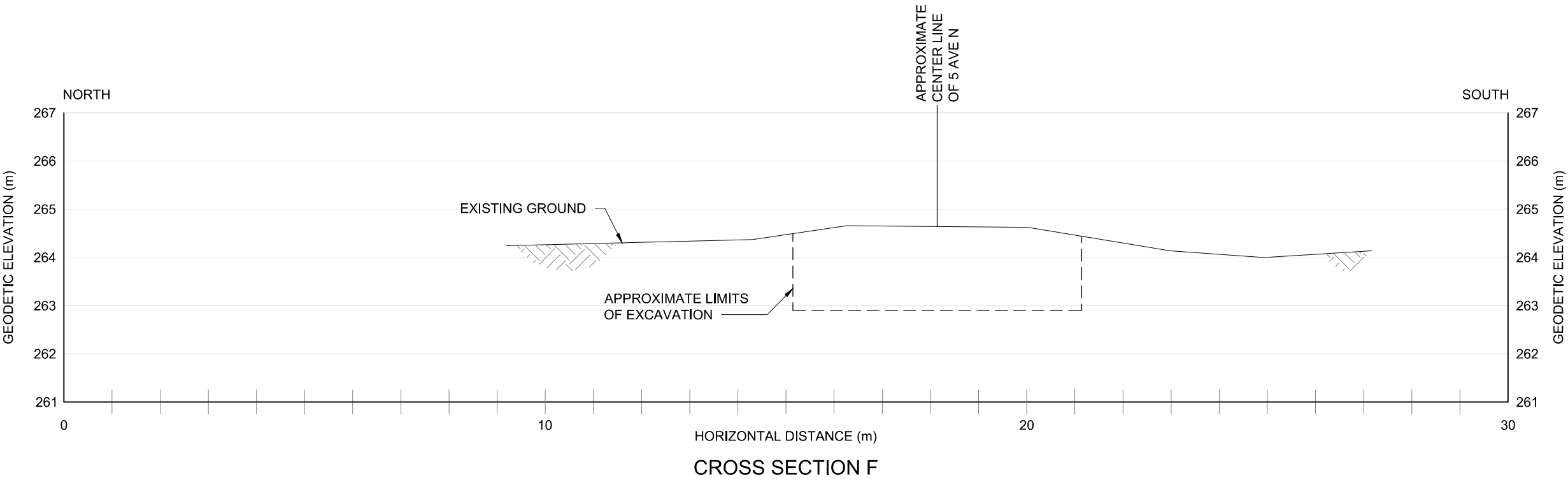
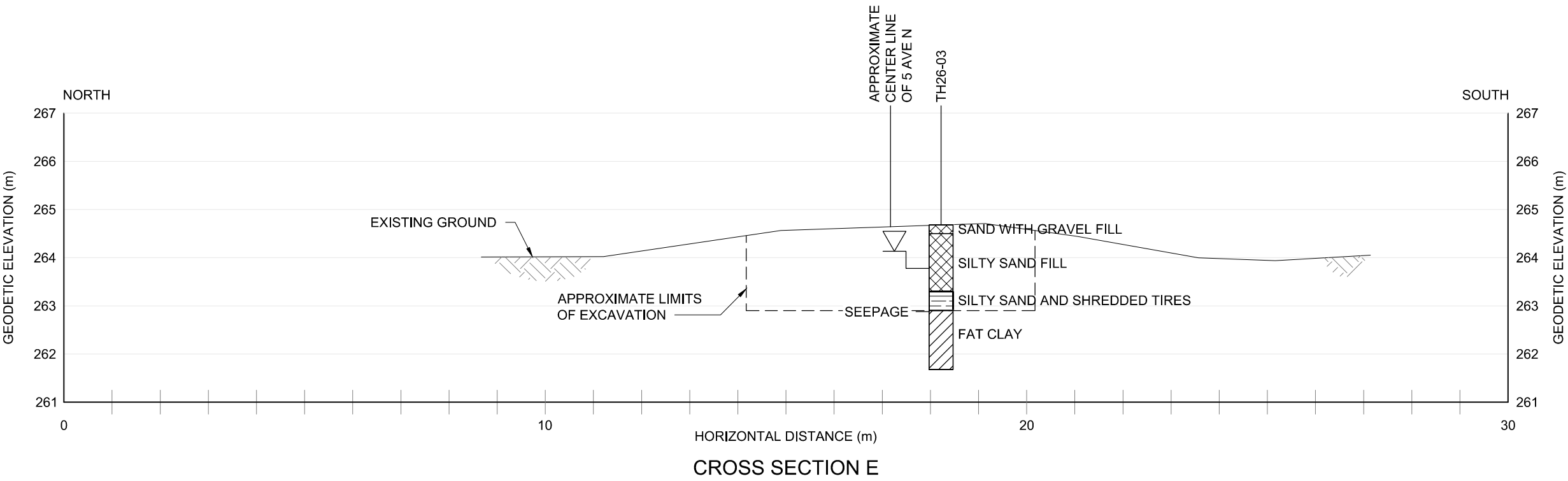
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GROUNDWATER ELEVATION



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LEGEND:  GROUNDWATER ELEVATION



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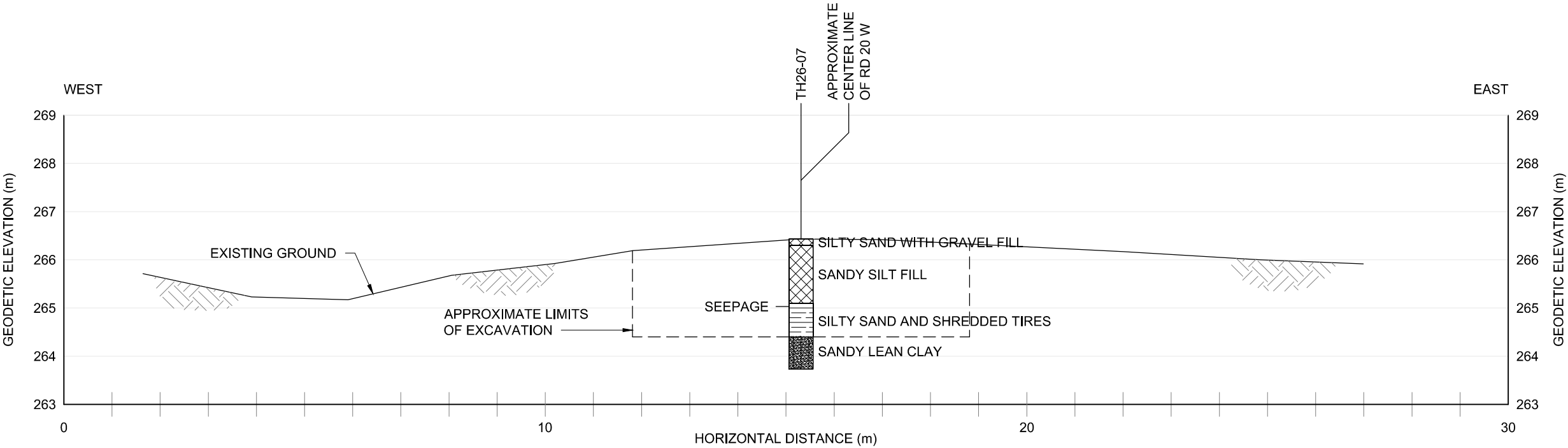
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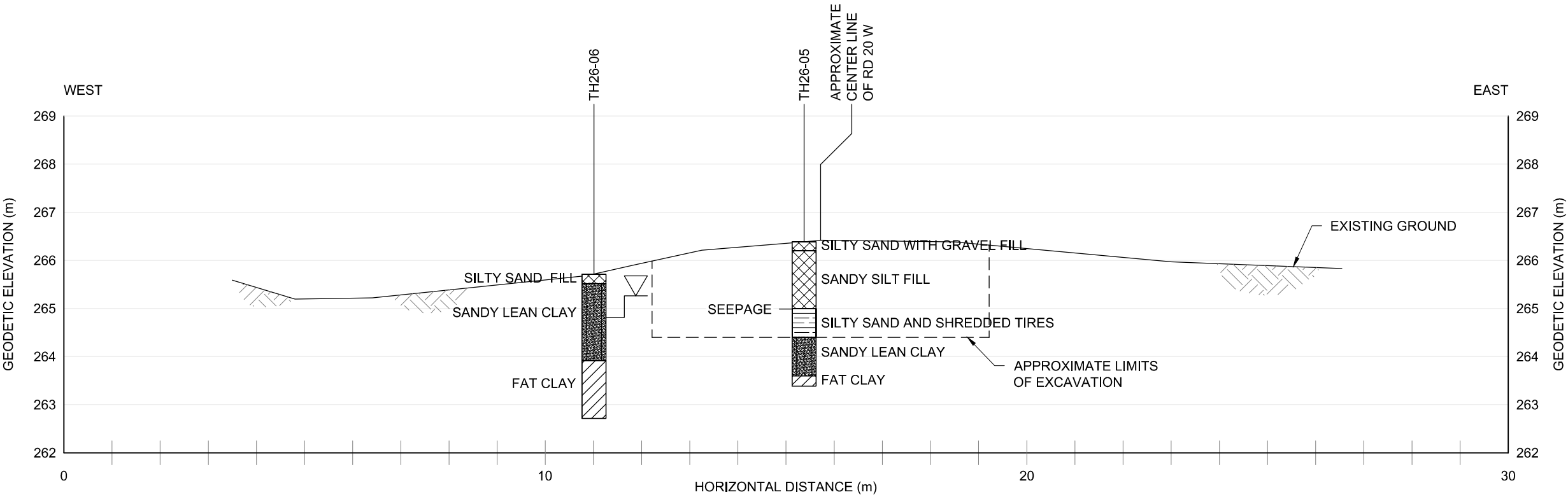
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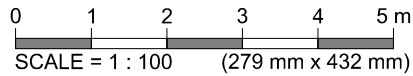
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CROSS SECTION G



