Latta Bridge (B027) Replacement

Environmental Impact Assessment Pursuant to Bylaw 7188
Final Report

Prepared for:
City of Edmonton
Edmonton, Alberta

Under Contract to:
BPTEC Engineering Ltd.
Edmonton, Alberta

Project Number EP-917L
October 2021

Prepared by:
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Dear Mr. Adhikari,

Re: AA21-52 - FINAL Environmental Impact Assessment Pursuant to Bylaw 7188 for Latta Bridge Replacement

We are pleased to submit this pdf copy of the above-mentioned final Environmental Impact Assessment (EIA) for City Administration approval to move forward to City Council for approval. This report is intended to fulfil Bylaw 7188 environmental review requirements and includes revisions identified during the City's draft EIA review process. A concordance table documenting reviewers' comments and the project team's responses is included in the final EIA in Appendix E.

Please contact the undersigned if you require additional information.

Sincerely,

Spencer Environmental
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Table of Contents

List of Tables

List of Plates

1.0 INTRODUCTION

The City of Edmonton proposes to replace the aging and deteriorating Latta Bridge (B027), which carries Jasper Avenue over Latta Ravine near 91 Street (Plates 1.1-1.3)(Figure 1, Appendix A). The Latta Bridge was originally constructed as a trestle bridge over the Latta Ravine in 1911 [Thurber Engineering (Thurber) 2021a; Appendix B]. Coal mining in the area began in 1910 and continued until the mid-1920s, including underground under the ravine and bridge. Mine subsidence in the 1920s caused significant settlement of the bridge structure. Consequently, an attempt to infill the ravine in 1928 was made to eliminate the need for a bridge crossing, however, ongoing subsidence from collapsing coal mines under the site brought that initiative to an end (Thurber 2021a; Appendix B). The trestle bridge was replaced with the current five-span steel structure in 1936 once coal mine subsidence appeared to have stabilized.

The existing bridge is a 5-span steel structure approximately 62 m long and 16.3 m wide supported by rocker bents on concrete pedestals and is a Provincially Designated Historic Resource (BPTEC & Stantec 2021). It is oriented in a general north-south direction with a slight skew to the east. The clear roadway width is 12.2 m, accommodating four lanes of undivided traffic. Pedestrian sidewalks are located on both sides of the bridge, which are 1.5 m wide each and separated from the traffic lanes by steel railings on a concrete curb. The bridge was rehabilitated in 1977 and 2004 and now requires replacement to maintain safe operation (BPTEC & Stantec 2021).

Latta Ravine is short and deeply incised with steep slopes under the Latta Bridge. The terminus of the short ravine is immediately west of the bridge at 91 Street. There is an informal bare-earth City maintenance path from 91 Street that descends down the slope and under the bridge ultimately connecting with Dawson Park in the North Saskatchewan River Valley (NSRV) bottom. The west side of the bridge comprises medium- and high-density residential while the east side of the bridge comprises vegetated NSRV slopes descending to Dawson Park. There is an existing formal lookout structure located at the northeast corner of the bridge and a 115-year old Manitoba maple heritage tree located near the southeast corner of the bridge.

There are numerous existing utilities under, on and adjacent the bridge including an active EPCOR 250 to 300 mm combined sewer (CSO) (BPTEC & Stantec 2021). That CSO is located approximately 10 m underground and lies parallel and west of the north bridge abutment, then angles towards the east (southeast) and crosses under the bridge near the trail in the bottom of the ravine.

Plate 1.1. View to southwest of Latta Bridge on Jasper Avenue (11 September 2020).

Plate 1.2. View to northeast under Latta Bridge (02 August 2019).

Plate 1.3. View to southeast under Latta Bridge (02 August 2019).

Latta Bridge and adjacent lands needed for replacement activities are wholly located within the boundaries of the City of Edmonton's North Saskatchewan River Valley Area Redevelopment Plan (NSRV ARP) (Bylaw 7188) and, therefore, trigger the need for an environmental review pursuant to that Bylaw (Figure 1, Appendix A). City Planning determined at a project scoping meeting held on 26 February 2021 that an Environmental Impact Assessment (EIA) is the appropriate level of environmental review for the proposed project to remain in compliance with Bylaw 7188. The EIA will require City Council approval.

The replacement bridge will occupy the same footprint as the existing bridge, however, there is a need to slightly expand the roadway right-of-way (ROW) by 2-3 m on the east side of the bridge to accommodate a slightly wider shared-use path (SUP) sidewalk (Appendix C). In addition, several localized, temporary easement areas are required to accommodate construction activities and laydown areas. The City's legal department has reviewed the proposed project including the proposed ROW and easement areas and has determined that a separate Site Location Study (SLS) is not required pursuant to Bylaw 7188 for the proposed bridge replacement project (M. Schutta, *pers. comm.*).

This report comprises the Bylaw 7188 EIA prepared in support of the proposed Latta Bridge replacement project. The EIA format and content follow a project-specific Terms of Reference (ToR) (Appendix D), informed by the NSRV ARP Guide to Completing Environmental Impact Assessments Environmental Review ToR and adapted with additional subsections to include all information relating to site plans, the project location and anticipated project activities.

The draft EIA was submitted to City Planning for Bylaw 7188 review and circulation. Reviewers' comments from the initial circulation and a second circulation as well as the project team's responses are captured in a concordance table provided in Appendix E. This final EIA report reflects responses to reviewer comments as noted.

2.0 THE PROPERTY

2.1 Project Area Location, Disposition, Zoning

The Latta Bridge local study area assessed by this EIA encompasses Latta Ravine (NE 4-53-24-W4M) under and adjacent the Latta Bridge in the vicinity of 91 Street and Jasper Avenue. Figure 1(Appendix A) illustrates the bridge's location in relation to Bylaw 7188 and adjacent lands. The bridge and adjacent lands are located on City-owned lands and lands in the local study area are zoned as Metropolitan Recreation Zone (A), Low Rise Apartment Zone (RA7), High Rise Apartment Zone (RA9), Urban Services Zone (US), and Small-Scale Infill Development Zone (RF3) (Figure 2, Appendix A). The local study area is located outside of the City's Flood Protection Overlay and the Government of Alberta's Flood Hazard Mapping.