CROSS SECTION H

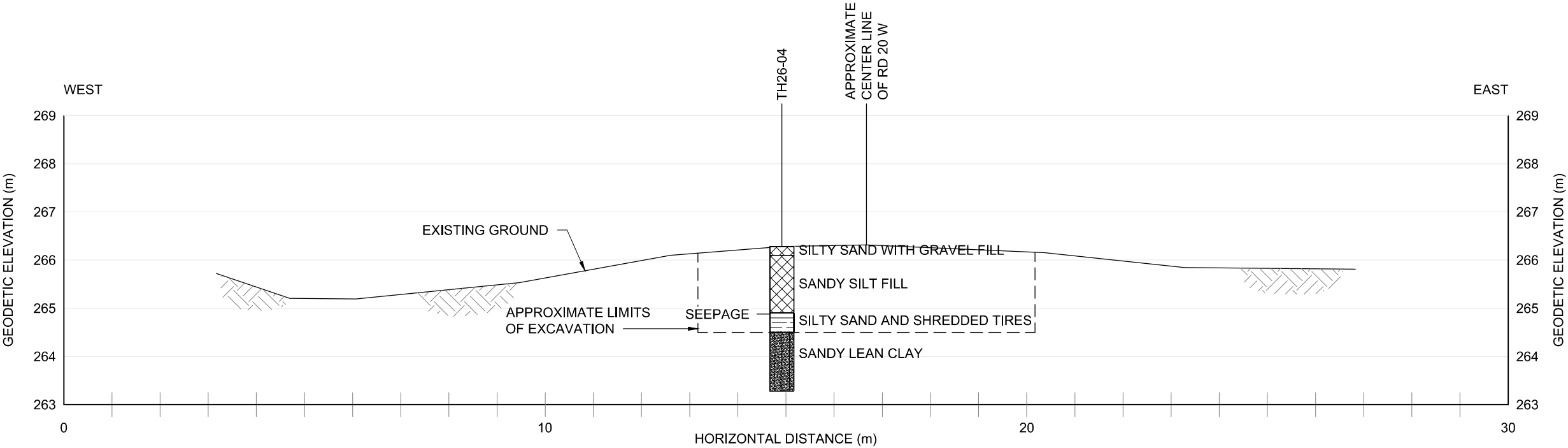


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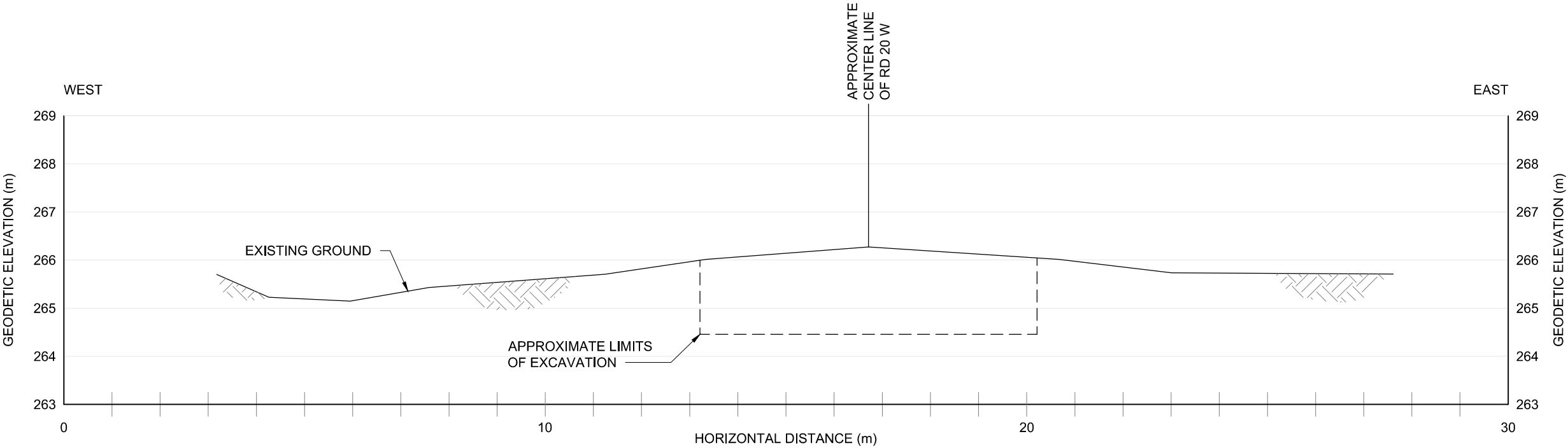




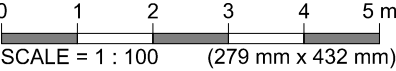
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CROSS SECTION I



CROSS SECTION J



Sub-Surface Logs

General Notes:

1. Inorganic and organic soils are classified in general accordance with the Unified Soil Classification System (USCS) as described in ASTM D2487-17, supplemented with the visual-manual procedures described in ASTM D2488-17. Soil descriptions are based on the overall visual classifications and supported with appropriate laboratory testing.
2. Descriptions on these sub-surface logs apply only at the specific exploratory locations and at the time of the exploration. Variability of soil and groundwater conditions may exist between exploratory locations.
3. Interpreted geologic origins may be shown within (parentheses), and colloquial / layperson terms may be shown within "quotations", and should be considered as supplementary information to aid in understanding the general soil classification.
4. Soil layers exhibiting a range of behaviours may be represented by multiple USCS group symbols. Refer to ASTM D2487 for more details. For example, a clay layer that is predominantly high plastic but that include zones that are intermediate plastic, or a clay layer with plasticity at the boundary of intermediate and high plasticity (i.e., LL between 45 and 55) may be classified as FAT CLAY – CH/CI, where the first group symbol represents the predominant soil type for the layer.

Abbreviations and Symbols:

LL	- Liquid Limit (%)	RQD	- Rock Quality Designation	SI	- Slope Inclinator Casing
PL	- Plastic Limit (%)	Qu	- Unconfined Compression		
PI	- Plasticity Index (%)	Su	- Undrained Shear Strength		
MC	- Moisture Content (%)	VWP	- Vibrating-wire Piezometer		
SPT	- Standard Penetration Test	SP	- Standpipe Piezometer		

Standard Penetration Test (SPT):

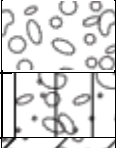
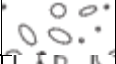
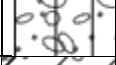
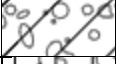
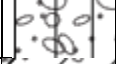
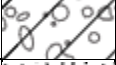
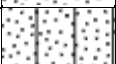
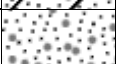
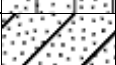
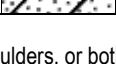
- SPT refusal is considered 100 blows over 12" of penetration (or less) in the 2nd and 3rd sets. The 1st set is neglected from determining refusal and/or N-values. Test is terminated and considered invalid when no penetration is observed over 10 blows.
- Blow counts shown are per 6" interval. Where refusal is reached partially through an interval, the penetration per interval is noted (e.g., 50 / 3").
- N-values shown on logs as N/A are associated with invalid tests, which may include no penetration of the sampler for 10 or more blows, or poor recovery due to sampler blockage (e.g. gravel lodged in spoon).

Subsurface Logs - Graphics Legend

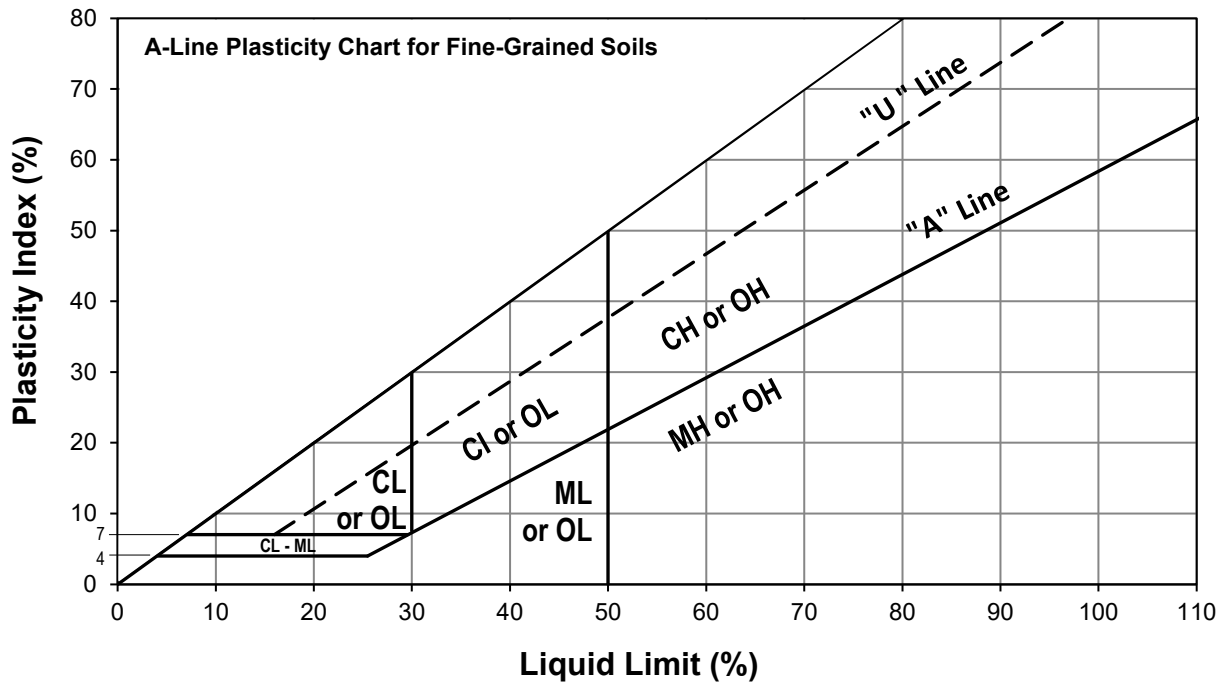
Pavements, Particle Sizes, Common Soil and Rock Types						Backfill	
	Asphalt		Limestone or Dolomite		Fines		Drill Cuttings
	Concrete		Shale		Clay		Bentonite chips
	Pavers		Siltstone		Silt		Cement
	Fill		Sandstone		Sand		Filter pack sand
	Silt Till		Peat		Gravel		Grout
	Clay Till		Boulders		Cobbles		Slough

Groundwater Conditions, Wells, Casings and Transducers					
	Standpipe or Inclinator Casing		Slotted Pipe		Casagrande Tip
	Vibrating-Wire Piezometer		Down-hole Level Logger		
	During Drilling		At End of Drilling		At Time Indicated on Log
	Seepage		Sloughing		Seepage and Sloughing

Soil Components by Particle Size (ASTM D6913 / D7928)					
Principal Soil	Particle Size (mm)	ASTM Sieve Size	Principal Soil	Particle Size (mm)	ASTM Sieve Size
CLAY	< 0.002	< #200	GRAVEL		
SILT	0.002 - 0.075	< #200	Fine	4.75 - 19	#4 to ¾"
SAND			Coarse	19 - 75	¾" to 3"
Fine	0.075 - 0.425	#200 to #40	COBBLES	75 - 300	3" to 12"
Medium	0.425 - 2.0	#40 to #10	BOULDERS	> 300	>12"
Coarse	2.0 - 4.75	#10 to #4			

Summary of USCS Soil Classification Group Names and Symbols (ASTM D2487) – Coarse Grained Soils						
Major Divisions			USCS Symbol	USCS Graphic	USCS Group Name (Notes 1 to 4)	USCS Laboratory Classification Criteria
Gravels (More than half of coarse fraction is larger than 4.75)	Well-graded	<5% fines	GW		Well-graded gravel	$C_U = \frac{D_{60}}{D_{10}} \geq 4$ & $C_C = \frac{(D_{30})^2}{D_{10}D_{60}}$ between 1 and 3
		5-12% fines	GW-GM		Well-graded gravel with silt	GW & Atterberg limits on fines below A-line or PI < 4
			GW-GC		Well-graded gravel with clay or silty clay	GW & Atterberg limits on fines above A-line and PI > 4
	Poorly-graded	<5% fines	GP		Poorly-graded gravel	Not meeting all gradation requirements for GW
		5-12% fines	GP-GM		Poorly-graded gravel with silt	GP & Atterberg limits on fines below A-line or PI < 4
			GP-GC		Poorly-graded gravel with clay or silty clay	GP & Atterberg limits on fines above A-line and PI > 4
	>12% fines	Fines are ML or MH	GM		Silty gravel	Atterberg limits on fines below A-line or PI < 4
		Fines are CL-ML, CL or CH	GC		Clayey gravel	Atterberg limits on fines above A-line and PI > 4
	Well-graded	<5% fines	SW		Well-graded sand	$C_U = \frac{D_{60}}{D_{10}} \geq 6$ & $C_C = \frac{(D_{30})^2}{D_{10}D_{60}}$ between 1 and 3
		5-12% fines	SW-SM		Well-graded sand with silt	SW & Atterberg limits on fines below A-line or PI < 4
			SW-SC		Well-graded sand with clay or silty clay	SW & Atterberg limits on fines above A-line and PI > 4
	Poorly-graded	<5% fines	SP		Poorly-graded sand	Not meeting all gradation requirements for SW
		5-12% fines	SP-SM		Poorly-graded sand with silt	SP & Atterberg limits on fines below A-line or PI < 4
			SP-SC		Poorly-graded sand with clay or silty clay	SP & Atterberg limits on fines above A-line and PI > 4
	>12% fines	Fines are ML or MH	SM		Silty sand	Atterberg limits on fines below A-line or PI < 4
		Fines are CL-ML, CL or CH	SC		Clayey sand	Atterberg limits on fines above A-line and PI > 4

- Notes:
1. If field sample contained cobbles or boulders, or both add suffix "with cobbles, with boulders, or with cobbles and boulders" to group name.
 2. Gap graded may be used to describe poorly graded sand or gravel with two distinct particle sizes. Gap graded soils use the poorly-graded group symbols (e.g. GP, SP)
 3. For gravels, if ≥15% sand, add suffix "with sand" to group name (or "and sand" to group names ending in "with silt" or "with clay").
 4. For sands, if ≥15% gravel, add "with gravel" to group name (or "and gravel" to group names ending in "with silt" or "with clay").



Summary of USCS Soil Classification Group Names and Symbols (ASTM D2487) – Fine Grained and Organic Soils						
Major Divisions		USCS Symbol	USCS Graphic	USCS Group Name (Notes 1 to 3)	USCS Laboratory Classification Criteria	
Fine-Grained soils (More than half the material is smaller than No. 200)	High Plasticity (Liquid Limit ≥ 50)	Inorganic		Fat Clay	PI on/above A-Line	
				Elastic Silt	PI below A-Line	
		Organic		Organic Clay	LL (oven dried) less than 75% of LL (not dried)	PI on/above A-Line
				Organic Silt		PI below A-Line
	Low to Intermediate Plasticity (Liquid Limit < 50)	Inorganic		Intermediate Clay (Note 3)	PI on/above A-Line	LL over 30
				Lean Clay		LL under 30 PI greater than 7
				Silty Clay		PI between 4 and 7
				Silt		PI below A-Line
		Organic		Organic Clay	LL (oven dried) less than 75% of LL (not dried)	PI on/above A-Line
				Organic Silt		PI below A-Line

Notes:

- If 15 to <30% plus No. 200, add suffix "with sand" or "with gravel" to group name (whichever is predominant)
- If $\geq 30\%$ plus No. 200, add prefix "sandy" or "gravelly" to group name, whichever is predominant. In this case, if there is > 15% of the less predominant component, add the suffix "with sand" or "with gravel" to group name.
- Intermediate Clay (CI) with intermediate plasticity ($30 \leq LL < 50$) is a modification to ASTM/USCS and is based on Casagrande, 1962. Only inorganic soils classified as Clay will have a group symbol or name reflecting intermediate plasticity. Silt or organic soils of intermediate plasticity are classified as ML or OL.

The following terminology is used to describe soil layers based on ASTM D2488 and other publications:

Minor components (not covered in the USCS tables above)

Trace (under 5%) Few (5% to 12%) Little (12% to 30%) Some (30 to 50%) Mostly (>50%)

Soil Moisture:

Dry (Absence of moisture, dusty, dry to the touch) Moist (Moist to the touch, but no visible water) Wet (Visible free water)

Consistency / Strength of Fine-Grained Soils:

Consistency Term	Undrained Shear Strength (kPa)	SPT N (Blows per ft)	Visual/manual Identification
Very Soft	under 12	under 2	Easily penetrated several centimeters by the fist
Soft	12 to 25	2 to 4	Easily penetrated several centimeters by the thumb
Firm	25 to 50	4 to 8	Can be penetrated several centimeters by the thumb with moderate effort
Stiff	50 to 100	8 to 15	Readily indented by the thumb but penetrated only with great effort
Very Stiff	100 to 200	15 to 30	Readily indented by the thumb nail
Hard	over 200	over 30	Indented with difficulty by the thumb nail

Soil Structure:

Description	Criteria
Laminations	Alternating layers of varying material or colour with the layers less than 6mm thick
Stratified	Alternating layers of varying material or colour with layers at least 6mm thick
Fissures	Breaks along definite planes of fracture with little resistance to fracturing
Slickensides ¹	Fracture planes appear polished or glossy, sometimes striated
Blocky/Friable ¹	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Varved	Alternating layers such as silt and clay typically between 12 to 25mm thick
Homogeneous	Same colour and appearance throughout

Density of Coarse-Grained Soils:

Compactness Condition	SPT N (blows per foot)
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50
Refusal	> 100
<i>Note: these terms can be used for non-plastic to low plastic silt tills</i>	

Particle Elongation (Gravels)

Elongation	Criteria
Flat	Width / Thickness > 3
Elongated	Length / Width > 3
Flat and Elongated	Meets Both Criteria

Particle Angularity (Gravels, Coarse Sand)

Angularity	Criteria
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces
Sub angular	Particles are similar to angular description but have rounded edges
Sub rounded	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	particles have smoothly curved sides and no edges

Client:	Engineered Rubber Aggregate	Date Drilled:	2026-07-08
Project Name:	Assessment of Tire Derived Aggregate in Rural Road Construction	Location:	Carman and Winkler, MB
Project Number:	0186-003-00	Description:	Carman - 5th Ave. NE Problem Area
Contractor:	Bicycle Consulting Ltd.	UTM:	14U: 572343.9 E, 5485264.4 N
Equipment:	Toban Truck-Mount	Ground Elevation:	264.67 m
Method:	125 mm Diameter Solid Stem Auger	Total Depth:	3.05 m

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C) Sidewall (SW)															
Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Particle Size (%)					Undrained Shear Strength (kPa)				

END OF HOLE AT 3.0 m

Notes:

- Seepage observed between 1.4 to 1.8 m. No sloughing observed.
- Test hole open to 1.5 m immediately after removal of augers.
- Water level at 0.9 m 2 minutes after removal of augers.
- Test hole backfilled with auger cuttings to surface.

Logged By: Tyler Chapko Reviewed By: Kent Bannister Project Engineer: Ken Skaffeld

Client:	Engineered Rubber Aggregate	Date Drilled:	2026-07-08
Project Name:	Assessment of Tire Derived Aggregate in Rural Road Construction	Location:	Carman and Winkler, MB
Project Number:	0186-003-00	Description:	Winkler - Rd. 20 W Problem Area
Contractor:	Bicycle Consulting Ltd.	UTM:	14U: 579335.3 E, 5450775.6 N
Equipment:	Toban Truck-Mount	Ground Elevation:	266.27 m
Method:	125 mm Diameter Solid Stem Auger	Total Depth:	3.05 m

Sample Type: Grab (G) Shelby Tube (T) Split Spoon (SS) / SPT Split Barrel (SB) / LPT Core (C) Sidewall (SW)															
Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Particle Size (%)					Undrained Shear Strength (kPa)				
						<									