2.2 Historic Conditions

Historical aerial photograph review was limited to available City of Edmonton pictometry imagery for 2007, 2013-2018 and 2020, as well as Google Earth (2020) imagery that spanned the period of 2002 to 2020. Very little change in development was observed on the available aerial photographs in the Latta Bridge area and vicinity during this period as this area of the city and the river valley is located in Central Edmonton and has been developed for decades.

2.3 Environmental Site Assessment

Thurber (2021b) completed an Environmental Overview (EO) and a Phase II Environmental Site Assessment (ESA) for the proposed project. A summary is provided below with Thurber's full report provided in Appendix F.

2.3.1 Environmental Overview

The EO was conducted in general accordance with the *City of Edmonton Site Assessment Guidebook* to identify areas of potential environmental concern at the bridge site and adjacent properties. The EO scope of work included the following:

- Review of site history.
- Site reconnaissance.
- Assessment and report preparation.

Based on the information reviewed in support of the EO, Thurber (2021b; Appendix F) determined that the available historical evidence did not indicate that the bridge site was contaminated. However, Thurber (2021b) did identify areas of potential environmental concern (APECs) including lead-based paint on the bridge coating material, fill material of an unknown origin present at the site at depths of up to approximately 4 m below ground surface and the presence of subsurface refuse material in the vicinity of the bridge (exact location unknown). Based on these findings, Thurber (2021b) then conducted a Phase II

ESA to assess the identified APECs and to establish baseline soil and groundwater conditions.

2.3.2 Phase II ESA

The Phase II ESA was undertaken according to CSA Standards and Thurber's (2021b; Appendix F) scope of work comprised the following:

- Advancement of 21 hand-augered test holes beneath the bridge, at the bridge drip lines, at 5 m and 10 m step-outs from the bridge.
- Drilled three test holes at the north and south abutments of the bridge and in the middle of Latta Ravine to depths ranging from 12.2 m to 13.1 m below the ground surface.
- Installed three groundwater monitoring wells in the drilled test holes.
- Submitted selected soil samples and field duplicates for chemical analyses of BTEX (benzene, toluene, ethylbenzene and xylene) and petroleum hydrocarbons (PHC), F1 to F4 fractions, polycyclic aromatic hydrocarbons (PAHs), metals, soil salinity and grain size.
- Measured depth to groundwater and collected water samples for analyses of BTEX, PHC fractions F1 and F2, PAHs, dissolved metals and routine chemistry parameters.
- Collected five paint samples from the bridge surface coating and submitted them for lead chemical analyses.

Laboratory analyses identified lead concentrations and PHC fractions F2 to F4 in a fill sample from a test hole in the bottom of Latta Ravine that did not meet Alberta Environment and Parks (2019) Tier 1 Guidelines (Thurber 2021b; Appendix F). Evidence of salt impacts likely related to winter roadway maintenance activities were also identified in some surficial fill samples collected near the bridge's north and south abutments based on elevated salinity parameters, which were rated as poor and unsuitable. The soil assessment also identified lead and zinc concentrations not meeting AEP (2019) Tier 1 Guidelines in several surficial samples that were collected in the vicinity of the site.

Groundwater samples met the applied guidelines for BTEX, PHC fractions F1 and F2 and PAHs. Concentrations of some dissolved metals and routine parameter in groundwater including uranium, sodium, manganese, chloride, sulfate and TDS did not meet guidelines, but were observed to be similar to elevated concentrations commonly encountered in groundwater in the Edmonton area (Thurber 2021b; Appendix F).

Lead concentrations in three of the five paint samples collected from the bridge did not meet federal guidelines. Based on these results, Thurber (2021b) recommended that the following measures be taken during construction to reduce the potential human health and environmental risks associated with lead-based paint:

- The lead paint must be captured and fully contained during coating removal and dismantling operations to ensure that it is not released to the surrounding environment.
- Lead paint must be securely contained while it is awaiting proper disposal and then conveyed by a licensed hazardous waste transporter to a licensed waste disposal facility.

Thurber (2021b; Appendix F) recommended that a Phase III ESA be conducted to determine the vertical and lateral extents of the soil contamination in the vicinity of the site. The Phase III ESA would include advancement of up to 70 test holes and submission of soil samples for lead, zinc, PHCs, PAHs, and grain size analyses. The test holes would be advanced to a depth of up to 3 m using a small truck-mounted drill rig. The Phase III ESA report would include an outline of the contamination plume and estimated volume of impacted material (BPTEC and Stantec 2021).

2.3.3 City of Edmonton Construction Management Plan (Contamination Risk Management Plan

In response to the above-noted Phase II ESA results, the City prepared a final Construction Management Plan (contamination risk management plan) (finalized on 09 July 2021) to address concerns associated with the presence of contaminated soil during construction (Appendix G). That document details the management measures required during construction to ensure the safety of workers and the public and to ensure proper handling and disposal of excavated soil during the bridge replacement activities. It is understood that the City will conduct additional soil sampling and testing in the project area during detailed design and that the Construction Management Plan will be updated accordingly for inclusion in future tender documents.

2.3.4 Soil Quality Assessment

Crimson Environmental Limited (Crimson)(2021; Appendix H) was retained by the City to conduct a soil quality assessment of the area immediately under and/or adjacent the Latta Bridge to determine the quality of surface soils in the project area. Their scope comprised 1) determination of the soil quality of laydown and easement areas prior to construction, and 2) delineation of impacts from lead, zinc and/or polycyclic aromatic hydrocarbons (PAHs) that were previously identified in the Phase II ESA. Field investigations were conducted on 21 and 28 July 2021 and 08 August 2021 and comprised advancement of 31 boreholes. A total of 67 soil samples was collected and analyzed. Crimson's (2021) detailed results are provided in their report in Appendix H. Crimson also prepared a Record of Site Condition report, which is also provided in Appendix H.