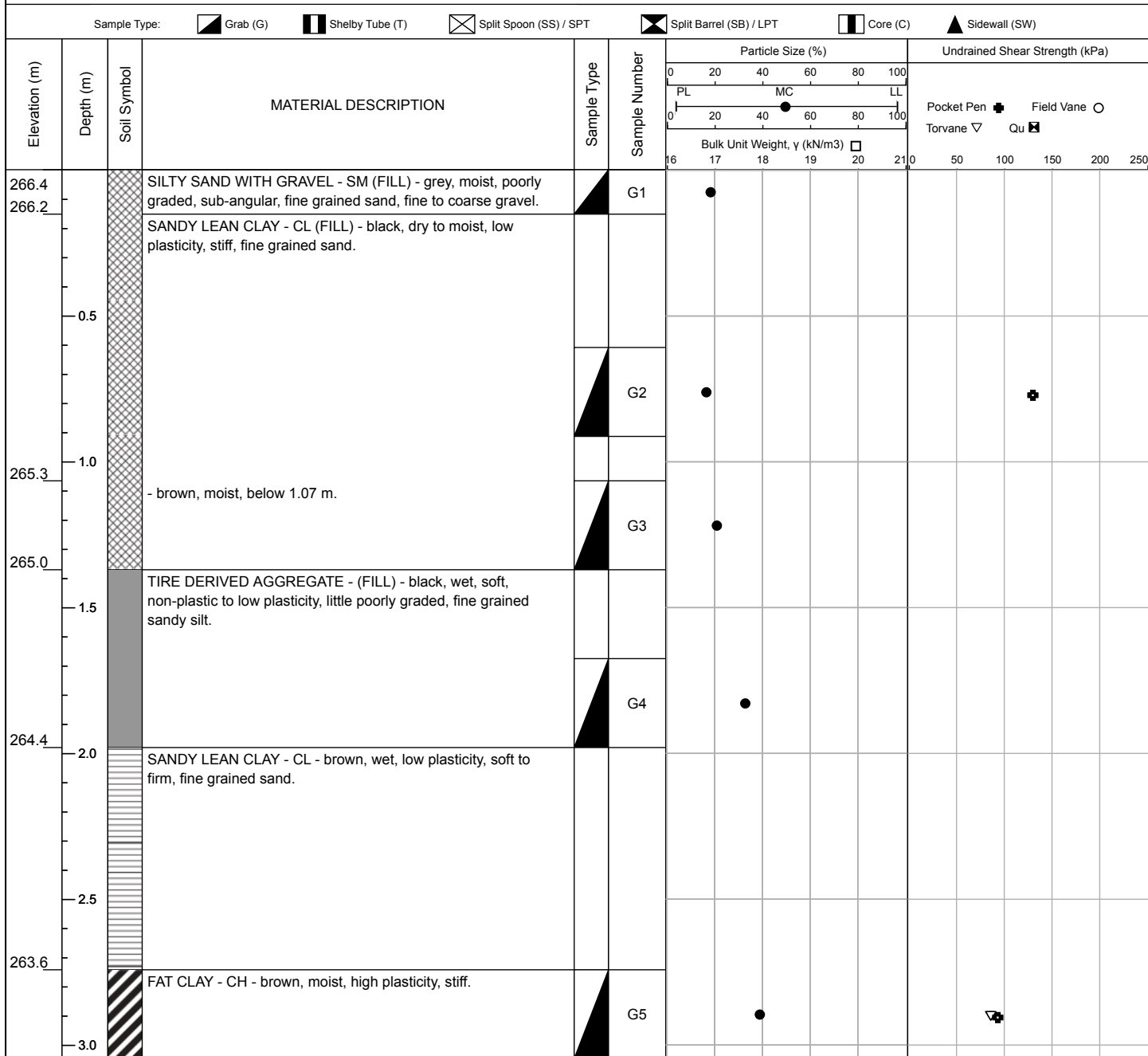
END OF HOLE AT 3.0 m

Notes:

- Seepage observed between 1.4 to 1.8 m. No sloughing observed.
- Test hole open to 0.3 m and free from accumulated water immediately after removal of augers.
- Test hole backfilled with auger cuttings to surface.

Logged By: Tyler Chapko Reviewed By: Kent Bannister Project Engineer: Ken Skaffeld

Client:	Engineered Rubber Aggregate	Date Drilled:	2026-07-08
Project Name:	Assessment of Tire Derived Aggregate in Rural Road Construction	Location:	Carman and Winkler, MB
Project Number:	0186-003-00	Description:	Winkler - Rd. 20 W Minor Problem Area
Contractor:	Bicycle Consulting Ltd.	UTM:	14U: 579336.6 E, 5450725.5 N
Equipment:	Toban Truck-Mount	Ground Elevation:	266.38 m
Method:	125 mm Diameter Solid Stem Auger	Total Depth:	3.05 m

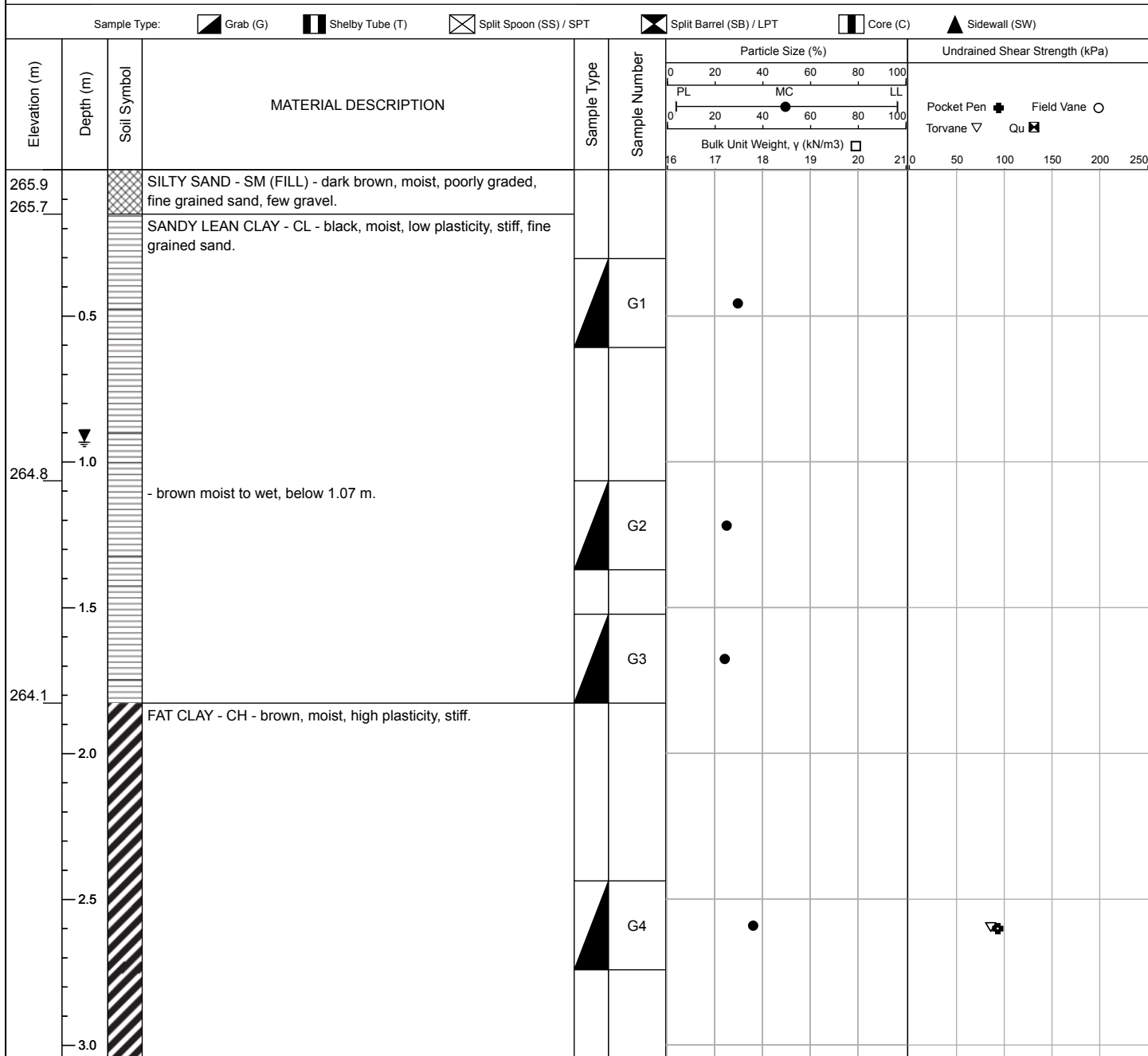


END OF HOLE AT 3.0 m

Notes:

1. Seepage observed between 1.4 to 2.0 m. No sloughing observed.
2. Test hole open to 0.2 m and free from accumulated water immediately after removal of augers.
3. Test hole backfilled with auger cuttings to surface.

Client:	Engineered Rubber Aggregate	Date Drilled:	2026-07-08
Project Name:	Assessment of Tire Derived Aggregate in Rural Road Construction	Location:	Carman and Winkler, MB
Project Number:	0186-003-00	Description:	Winkler - Rd. 20 W Minor Problem Area - Shoulder Hole
Contractor:	Bicycle Consulting Ltd.	UTM:	14U: 579333.0 E, 5450727.9 N
Equipment:	Toban Truck-Mount	Ground Elevation:	265.89 m
Method:	125 mm Diameter Solid Stem Auger	Total Depth:	3.05 m



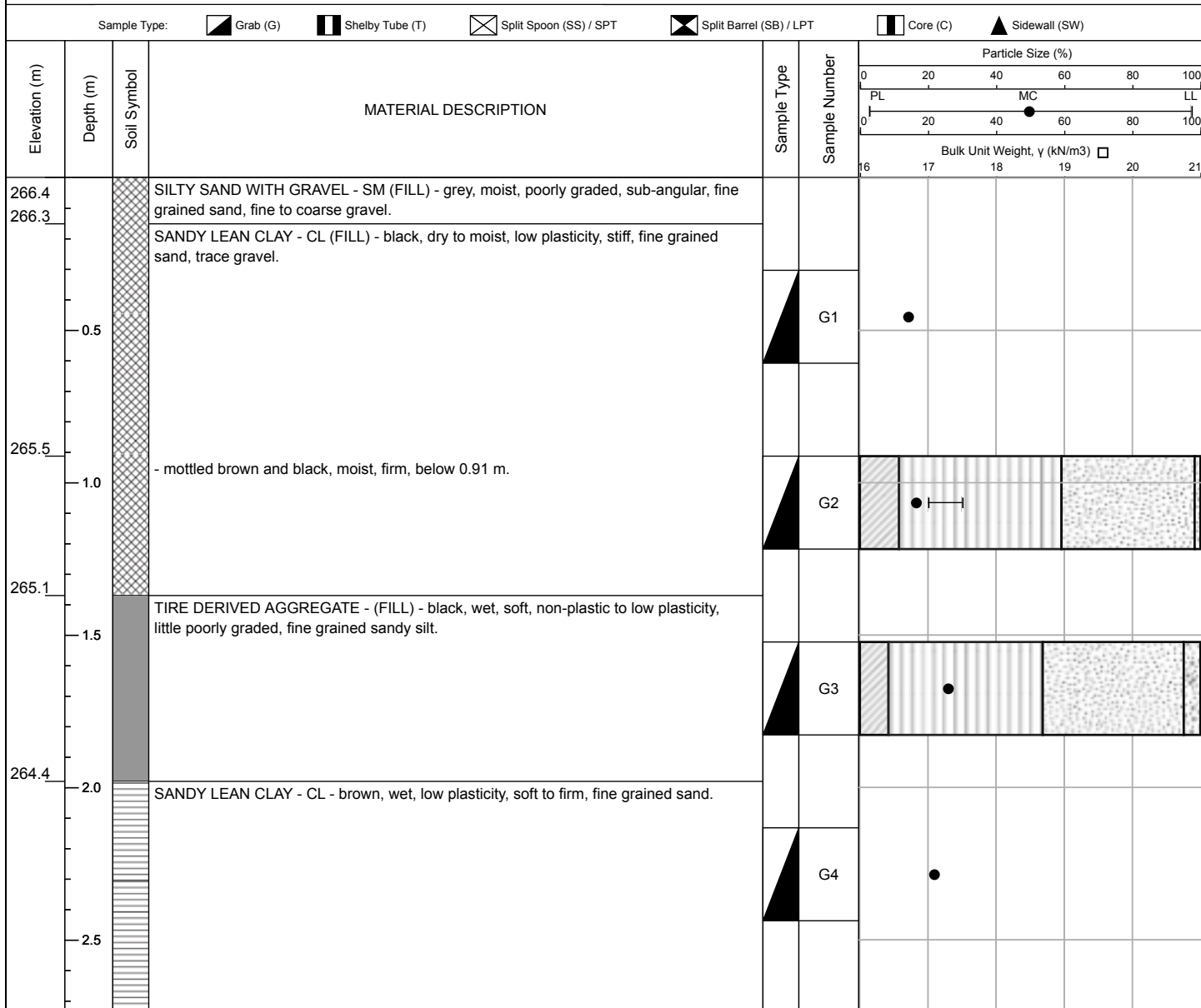
END OF HOLE AT 3.0 m

Notes:

- Seepage and sloughing observed between 1.1 to 1.8 m.
- Test hole open to and water at 0.9 m 30 minutes after removal of augers.
- Test hole backfilled with auger cuttings to surface.

Logged By: Tyler Chapko Reviewed By: Kent Bannister Project Engineer: Ken Skaffeld

Client:	Engineered Rubber Aggregate	Date Drilled:	2026-07-08
Project Name:	Assessment of Tire Derived Aggregate in Rural Road Construction	Location:	Carman and Winkler, MB
Project Number:	0186-003-00	Description:	Winkler - Rd. 20 W Problem Area
Contractor:	Bicycle Consulting Ltd.	UTM:	14U: 579337.3 E, 5450685.3 N
Equipment:	Toban Truck-Mount	Ground Elevation:	266.43 m
Method:	125 mm Diameter Solid Stem Auger	Total Depth:	2.74 m



END OF HOLE AT 2.7 m

Notes:

1. Seepage observed between 1.4 to 2.0 m. No sloughing observed.
2. Test hole open to 0.3 m and free from accumulated water immediately after removal of augers.
3. Test hole backfilled with auger cuttings to surface.

Logged By: Tyler Chapko Reviewed By: Kent Bannister Project Engineer: Ken Skaffeld

Client:	Engineered Rubber Aggregate	Date Drilled:	2026-07-08
Project Name:	Assessment of Tire Derived Aggregate in Rural Road Construction	Location:	Carman and Winkler, MB
Project Number:	0186-003-00	Description:	Winkler - Rd. 20 W Background Hole
Contractor:	Bicycle Consulting Ltd.	UTM:	14U: 579337.0 E, 5450622.0 N
Equipment:	Toban Truck-Mount	Ground Elevation:	266.51 m
Method:	125 mm Diameter Solid Stem Auger	Total Depth:	3.05 m

Sample Type: ☒ Grab (G) ☐ Shelby Tube (T) ☐ Split Spoon (SS) / SPT ☐ Split Barrel (SB) / LPT ☐ Core (C) ☐ Sidewall (SW)

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Particle Size (%)										Bulk Unit Weight, γ (kN/m3)									
						Particle Size (%)										Bulk Unit Weight, γ (kN/m3)									
						Particle Size (%)										Bulk Unit Weight, γ (kN/m3)									
						Particle Size (%)										Bulk Unit Weight, γ (kN/m3)									
266.5			SILTY SAND WITH GRAVEL - SM (FILL) - brown, dry to moist, poorly graded, sub-angular, fine grained sand.																						
266.4																									
	0.5					G1																			
	1.0																								
265.3			SILTY SAND - SM - brown, moist to wet, poorly graded, fine grained sand.		G2																				
	1.5																								
264.8				- wet, below 1.68 m.																					
	2.0																								
	2.5				G3																				
	3.0				G4																				

END OF HOLE AT 3.0 m

Notes:

1. No seepage and sloughing observed.
2. Test hole open to 3.0 m and free from accumulated water immediately after removal of augers.
3. Test hole backfilled with auger cuttings to surface.

Logged By: Tyler Chapko Reviewed By: Kent Bannister Project Engineer: Ken Skaffeld

Appendix A

Laboratory Testing

Date	July 17, 2026
To	Tyler Chapko, TREK Engineering
From	Angela Fidler-Kliewer, TREK Engineering
Project No.	0186-003-00
Project	TSM Special Grant
Subject	Laboratory Testing Results – Lab Req. R26-227

Distribution	Ken Skafffeld
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Attached are the laboratory testing results for the above noted project. The testing included moisture content determinations and particle size distribution (Hydrometer method).

Regards,

Angela Fidler-Kliewer, C.Tech.

Attach.

Review Control:

<i>Prepared By:</i> DS, SCH	<i>Reviewed By:</i> AFK	<i>Checked By:</i> NJF
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Project No. 0186-003-00
Client OTR Recycling
Project TSM Special Grant

Sample Date 08-Jul-26
Test Date 10-Jul-26
Technician H. Sandhu

Test Hole	TH26-01	TH26-01	TH26-01	TH26-01	TH26-01	TH26-01
Depth (m)	0.0 - 0.3	0.6 - 0.9	1.2 - 1.5	1.5 - 1.8	2.1 - 2.4	2.7 - 3.0
Sample #	G01	G02	G03	G04	G05	G06
Tare ID	M21	W15	E30	D34	AH18	P06
Mass of tare	7.0	8.4	6.7	8.7	9.8	8.7
Mass wet + tare	166.0	369.7	164.9	371.5	167.1	169.4
Mass dry + tare	151.5	309.0	134.1	300.5	125.5	127.0
Mass water	14.5	60.7	30.8	71.0	41.6	42.4
Mass dry soil	144.5	300.6	127.4	291.8	115.7	118.3
Moisture %	10.0%	20.2%	24.2%	24.3%	36.0%	35.8%

Test Hole	TH26-02	TH26-02	TH26-02	TH26-02	TH26-02	TH26-03
Depth (m)	0.0 - 0.2	0.5 - 0.8	1.1 - 1.4	1.8 - 2.1	2.4 - 2.7	0.0 - 0.2
Sample #	G01	G02	G03	G04	G05	G01
Tare ID	D226	H25	M58	Z58	E22	QT88
Mass of tare	6.8	8.7	7.1	8.8	8.5	8.5
Mass wet + tare	162.2	158.7	369.5	359.9	168.0	159.0
Mass dry + tare	150.5	138.7	307.0	287.8	123.3	128.8
Mass water	11.7	20.0	62.5	72.1	44.7	30.2
Mass dry soil	143.7	130.0	299.9	279.0	114.8	120.3
Moisture %	8.1%	15.4%	20.8%	25.8%	38.9%	25.1%

Test Hole	TH26-03	TH26-03	TH26-03	TH26-03	TH26-04	TH26-04
Depth (m)	0.5 - 0.8	1.1 - 1.4	1.5 - 1.8	2.1 - 2.4	0.0 - 0.2	0.5 - 0.8
Sample #	G02	G03	G04	G05	G01	G02
Tare ID	P10	F51	D244	H30	K39	AA5
Mass of tare	8.5	8.8	7.1	8.8	8.5	7.0
Mass wet + tare	162.3	163.2	179.3	161.7	173.6	175.0
Mass dry + tare	141.0	139.7	143.2	122.6	151.9	152.7
Mass water	21.3	23.5	36.1	39.1	21.7	22.3
Mass dry soil	132.5	130.9	136.1	113.8	143.4	145.7
Moisture %	16.1%	18.0%	26.5%	34.4%	15.1%	15.3%

Project No. 0186-003-00
Client OTR Recycling
Project TSM Special Grant

Sample Date 08-Jul-26
Test Date 10-Jul-26
Technician H. Sandhu

Test Hole	TH26-04	TH26-04	TH26-04	TH26-05	TH26-05	TH26-05
Depth (m)	1.1 - 1.4	1.5 - 1.8	2.1 - 2.4	0.0 - 0.2	0.6 - 0.9	1.1 - 1.4
Sample #	G03	G04	G05	G01	G02	G03
Tare ID	W101	B23	T72	ZD27	E33	F83
Mass of tare	8.7	6.8	6.7	8.3	6.8	8.5
Mass wet + tare	161.9	171.4	157.2	174.2	165.2	155.3
Mass dry + tare	137.5	135.2	123.8	147.8	142.1	129.3
Mass water	24.4	36.2	33.4	26.4	23.1	26.0
Mass dry soil	128.8	128.4	117.1	139.5	135.3	120.8
Moisture %	18.9%	28.2%	28.5%	18.9%	17.1%	21.5%

Test Hole	TH26-05	TH26-05	TH26-06	TH26-06	TH26-06	TH26-06
Depth (m)	1.7 - 2.0	2.7 - 3.0	0.3 - 0.6	1.1 - 1.4	1.5 - 1.8	2.4 - 2.7
Sample #	G04	G05	G01	G02	G03	G04
Tare ID	M77	E02	P03	A101	Z023	D217
Mass of tare	6.9	7.7	8.7	8.5	6.8	6.8
Mass wet + tare	176.4	160.9	169.9	169.5	153.7	154.2
Mass dry + tare	134.0	117.5	132.4	136.7	124.5	114.6
Mass water	42.4	43.4	37.5	32.8	29.2	39.6
Mass dry soil	127.1	109.8	123.7	128.2	117.7	107.8
Moisture %	33.4%	39.5%	30.3%	25.6%	24.8%	36.7%

Test Hole	TH26-07	TH26-07	TH26-07	TH26-07	TH26-08	TH26-08
Depth (m)	0.3 - 0.6	0.9 - 1.2	1.5 - 1.8	2.1 - 2.4	0.3 - 0.6	1.2 - 1.5
Sample #	G01	G02	G03	G04	G01	G02
Tare ID	D211	QW1	A106	E76	D212	E4
Mass of tare	6.8	6.7	8.3	7.0	6.8	6.7
Mass wet + tare	161.8	363.0	377.5	170.4	360.8	170.2
Mass dry + tare	141.9	311.2	300.5	140.6	296.7	136.4
Mass water	19.9	51.8	77.0	29.8	64.1	33.8
Mass dry soil	135.1	304.5	292.2	133.6	289.9	129.7
Moisture %	14.7%	17.0%	26.4%	22.3%	22.1%	26.1%