3.0 ENVIRONMENTAL CONTEXT

3.1 Overview of Study Area and Adjacent Lands

Latta Bridge carries Jasper Avenue over Latta Ravine near 91 Street. Latta Ravine is oriented east-west and is approximately 70 m wide and 12 m deep (Thurber 2021a; Appendix B). The ravine is located along the west boundary of Dawson Park at the top of the west North Saskatchewan River Valley (NSRV) slope. There are no watercourses in the ravine; however, any surface water drainage resulting from heavy rainfall events and snow melt flows locally downslope in the general direction of Dawson Park and the more distant North Saskatchewan River (NSR). An undeveloped maintenance access path begins at 91 Street and descends under the bridge and towards Dawson Park in the valley bottom. This trail also is used by the public to connect to the informal and formal SUP trails in Dawson Park.

The EIA study area was defined at two scales: local and expanded. The extent of the bridge replacement work limits and laydown areas form the local study area (LSA) (Figure 3, Appendix A). The LSA comprises lands that have potential to be directly impacted by proposed bridge replacement activities, permanently or temporarily. An expanded study area was established for assessment of some resources, such as environmental sensitivities and wildlife movement, and included all of Latta Ravine, adjacent (structurally connected) river valley lands that may be indirectly affected, and adjacent residential areas as shown in Figure 3 (Appendix A).

3.2 Environmental Sensitivities

3.2.1 Original (2016) Mapping

Figure 4 (Appendix A) shows the results of the City of Edmonton environmental sensitivities analysis and classification mapping (Solstice 2016) in the proposed project vicinity, with the LSA overlaid. Latta Ravine was mapped as 'moderate' and 'high value' on the west side of Latta Bridge and 'high', 'very high' and 'extremely high value' to the east of the bridge. Manicured lands proposed as laydown areas adjacent Jasper Avenue were mapped as either 'high' or 'moderate value'. Lands within the NSRV are generally mapped as 'very high' or 'extremely high value', with more developed areas of Dawson Park being mapped as either 'moderate' or 'high value'. The City considers lands mapped as having 'high', 'very high', and 'extremely high value' to be lands suitable for protection or conservation, while lands with a lower value (i.e., 'low' and 'moderate value') are suitable for restoration/stewardship.

3.2.2 Refined Mapping

3.2.2.1 Methods

As requested by the ToR (Appendix D), using the 2021 site-specific vegetation data and mapping, we re- analyzed City of Edmonton's Environmental Sensitivities (2016) GIS layer for the study area. In particular, we updated the input Ecological Asset scores for the Natural Vegetation ('AVegNat2' attribute), and for the Non-Native Vegetation ('AVegNoNat1' attribute). Overlay analysis (union function) was used to intersect the

2021 vegetation polygons with the 2016 Environmental Sensitivities polygons. This not only allowed us to update the relevant scores, it also allowed us to break up the larger 2016 mapped polygons to reflect our finer scale 2021 mapped polygons. Scores were updated as shown in Table 3.1.

Table 3.1. Sensitivity Analysis Refinement

Where 2021 Vegetation were observed to be...	…the respective Environmental Sensitivities attribute was updated to:
Balsam Poplar Mixed Shrubs (PB.1)	If not originally so, update to: Natural Vegetation (‘AVegNat2’ attribute) = 2 score; Non-Native Vegetation (‘AVegNoNat1’ attribute) = 0 score.
Non-Forest Caragana - Steep Slopes (NF.1)	If not originally so, update to: Non-Native Vegetation (‘AVegNoNat1’ attribute) = 1 score; Natural Vegetation (‘AVegNat2’ attribute) = 0 score.
Non-Forest Smooth Brome - Steep Slopes (NF.6)	If not originally so, update to: Non-Native Vegetation (‘AVegNoNat1’ attribute) = 1 score; Natural Vegetation (‘AVegNat2’ attribute) = 0 score.
Manicured (M)	If not originally so, update to: Non-Native Vegetation (‘AVegNoNat1’ attribute) = 1 score; Natural Vegetation (‘AVegNat2’ attribute) = 0 score.

With the scores updated, the Environmental Sensitivities analysis – whereby Assets, Threats and Constraints were summed – was re-run using the model formula as per originally prescribed by Solstice Canada (2016) to produce the new cumulative Environmental Sensitivities layer for the study site. The original final score categorical classes were used to bin the new scores.

3.2.2.2 Description

Figure 5 (Appendix A) shows the results of the refined (2021) City of Edmonton environmental sensitivities mapping within the LSA. The refined mapping decreased the value of a small area adjacent to the east side of Latta Bridge from ‘high value’ to ‘moderate value’. A small area located to the east of the proposed south laydown area was upgraded from ‘moderate value’ to ‘high value’. No other changes in values were noted.

3.3 Surface Water, Groundwater and Fish Habitat

3.3.1 Methods

Surface Water

Surface water within the vicinity of the project was described based on examination of topographic maps and field observations during site visits on 02 August 2019, 11 September 2020, 22 June 2021 and 13 July 2021. The Fish and Wildlife Management Information System (FWMIS) (AEP 2021) was searched for evidence of mapped watercourses within Latta Ravine. Relevant environmental assessments were also reviewed.

Groundwater

Thurber (2021a) installed four (4) vibrating wire piezometers in test holes TH20-1 (2 installed at different depths), TH20-2 and PN10-4 during drilling investigations on between 21 March 2020 and 06 April 2020. Piezometers were installed to a depth of either 12.2 m below ground surface or 33.5 m below ground surface. Piezometers were completed with a sand pack, grout and bentonite seal to the ground surface. Groundwater levels were then checked on 24 March 2020 (Thurber 2021a). Thurber's full report can be found in Appendix B.

Fish Habitat

There are no watercourses in Latta Ravine, therefore, there is no fish habitat present in the project area. Fish and fish habitat, therefore, will not be discussed further in this EIA.

3.3.2 Description

Surface Water

A FWMIS (AEP 2021) search returned no results for a mapped watercourse or other waterbodies in Latta Ravine that would suggest the presence of a current or historical watercourse and no evidence of the presence of any waterbodies was observed in Latta Ravine during site investigations. Local surface water runoff, particularly after significant rainfall or snow melt events, likely periodically collects in the bottom of the ravine under the bridge and flows downhill along the informal maintenance path towards Dawson Park. The NSR is located approximately 290 m east of the bridge and it is unlikely that surface water flows would directly enter the river from the bridge area considering the distance to the river from the bridge and the presence of vegetation on intervening lands. Evidence of some erosion from surface runoff was observed on the bridge abutments during site visits (Plate 3.1).