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Tel: 204.975.9433

Moisture Content Report ASTM D2216-98

Project No. 0186-003-00
Client OTR Recycling
Project TSM Special Grant

Sample Date 08-Jul-26
Test Date 10-Jul-26
Technician H. Sandhu

Test Hole	TH26-08	TH26-08				
Depth (m)	2.1 - 2.4	2.7 - 3.0				
Sample #	G03	G04				
Tare ID	D12	P12				
Mass of tare	8.6	8.9				
Mass wet + tare	376.1	187.9				
Mass dry + tare	297.7	148.5				
Mass water	78.4	39.4				
Mass dry soil	289.1	139.6				
Moisture %	27.1%	28.2%				

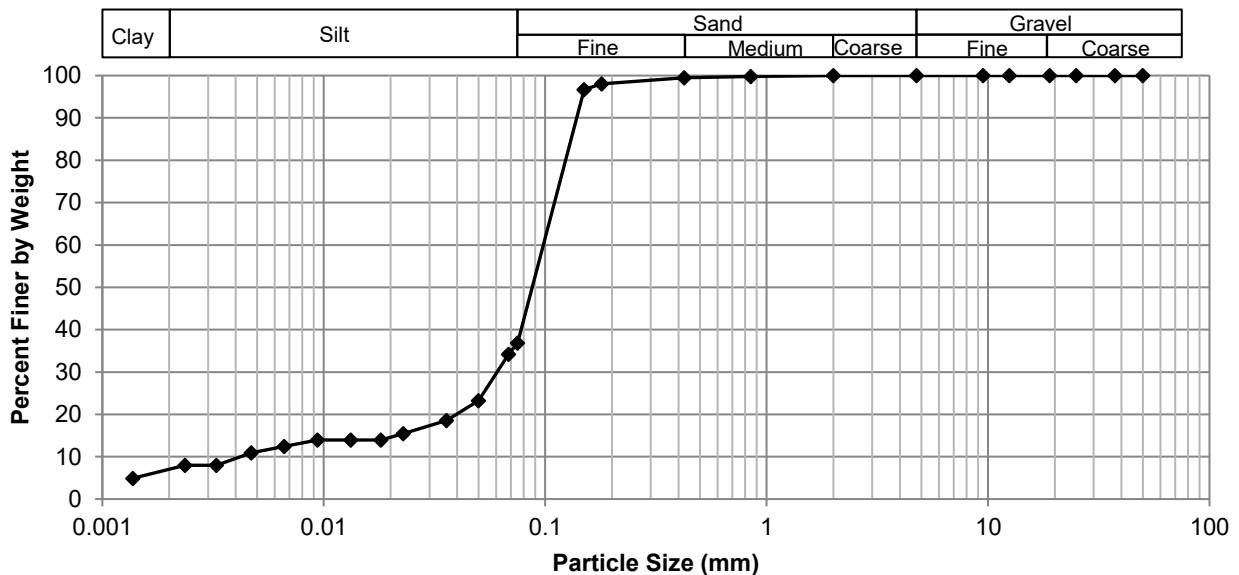
Project No. 0186-003-00
Client OTR Recycling
Project TSM Special Grant



Sample # TH26-01
Test Hole G2
Depth (m) 0.6 - 0.9
Sample Date 08-Jul-26
Test Date 14-Jul-26
Technician D. Sellick

Gravel	0.0%
Sand	63.2%
Silt	30.0%
Clay	6.9%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	36.83
37.5	100.00	2.00	100.00	0.0684	34.20
25.0	100.00	0.850	99.79	0.0500	23.26
19.0	100.00	0.425	99.49	0.0358	18.57
12.5	100.00	0.180	98.04	0.0228	15.49
9.50	100.00	0.150	96.72	0.0181	13.93
4.75	100.00	0.075	36.83	0.0132	13.93
				0.0094	13.93
				0.0066	12.42
				0.0047	10.90
				0.0033	7.98
				0.0024	7.98
				0.0014	4.91

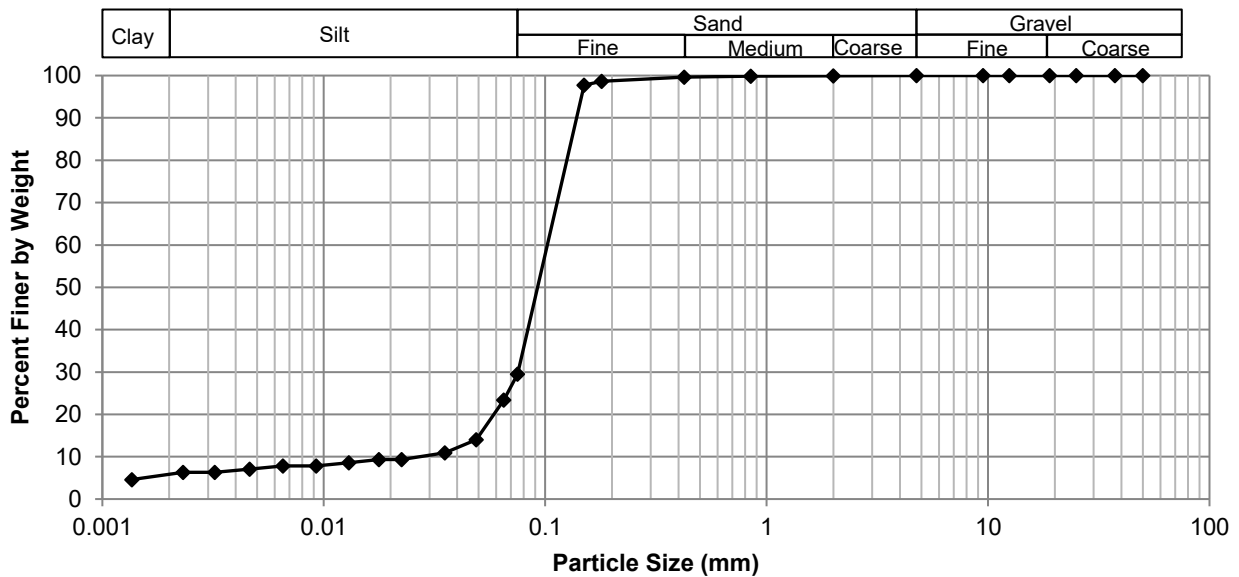
Project No. 0186-003-00
Client OTR Recycling
Project TSM Special Grant



Sample # TH26-01
Test Hole G4
Depth (m) 1.5 - 1.8
Sample Date 08-Jul-26
Test Date 15-Jul-26
Technician D. Sellick

Gravel	0.0%
Sand	70.5%
Silt	23.7%
Clay	5.7%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	29.48
37.5	100.00	2.00	99.90	0.0650	23.40
25.0	100.00	0.850	99.83	0.0489	14.03
19.0	100.00	0.425	99.64	0.0352	10.91
12.5	100.00	0.180	98.64	0.0225	9.34
9.50	100.00	0.150	97.78	0.0178	9.34
4.75	100.00	0.075	29.48	0.0130	8.59
				0.0092	7.81
				0.0065	7.81
				0.0046	7.07
				0.0032	6.31
				0.0023	6.31
				0.0014	4.61

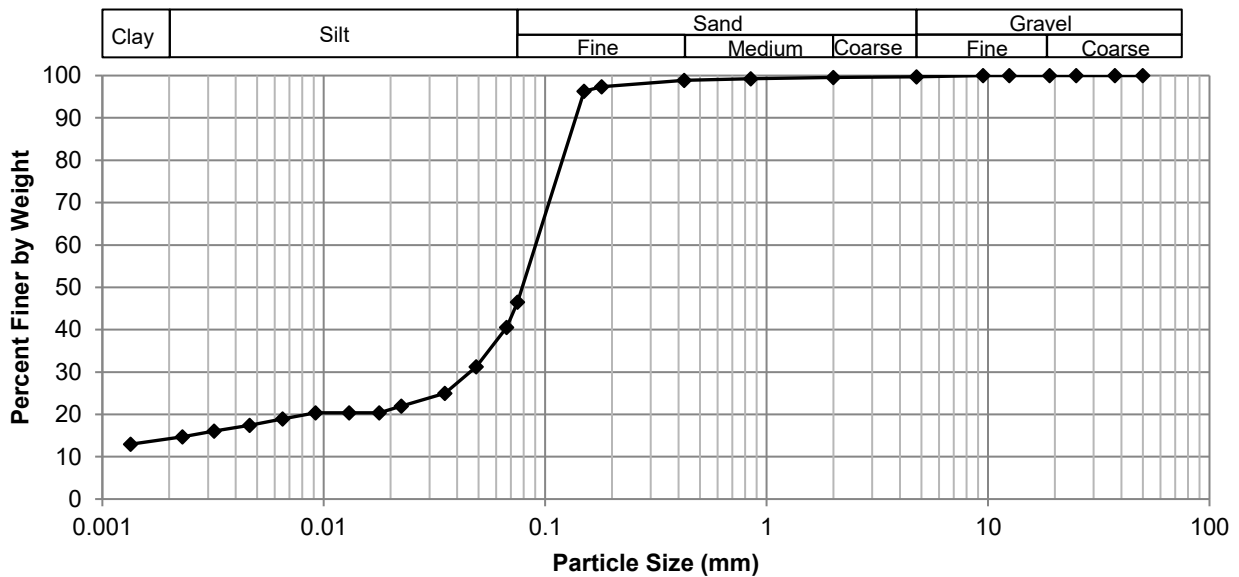
Project No. 0186-003-00
Client OTR Recycling
Project TSM Special Grant



Sample # TH26-02
Test Hole G3
Depth (m) 1.1 - 1.4
Sample Date 08-Jul-26
Test Date 14-Jul-26
Technician D. Sellick

Gravel	0.3%
Sand	53.2%
Silt	32.4%
Clay	14.1%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	99.70	0.0750	46.52
37.5	100.00	2.00	99.53	0.0671	40.55
25.0	100.00	0.850	99.26	0.0489	31.22
19.0	100.00	0.425	98.88	0.0352	24.99
12.5	100.00	0.180	97.37	0.0224	21.93
9.50	100.00	0.150	96.33	0.0178	20.37
4.75	99.70	0.075	46.52	0.0130	20.37
				0.0092	20.37
				0.0065	18.91
				0.0046	17.40
				0.0032	16.07
				0.0023	14.69
				0.0013	12.95