Plate 3.1. Erosion rills created by surface water runoff present on bridge abutment (02 August 2019)

Bridge Drainage

The existing bridge structure contains four storm drains (two on each side) located at piers 2 and 3 (BPTEC & Stantec 2021). The drains are connected to pipes, which convey flows down the west sides of the pier bents towards the underground CSO that crosses under the bridge. Stormwater catch basins connected to the CSO network are located along Jasper Avenue north and south of the bridge, with the north catch basins closest to the bridge (BPTEC & Stantec 2021).

Groundwater

On 24 March 2020 ground water levels were observed at 8.7 m, 12.2 m and 33.5 m below ground surface (Thurber 2021a, Appendix B). These results indicated a perched water level in the overburden soils between an elevation of 649 m and 653 m, and a deeper groundwater level in the bedrock at an approximate elevation of 628 m. Several groundwater levels may be present within the bedrock associated with and controlled by the different coal seams (Thurber 2021a, Appendix B).

Thurber (2021a; Appendix B) noted that these are relatively short-term readings and the stabilized water level could be higher. Groundwater levels are known to fluctuate seasonally and may rise in times of high precipitation levels.

3.4 Geology/Geomorphology

3.4.1 Methods

Thurber (2021a, Appendix B) conducted a geotechnical investigation in support of the proposed project comprising desktop analysis (review of published geological information, LiDAR topography and historical bridge reports) and field investigations in two phases. At the City's request, Thurber drilled three test holes (TH20-1 to TH20-3) and installed geotechnical instrumentation for Phase 1 in April 2020. Phase 2 was completed for the BPTEC project team in September 2020 and comprised drilling an additional three test holes (TH20-4 to TH20-6), logging conditions and taking samples (Thurber 2021a, Appendix B).

Full depth inclinometers and vibrating wire piezometers were installed in test holes TH20-1 and TH20-2. Laboratory testing included moisture content determination, visual description and classification of all soil samples. In addition, Atterberg Limits, grain size analyses, and water-soluble sulphate content tests (Thurber 2021a, Appendix B).

Limited equilibrium slope stability analyses were carried out using the SLOPE/W computer program to assess the current state of stability of the bridge headslopes. Stability analyses were carried out using generalized soil stratigraphy and groundwater levels were obtained from the results of the drilling investigations.

Thurber (2021a, Appendix B) also reviewed The Alberta Energy and Utilities Board records ("Coal Mine Atlas" 4th edition, March 2004) to provide relevant information on the former coal mining operations in the vicinity of Latta Bridge.

Thurber's (2021a) full report can be found in Appendix B.

3.4.2 Description

Geomorphology

Thurber determined that Latta Ravine is approximately 70 m wide and 12 m deep at the bridge crossing location with north and south ravine slopes measured as approximately 24 degrees and 28 degrees, respectively (2.2H:1V and 1.9H:1V, respectively) (Plate 3.2) (Thurber 2021a; Appendix B). In addition, they observed that the the ravine deepens to about 13 m at an overall slope of approximately 28 degrees (1.9H:1V) along the south bank in the north-east direction.

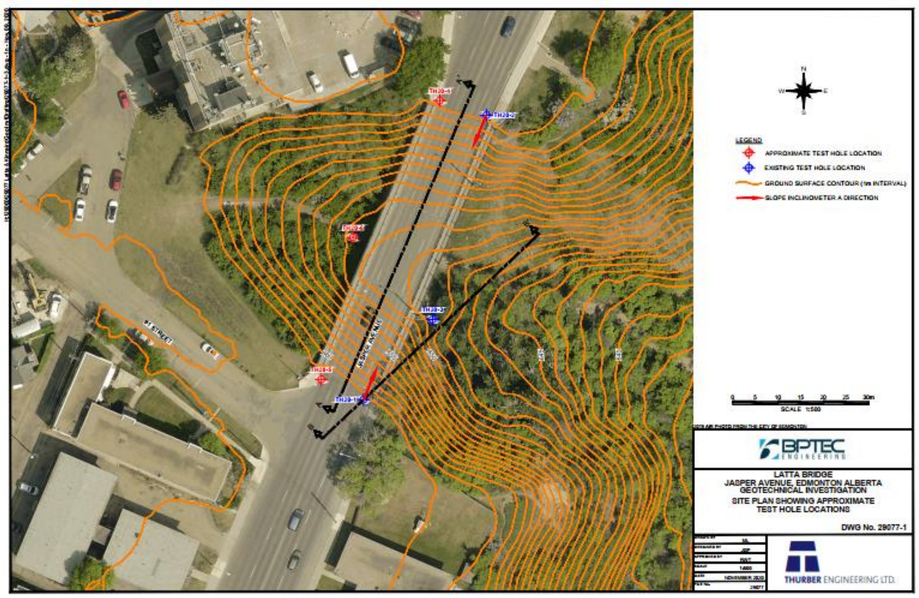

Plate 3.2. Contour lines of Latta Ravine at the bridge crossing site (Thurber 2021a; Appendix B).

Subsurface Conditions

Surficial deposits encountered at the south abutment comprised asphalt/concrete and granular fill overlying a firm to stiff high plastic clay fill layer extending to a depth of 3.7 m. Clay till containing sand layers extended to a depth of 19 m, overlying Empress Formation (preglacial sands) sand to a depth of about 24.4 m, overlying bedrock of the Edmonton Formation consisting of Upper Cretaceous non cemented clay shale with interbedded layers of sandstone and coal. Three distinct coal seams were noted (Thurber 2021a, Appendix B).

Surficial deposits encountered at the north abutment consisted of asphalt and granular fill overlying a firm to stiff high plastic clay fill layer extending to a depth of 5.5 m, overlying clay till containing sand layers and extending to a depth of 18.3 m, overlying Empress Formation sand to a depth of about 25.9 m, overlying bedrock of the Edmonton Formation consisting of Upper Cretaceous non cemented clay shale with interbedded layers of coal and sandstone (Thurber 2021a, Appendix B).

At the bottom of the ravine surficial deposits consisted of a firm to very stiff clay fill layer extending to a depth of 3.8 m, overlying clay till up to a depth of 8.8 m, overlying Empress Formation sand to a depth of about 13 m, overlying bedrock consisting of clay shale with interbedded layers of coal and sandstone (Thurber 2021a, Appendix B).

Slope Stability

Indications of slope instability were present at the south abutment, which appeared to be due to slow, ongoing creep movements (Thurber 2021a, Appendix B). The south abutment appeared to be moving primarily northwards towards the ravine; however, there may also be a lateral component to the movement as a result of landslides located east of the bridge.

The results of Thurber's (2021a, Appendix B) slope stability analysis indicated that the south ravine bank had a factor of safety ranging from about 1.2 to 1.3 depending on the shear strength parameters assumed. The north bank had a factor of safety of about 1.4. Those factors of safety are less than the generally recommended target factor of safety of 1.5 for bridge headslope stability (Thurber 2021a). Based on the current surface and subsurface conditions, bridge observations and results of these analyses, Thurber anticipates that the bridge structure can safely support traffic for at least the next few years until the bridge is replaced (Thurber 2021a, Appendix B).

Coal Mines

Thurber's (2021a; Appendix B) review of coal mine records determined that the Penn and Chinook Mines No. 632 and 147 were extensive underground mines that extended below Latta Ravine and bridge. The coal mines opened in 1915 using room-and-pillar extraction methods and operated up until closure in 1930. The City of Edmonton archival information indicated that Mine No. 632 extracted coal from two seams: one under the Latta Bridge at a depth of about 27.5 m and the other further south at depths ranging from 18 m to 76 m (Thurber 2021a; Appendix B).

Thurber (2021a; Appendix B) encountered three coal seams in the bore holes drilled in support of this project. The upper seam was encountered in four boreholes at depths ranging between about 25 m to 28 m below the existing bridge deck at approximate elevations 635 to 637 m. A middle seam was encountered in five of six bore holes at depths ranging from about 28 to 31 m below the existing bridge deck at approximate elevations 628 to 633 m. The lower seam was encountered in four of the six test holes at depths ranging from 33 m to 38 m below the existing bridge deck at approximate elevations 624 m to 626 m. The coal seam thicknesses ranged from approximately 0.3 m to 1.5 m.

3.5 Vegetation

3.5.1 Methods

Vegetation in the LSA was characterized by undertaking the following tasks:

- Desktop preliminary plant community classification and delineation using high resolution remote imagery and following the *Urban Ecological Field Guide for the City of Edmonton, Alberta, Canada* (City of Edmonton 2015).
- A search of the Alberta Conservation Information Management System (ACIMS) (AEP 2021a) for all records of special status plant species within the project area, on 08 July 2021 and 18 August 2021. The search area consisted of legal section 4-53-24-W4M.
- Rare plant survey on 13 July 2021 of the LSA, consisting of a meandering survey of all accessible lands. A full species inventory from that survey is available in Appendix I.

Species nomenclature follows the ACIMS' *List of all Vascular Plant Elements recorded for Alberta in the ACIMS Database - March 2018* (AEP 2018).

3.5.2 Description

Four plant communities were identified within the LSA (Figure 6, Appendix A):

- Balsam poplar mixed shrubs (PB.1)
- Non-forest caragana - steep slopes (NF.1)
- Non-forest smooth brome - steep slopes (NF.6)
- Manicured

3.5.2.1 Balsam Poplar Mixed Shrubs (PB.1)

The balsam poplar mixed shrubs plant community was found immediately east of the bridge on the ravine slope and continued to the south along the greater NSRV slope. There was an additional small area of this plant community observed northeast of the bridge. The forest canopy was a mature overstorey 10-15 m in height, dominated by balsam poplar (*Populus balsamifera*). The understorey canopy was sparse and contained Manitoba maple (*Acer negundo*) and small amounts of red elderberry (*Sambucus racemosa*) and Tatarian honeysuckle (*Lonicera tatarica*). The forb and grass layer was dominated by smooth brome (*Bromus inermis*) with common dandelion (*Taraxacum officinale*), prostrate saltbush (*Atriplex prostrata*), lamb's-quarters (*Chenopodium album*), quackgrass (*Elymus repens*) and summer-cypress (*Kochia scoparia*) also occurring occasionally. The noxious weeds woolly burdock (*Arctium tomentosum*), creeping thistle (*Cirsium arvense*) and creeping bellflower (Campanula rapunculoides) were observed in this community.

Plate 3.3. Balsam poplar mixed shrubs plant community with balsam poplar overstorey and smooth brome dominated understorey (13 July 2021).

3.5.2.2 Non-Forest Caragana - Steep Slopes (NF.1)

The non-forest caragana - steep slopes community was found on both the north and south ravine slopes on the west side of the bridge. This community comprised exotic shrub species. Many of the shrubs were 4 to 5 m in height with the larger, exotic white willow, occurring as a few individuals, reaching heights of approximately 10 m. Common caragana was the dominant shrub in this community with Manitoba maple, Tatarian honeysuckle and lilac (*Syringa sp.*) also occurring occasionally. The forb and grass layer was very sparse within this community owing to the dense shrub layer. However, many exotic grasses and forbs were present along the margins of this community including crested wheatgrass (*Agropyron cristatum*), prostrate saltbush, smooth brome, quackgrass, alfalfa (*Medicago sativa*) and yellow sweet clover (*Melilotus officinalis*). The noxious weeds woolly burdock, white cockle (*Silene latifolia*) and common tansy (*Tanacetum vulgare*) were also observed along the margins of this community.

Plate 3.4. View to east of Non-forest caragana - steep slopes community dominated by common caragana; beginning of City maintenance path in foreground (13 July 2021).

3.5.2.3 Non-Forest Smooth Brome - Steep Slopes (NF.6)

The non-forest smooth brome - steep slopes community was found on the north ravine slope and river valley slope on the east side of Latta bridge. The community was dominated by smooth brome with shrubs, forbs and other grasses scattered throughout. Shrubs comprised Manitoba maple, common caragana, Tartarian honeysuckle, lilac and buckbrush (*Symphoricarpos occidentalis*). Frequent and occasionally occurring forb species include prostrate saltbush, wild licorice (*Glycyrrhiza lepidota*) and alfalfa. Quackgrass was the only other grass species found in this community. The noxious weeds woolly burdock and creeping thistle were observed scattered throughout this community.