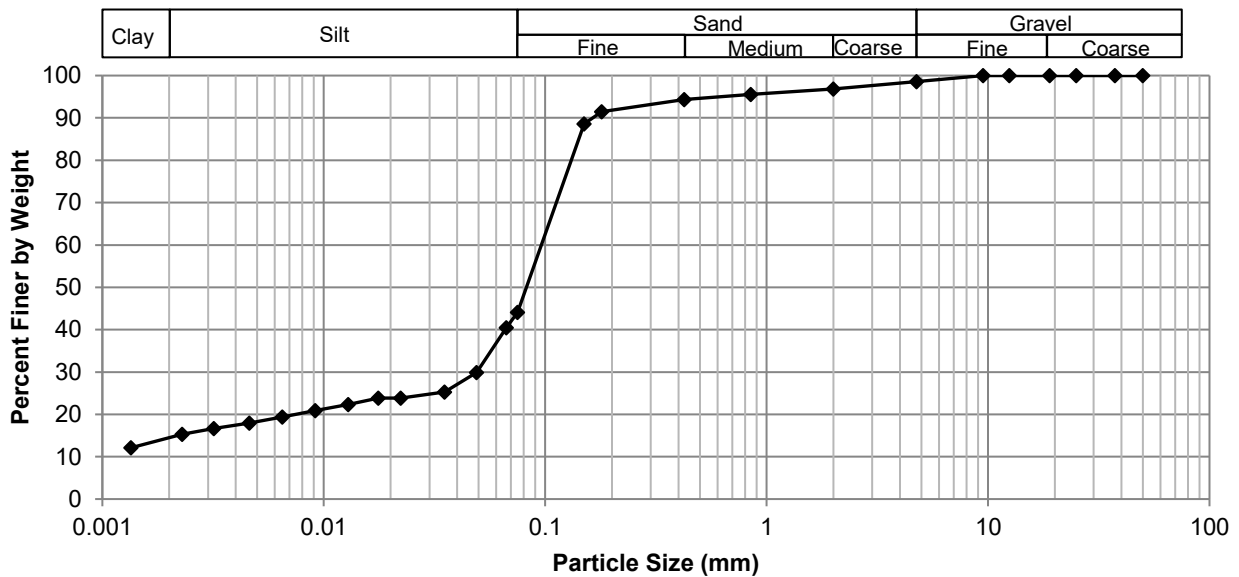
Project No. 0186-003-00
Client OTR Recycling
Project TSM Special Grant



Sample # TH26-02
Test Hole G4
Depth (m) 1.8 - 2.1
Sample Date 08-Jul-26
Test Date 14-Jul-26
Technician D. Sellick

Gravel	1.4%
Sand	54.5%
Silt	29.8%
Clay	14.3%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	98.60	0.0750	44.11
37.5	100.00	2.00	96.85	0.0668	40.47
25.0	100.00	0.850	95.52	0.0489	29.87
19.0	100.00	0.425	94.37	0.0351	25.28
12.5	100.00	0.180	91.50	0.0223	23.81
9.50	100.00	0.150	88.60	0.0176	23.81
4.75	98.60	0.075	44.11	0.0129	22.34
				0.0092	20.88
				0.0065	19.41
				0.0046	17.94
				0.0032	16.65
				0.0023	15.32
				0.0013	12.11

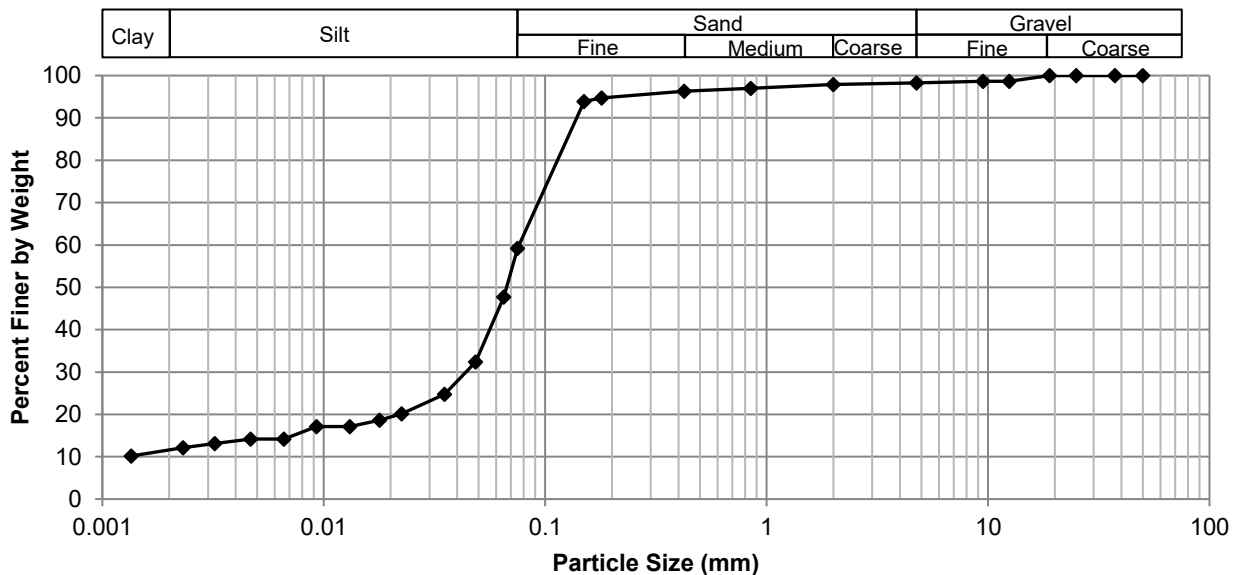
Project No. 0186-003-00
Client OTR Recycling
Project TSM Special Grant



Sample # TH26-07
Test Hole G2
Depth (m) 0.9 - 1.2
Sample Date 08-Jul-26
Test Date 14-Jul-26
Technician D. Sellick

Gravel	1.7%
Sand	39.1%
Silt	47.7%
Clay	11.5%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	98.28	0.0750	59.18
37.5	100.00	2.00	97.88	0.0651	47.70
25.0	100.00	0.850	97.02	0.0485	32.40
19.0	100.00	0.425	96.33	0.0351	24.75
12.5	98.67	0.180	94.74	0.0225	20.16
9.50	98.67	0.150	93.86	0.0179	18.63
4.75	98.28	0.075	59.18	0.0131	17.10
				0.0093	17.10
				0.0066	14.14
				0.0047	14.14
				0.0032	13.14
				0.0023	12.13
				0.0014	10.18

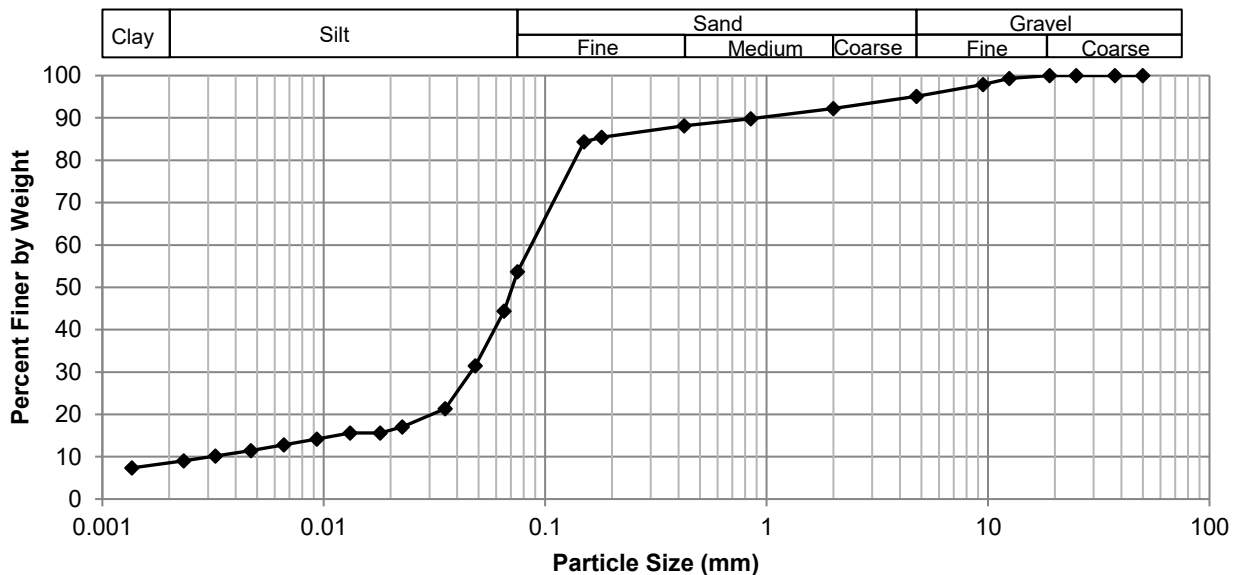
Project No. 0186-003-00
Client OTR Recycling
Project TSM Special Grant



Sample # TH26-07
Test Hole G3
Depth (m) 1.5 - 1.8
Sample Date 08-Jul-26
Test Date 14-Jul-26
Technician D. Sellick

Gravel	4.9%
Sand	41.4%
Silt	45.3%
Clay	8.4%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	95.10	0.0750	53.73
37.5	100.00	2.00	92.20	0.0653	44.41
25.0	100.00	0.850	89.85	0.0484	31.44
19.0	100.00	0.425	88.17	0.0354	21.35
12.5	99.33	0.180	85.45	0.0227	17.03
9.50	97.92	0.150	84.38	0.0180	15.59
4.75	95.10	0.075	53.73	0.0132	15.59
				0.0093	14.20
				0.0066	12.81
				0.0047	11.42
				0.0032	10.19
				0.0023	9.01
				0.0014	7.36