Plate 3.5. Non-forest smooth brome - steep slopes community dominated by smooth brome (13 July 2021).

3.5.2.4 Manicured (M)

Manicured areas in the river valley system are those subject to regular mowing or maintenance and/or supporting open space trees and shrubs. They are generally characterized by grassy areas and planted trees, as well as areas where original cover has been maintained but severely thinned. All three laydown/staging areas were classified as being manicured. These areas were dominated by Kentucky bluegrass (*Poa pratensis*), with smooth brome, quack grass, common dandelion, alfalfa and common plantain (*Plantago major*) also being present. The noxious weeds woolly burdock, creeping thistle and scentless chamomile (*Tripleurospermum inodorum*) were also found scattered throughout the manicured areas.

Plate 3.6. View to south of Manicured south laydown area (13 July 2021).

3.5.2.5 Heritage Tree

A large Manitoba Maple (*Acer negundo*) located within the fenced yard of an apartment building to the southeast of Latta Bridge, within the LSA, was planted in 1906 by the Latta family and has been designated a Heritage Tree by the Heritage Tree Foundation (Plate 3.7). For a tree to become a Heritage Tree, it must first be nominated then a Regional Selection Committee comprising local individuals selects trees of importance to their respective communities (Heritage Tree Foundation 2008). The tree has been marked with a plaque on the apartment building fence (Plate 3.8).

Plate 3.7. Heritage Tree in fenced lot located southeast of Latta Bridge (21 December 2020; BPTEC & Stantec 2021).

Plate 3.8. Heritage Tree plaque (21 December 2020; BPTEC & Stantec 2021).

3.5.2.6 Special Status Species

City of Edmonton considers plant species found in Edmonton having an ACIMS provincial conservation rank of S1, S2 or S3 to be rare species. S1 species are known from five or fewer locations in the province. S2 species are known from 6-20 occurrences, and S3 species are known from 21-100 occurrences in the province. A search of ACIMS data conducted on 08 July 2021 returned results showing smooth sweet cicely (*Osmorhiza longistylis*) observed east of Latta Bridge in Dawson Park. The most recent record of smooth sweet cicely is from June 2013. During the 13 July 2021 rare plant survey, no special status plant species were observed in the LSA.

3.5.2.7 Weeds

The Alberta *Weed Control Act* defines two categories of weeds: prohibited noxious and noxious. Prohibited noxious weeds are those that are currently uncommon or absent in the province but have been identified as noxious due to their potential to invade and damage natural and cultivated systems. Alberta law requires that prohibited noxious weeds be destroyed where they are found. Noxious weeds are generally those that are currently widespread in the province and are considered difficult to eradicate. Provincial legislation requires these species be controlled.

Prohibited Noxious Species

No prohibited noxious weeds were observed during the 13 July 2021 rare plant survey.

Noxious Species

Six noxious plant species were observed in the LSA during the 13 July 2021 rare plant survey, including: woolly burdock, creeping bellflower, creeping thistle, white cockle, common tansy and scentless chamomile.

3.6 Wildlife

3.6.1 Methods

Wildlife resources in the study area were characterized by undertaking the following tasks:

- Conducting one breeding bird survey in representative habitats in the project area on 22 June 2021, at 0550 hours, by a professional biologist experienced in breeding bird surveys. Three, 80 m wide, fixed width transects (Figure 7, Appendix A) were surveyed in the project area. Transects were walked slowly at a rate of 15-to-20 m per minute and all birds detected within a distance of 40 m on either side of the transect were recorded. All birds seen or heard within the transect were recorded and estimated bird locations were mapped within the survey area.
- Conducting two bat surveys (Bat Survey #1 and #2) comprising an emergence count and active acoustic monitoring on 25 June 2021 and 27 July 2021.
    - Seasonal habits of the two focal *Myotis* species (two bat species federally listed as Endangered [little brown myotis (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis*)] that have potential to be present in the LSA informed our survey methods. In general, the two focal bat species return to the Edmonton area in early May. In this Edmonton area, maternity roosting colonies may be present from early May through to late September (L. Wilkinson, *pers. comm.*).
    - Bat Survey #1 was conducted by two observers at two stations (Figure 7, Appendix A) at the Latta Bridge on 25 June 2021 from 10:37 p.m. to 11:07 p.m. using protocols that followed Vonhof (2006). The temperature during the survey was 25°C with a wind speed of <2 km/h.
    - Bat Survey #2 was conducted by the same two observers, each at the same station as survey #1, on 27 July 2021 from 10:07 p.m. – 10:38 p.m. using the same protocols. The temperature during the survey was 25°C with a wind speed of <2 km/h.
    - For both surveys, observers were located at the southwest and northeast corners of the bridge, respectively, to observe bat emergence from the bridge and adjacent vegetation (Figure 7, Appendix A). Each of those observers were also equipped with EMT2 bat detectors attached to a cell phone and tablet, respectively, to detect bats acoustically. Due to safety concerns, it was not possible to inspect under the bridge for evidence of roosting bats and guano or listen for audible bat sounds (e.g., squeaking).
    - Visual observations of bats roosting or flying during each of the bridge surveys were tallied. All digitally recorded echolocation calls were recorded in full spectrum format (recordings that provide time-frequency data) and were processed using Kaleidoscope 5 acoustic analysis software from Wildlife Acoustics, Inc. Only search phase calls of sufficient quality (non-fragmented) were used in species identification. Two methods of identifying recorded echolocation calls were employed: automated identification by the EMT2 detector app and comparison of call parameters to bat identification keys.
- Visually surveying the LSA on 22 June 2021for the presence of wildlife trees.

- Documenting all incidental wildlife and wildlife sign observations during site visits.
- Documenting incidental wildlife and wildlife sign observations in the ravine during site visits.
- Characterizing available habitat type, condition and quality through field observations and examination of City of Edmonton vegetation datasets and maps.
- Searching Fish and Wildlife Management Information System (FWMIS) for all wildlife records for lands within a one km radius centered on the bridge. FWMIS was accessed on 18 August 2021 (AEP 2021b).
- Searching eBird for verified species observation records.
- Preparing a list of potential wildlife species present, including special status species, by considering all of the above and our knowledge of Edmonton wildlife communities and occurrences (Appendix J).
- Qualitatively assessing wildlife movement corridors/habitat connectivity in the expanded study area.
- Common species names are used throughout the text; scientific names are provided in Appendix J.

Wildlife nomenclature in this report follows the American Ornithological Society's 2020 Checklist (birds) (Chesser et. al. 2020), the Government of Alberta's 2015 Wild Species Status List (mammals, amphibians, reptiles) and Alberta eBat (bats).

3.6.2 Description

3.6.2.1 Available Habitat, Observed and Potential Wildlife

Wildlife habitat in the LSA is of low to moderate quality, considering the disturbed nature of the developed areas adjacent Jasper Avenue, the steep slopes in the vicinity of Latta Bridge, and the high incidence of non-native plant species throughout the LSA. Wildlife habitat use is expected to be limited to commonly occurring, urban-tolerant wildlife species that may forage and possibly occasionally nest in the area. No wildlife trees (i.e., trees with visible nests or large trees with cavities) were observed in the LSA. Better and higher quality habitat is located in the expanded study area in the river valley to the east and downslope.

Based on the habitat present, expected species are limited to commonly occurring urban-tolerant species found in the river valley, such as black-capped chickadee, chipping sparrow, American crow, coyote, deer, white-tailed jackrabbit and deer mice. During the 11 September 2020 site visit, hairy woodpecker, black-billed magpie and black-capped chickadee were observed in the LSA. The remnants of an old American robin nest were also observed on one of the bridge girders during the 11 September 2020 site visit. A list of all wildlife species potentially occurring in the LSA is provided in Appendix J.

Avifauna

Breeding Bird Survey

The EIA's breeding bird survey provides a snapshot of passerine use of the area. The survey recorded 22 individuals of 11 species across the three transects surveyed (Table 3.2, Figure 7; Appendix A). All species observed are known to commonly breed in Edmonton.

Table 3.2. Summary of Bird Species Observed in the Project Area During the Breeding Bird Survey (June 2021)

Species	**Fixed-width Transect (80 m wide)**			**Total Individuals**
	1	**2**	**3**	
American robin			2	2
Black-billed magpie	3			3
Black-capped chickadee			1	1
Clay-colored sparrow	1			1
Downy woodpecker	1			1
Hairy woodpecker			1	1
House sparrow	1	2	1	4
Red-eyed vireo			2	2
Rock pigeon			3	3
Song sparrow			1	1
Yellow warbler			3	3
Totals (abundance)	**6**	**2**	**17**	**22**
Totals (species richness)	**4**	**1**	**8**	**11**

Most of the species detected during the breeding bird survey were singing territorially and may have been nesting in the study area. Species abundance ranged from 2 to 17 individuals across all transects. Species richness per transect ranged from 1 to 8 species. Highest species richness and abundance were detected along Transect 3 downslope of the bridge towards Dawson Park, particularly where the maintenance path and an informal north/south trail intersected near where the edge of the LSA intersects with Transect 3 on Figure 7 in Appendix A. Most birds on Transect 3 were observed in this area (e.g., yellow warbler, red-eyed vireo, song sparrow, black-capped chickadee and hairy woodpecker. The habitat in this area comprised mature trees and shrubs providing structurally complex habitat for a variety of bird species. The area around the bridge itself provided poor habitat with few birds observed under the bridge or along Jasper Avenue [e.g., house sparrow (non-native species), American robin (habitat generalist), black-billed magpie (habitat generalist) and rock pigeons (non-native species)].

Mammals

Bat Emergence and Acoustic Survey

No bats were visually observed emerging from the bridge during each of the emergence surveys. Both EMT2 detectors detected high levels of noise from passing vehicles along Jasper Avenue. No bat passes were detected from Station 1 on the west side of the bridge, however, the Station #2 bat detector did record 7 potential bat passes during each of the survey sessions, including passes comprising two separate individual bats at the same time. Manual vetting of those recordings was challenging due to the ambient level of noise recorded by the bat detectors, which obscured some very weak bat calls and produced short recordings (e.g., 4s). All recordings, however, did show distinct search phase calls of a 25kHz bat species (Plate 3.9). It can be very difficult and even impossible to distinguish calls between 25kHz bat species, particularly in cluttered environments. Considering the species most likely to occur in Edmonton [e.g., *Eptesicus fuscus* (big brown bat) and *Lasionycteris noctivagans* silver-haired bat), these calls most closely fit either of those species flying in a high clutter environment (steep slope and calls starting at 25kHz) and it is normal convention to name the call as potentially big brown bat/silver-haired bat without committing to one species or the other (Lausen *et. al.* 2019). Identification to species could only be achieved by capturing these bats for positive identification in hand.

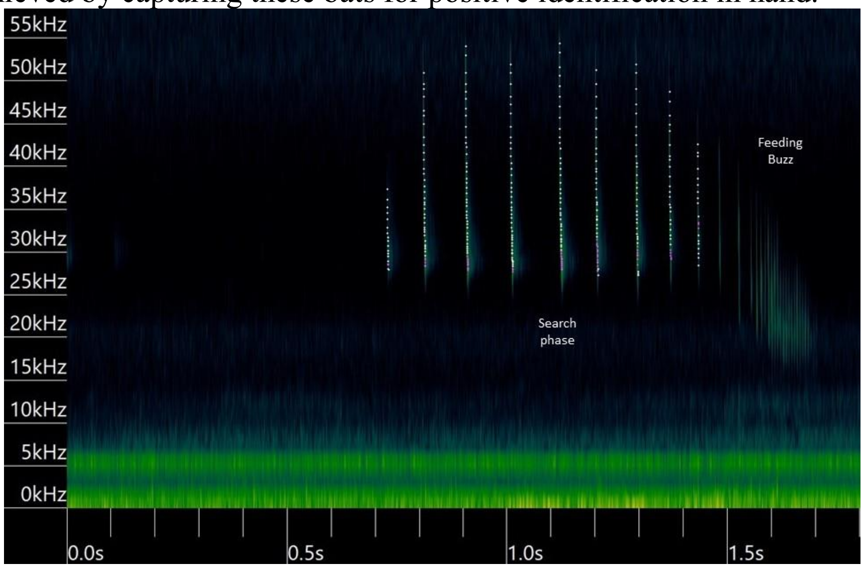

Plate 3.9. 25kHz big brown bat/silver-haired bat (25 kHz) recorded at Station 2 (real time; search phase followed by feeding buzz in cluttered environment)(25 June 2021)

Overall, bats appeared to be present in relatively low numbers in the Latta Ravine study area and there did not appear to be any maternity roosts in or on the bridge in summer of 2021. This lack of bat activity and lack of evidence of maternity roosts at the bridge structure, particularly for little brown myotis, suggests the structures did not present suitable conditions for maternity roosts (i.e., structures were too cold; pregnant and lactating bats require a warm place (approximately 37°C) to develop the fetus, produce milk and raise the pup (Lausen *pers. comm.*).