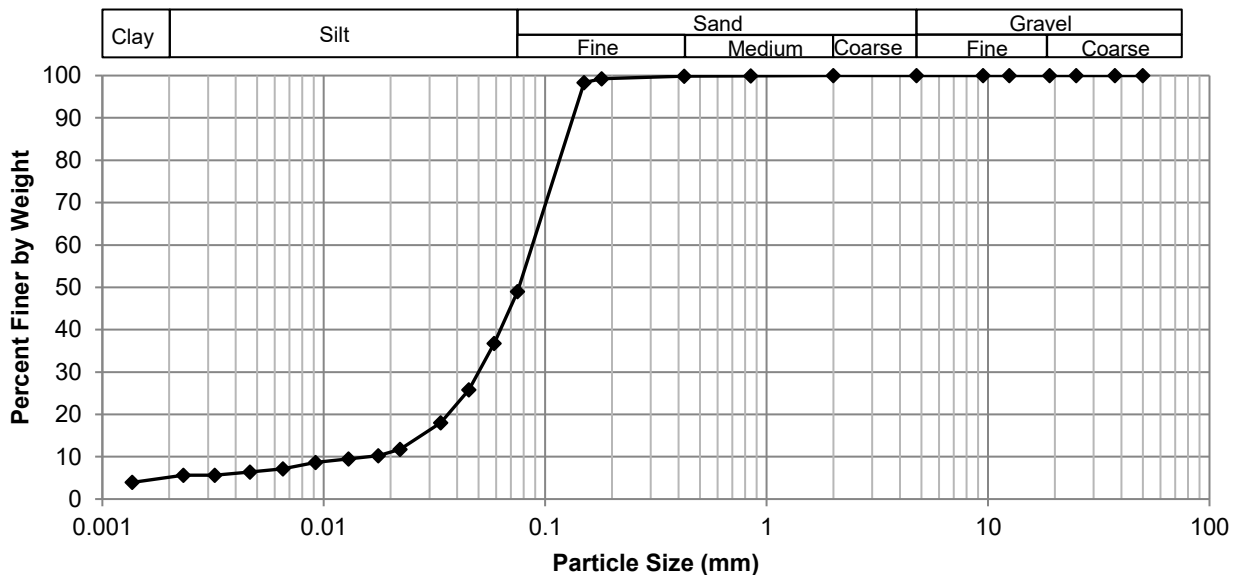
Project No. 0186-003-00
Client OTR Recycling
Project TSM Special Grant



Sample # TH26-08
Test Hole G3
Depth (m) 2.1 - 2.4
Sample Date 08-Jul-26
Test Date 15-Jul-26
Technician D. Sellick

Gravel	0.0%
Sand	51.0%
Silt	43.9%
Clay	5.1%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing	Particle Size (mm)	Percent Passing
50.0	100.00	4.75	100.00	0.0750	48.98
37.5	100.00	2.00	99.98	0.0588	36.79
25.0	100.00	0.850	99.92	0.0452	25.85
19.0	100.00	0.425	99.84	0.0337	18.03
12.5	100.00	0.180	99.25	0.0222	11.78
9.50	100.00	0.150	98.36	0.0176	10.24
4.75	100.00	0.075	48.98	0.0129	9.46
				0.0092	8.68
				0.0066	7.15
				0.0046	6.39
				0.0032	5.67
				0.0023	5.67
				0.0014	3.93

Date	August 11, 2026
To	Tyler Chapko, TREK Engineering
From	Angela Fidler-Kliewer, TREK Engineering
Project No.	0186-003-00
Project	TSM Special Grant
Subject	Laboratory Testing Results – Lab Req. R26-284

Distribution	Ken Skafffeld
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Attached are the laboratory testing results for the above noted project. The testing included Atterberg Limits.

Regards,

Angela Fidler-Kliewer, C.Tech.

Attach.

Review Control:

<i>Prepared By:</i> SCH	<i>Reviewed By:</i> AFK	<i>Checked By:</i> BH
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Tel: 204.975.9433

Atterberg Limits
ASTM D4318-17e1

Project No. 0186-003-00
Client OTR Recycling
Project TSM Special Grant

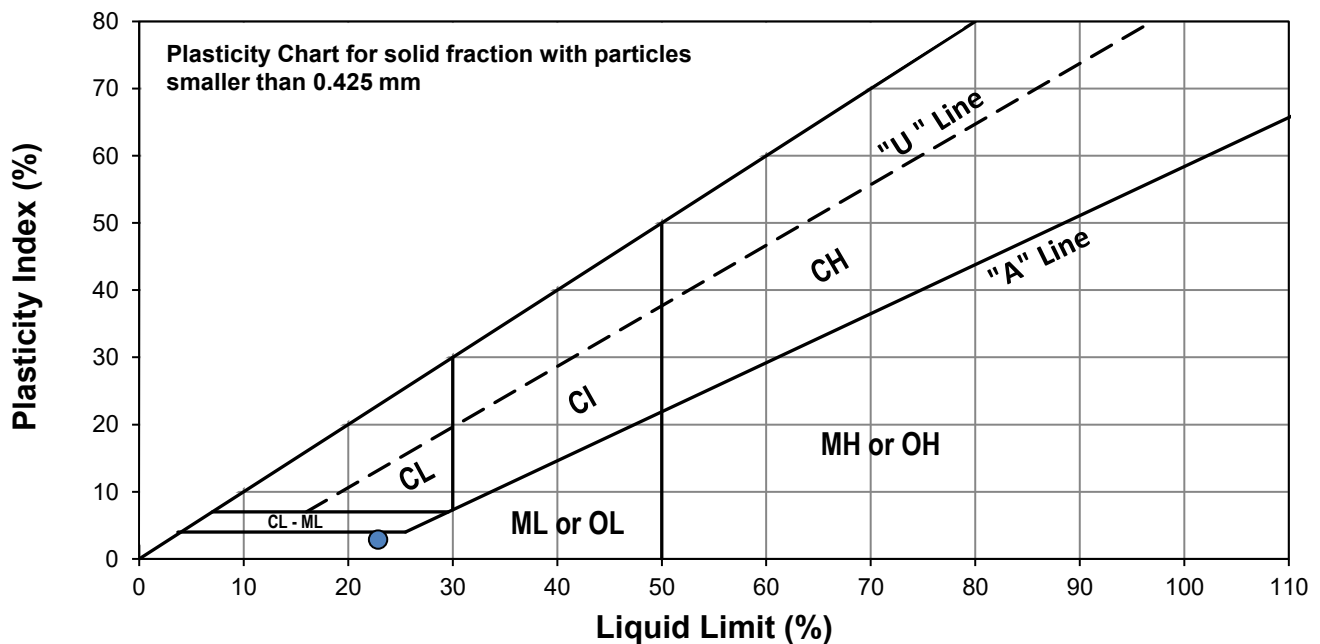


Sample # G3
Test Hole TH26-02
Depth (m) 1.1 - 1.4
Sample Date 07-Aug-26
Test Date 10-Aug-26
Technician D. Sellick

Liquid Limit	23
Plastic Limit	20
Plasticity Index	3

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	17	28	34		
Mass Tare (g)	13.723	13.914	14.151		
Mass Wet Soil + Tare (g)	26.334	24.476	27.052		
Mass Dry Soil + Tare (g)	23.947	22.524	24.681		
Mass Water (g)	2.387	1.952	2.371		
Mass Dry Soil (g)	10.224	8.610	10.530		
Moisture Content (%)	23.347	22.671	22.517		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.167	13.916			
Mass Wet Soil + Tare (g)	22.862	21.710			
Mass Dry Soil + Tare (g)	21.406	20.417			
Mass Water (g)	1.456	1.293			
Mass Dry Soil (g)	7.239	6.501			
Moisture Content (%)	20.113	19.889			

Note: Additional information recorded/measured for this test is available upon request.



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Winnipeg, MB R3H 0L3
Tel: 204.975.9433

Atterberg Limits
ASTM D4318-17e1

Project No. 0186-003-00
Client OTR Recycling
Project TSM Special Grant

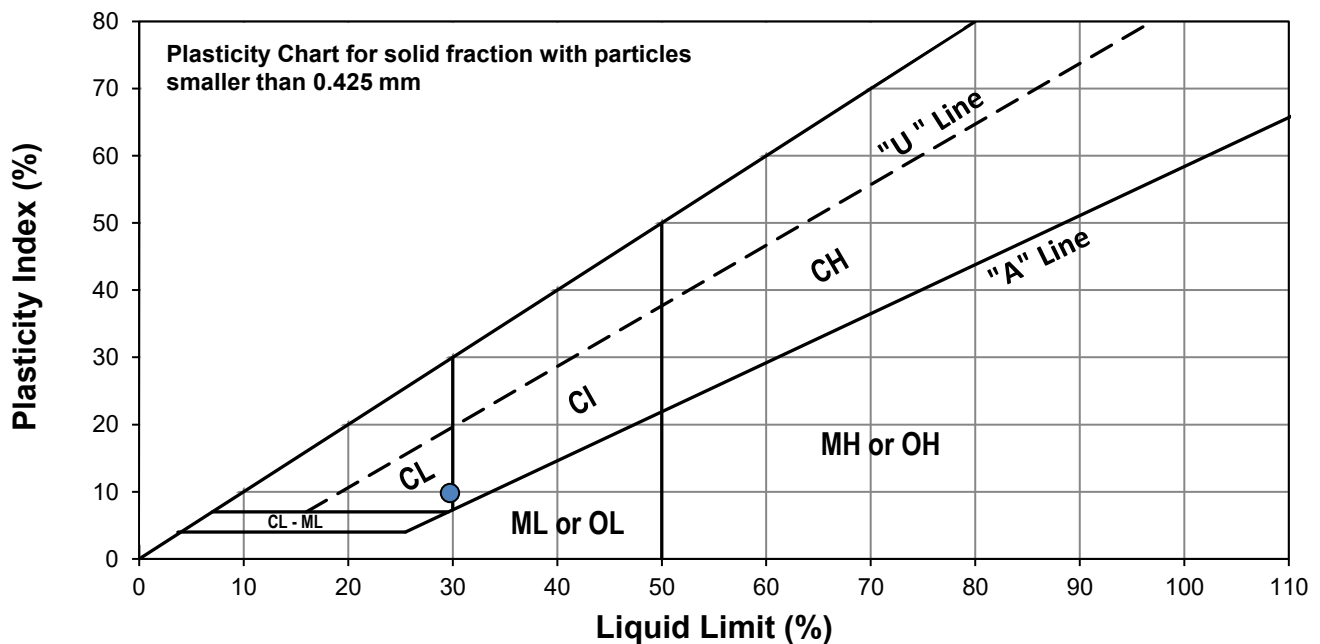


Sample # G2
Test Hole TH26-07
Depth (m) 0.9 - 1.2
Sample Date 07-Aug-26
Test Date 10-Aug-26
Technician D. Sellick

Liquid Limit	30
Plastic Limit	20
Plasticity Index	10

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	16	21	34		
Mass Tare (g)	13.925	13.710	13.949		
Mass Wet Soil + Tare (g)	21.504	23.812	22.694		
Mass Dry Soil + Tare (g)	19.701	21.465	20.743		
Mass Water (g)	1.803	2.347	1.951		
Mass Dry Soil (g)	5.776	7.755	6.794		
Moisture Content (%)	31.215	30.264	28.717		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.972	13.909			
Mass Wet Soil + Tare (g)	21.886	21.761			
Mass Dry Soil + Tare (g)	20.582	20.443			
Mass Water (g)	1.304	1.318			
Mass Dry Soil (g)	6.610	6.534			
Moisture Content (%)	19.728	20.171			

Note: Additional information recorded/measured for this test is available upon request.