Based on our results, the best bat habitat in the project area appeared to be on the east side of Latta Bridge towards the continuous vegetated river valley, where all acoustic detections of bats were made over the tree canopy. Bats were acoustically detected near the end of each survey period, which seemed to coincide with suitable foraging conditions comprising mosquito emergence on 25 June 2021 and moth emergence on 27 July 2021.

3.6.2.2 Wildlife Movement/Connectivity

Wildlife movement and habitat connectivity was considered at the scale of the expanded study area, which contains the NSRV in the vicinity of Dawson Park and having direct connection to Latta Ravine. The province maps the NSRV and ravine system in the City of Edmonton as a Key Wildlife Biodiversity Zone (KWBZ) (AEP 2021a). This mapping is done at a coarse scale using major river corridors, valley topography, valley slope breaks and ungulate winter density data (AEP 2010). The KWBZ includes Latta Ravine. Designation of the NSRV and ravine system as a KWBZ is consistent with the City of Edmonton's identification of the river valley as a regional biological corridor within the City's ecological network (City of Edmonton 1990 and 2007) and recent identification as a key component of City Plan's green and blue network (City of Edmonton 2020). All of these designations recognize the importance of the river valley and ravine system as a major wildlife movement corridor having high value habitat, in undisturbed areas.

Latta Ravine, while supporting some low to medium quality wildlife habitat, is a minor component of the river valley wildlife corridor, given its relatively short length and its abrupt terminus in a residential area at 91 Street in downtown Edmonton. Regardless, urban-adapted animals including large, medium and small-terrestrial, aerial mammals and birds can easily pass under the existing Latta Bridge if they choose to use local resources in this small ravine. Higher quality habitat is located downslope in the main river valley system on the north valley slope and valley bottom in the vicinity of Dawson Park.

3.6.2.3 Special Status Species

Based on species habitat requirements, an understanding of the available habitat in the local study area, provincial species distributions and species records in the FWMIS database, several special status species were identified as having potential to occur in the project area. The following section discusses the potential occurrence of species that are ranked by the Province that are *At Risk* or *May Be At Risk*, or, have been federally assessed by the Committee on the Status of Endangered Wildlife in Canada (COSWIC) as either *Endangered*, *Threatened*, or *Special Concern*, and were rated in this study as having at least a moderate likelihood of occurrence within the study area. In addition, all species on Schedule 1 of the *Species at Risk Act* (SARA) with ranges that include Edmonton and for which suitable habitat is available in the project area are included for discussion. Species having a provincial status of Sensitive, but no federal status, hold no potential to trigger project considerations beyond those applicable to wildlife in general, and, thus, are not discussed, even if their potential for occurrence was considered moderate or high.

A FWMIS search of a one kilometer radius around Latta Bridge returned historic records of four special status species in the area: barred owl (*Strix varia*), short-eared owl (*Asio flammeus*), little brown myotis (*Myotis lucifugus*) and northern leopard frog (*Lithobates pipiens*). Barred owls are uncommon in Edmonton and there is no suitable nesting habitat (natural cavities or abandoned stick nests) present in the LSA or immediately adjacent the LSA. Short-eared owl is not expected to be found around Latta Bridge as that species requires large open grasslands for foraging and nesting. Northern leopard frog is not expected to be found within Latta Ravine as there are no wetlands present in the ravine and that species has been extirpated from the Edmonton area (Wagner 1997). Table 3.3 includes an overview of species with a moderate or high likelihood of occurrence in the study area.

Table 3.3. Special Status Wildlife Species with Potential to Occur in the Project Area

Common Name	Provincial Status (General Status of AB Wild Species 2015)	Wildlife Act Designation*	COSEWIC Designation	SARA Designation	Observed/ Previous Record	Likelihood of Occurrence	Potential Habitat Use
Little Brown Myotis	May Be At Risk	None Given	Endangered	Schedule 1 (Endangered)	FWMIS (2021)	Moderate	Foraging/ roosting

A search of the eBird database returned no additional records of special status bird species for the local study area.

Little Brown Myotis

Little brown myotis utilizes tree crevices (especially old dead or dying trees in mature deciduous forests), buildings and bridges for roosting and maternity roosts during the breeding season. Results of the bat surveys concluded there is no little brown myotis maternity colony in the bridge. Individuals of that species could, however, use the bridge as a day or night roost site on occasion. Considering Latta Ravine's relative close proximity to the NSR, a suitable foraging area and water source, and they likely forage over the vegetated areas east of the bridge, the likelihood of occurrence in the LSA for little brown myotis was rated as moderate.

Sensitive Species Range Records

FWMIS sensitive species range records indicate that the study area falls within the province's sharp-tailed grouse (*Tympanuchus phasianellus*) survey area and the bald eagle (*Haliaeetus leucocephalus*) range (AEP 2020). Sharp-tailed grouse are not expected to occur within the local study area because suitable grassland/shrubland habitat is not present. No suitable bald eagle perching or nesting sites are present in the LSA.

3.7 Historical Resources

As previously noted, Latta Bridge was originally built as a trestle bridge in 1911 and was replaced with a steel structure in 1936. Based on the 1936 construction date of the replacement structure, Latta Bridge is considered to be historical under the Alberta Culture, Multiculturalism and Status of Women (ACMSW) guidelines, which apply a 50-year threshold (BPTEC & Stantec 2021). To that end, Stantec submitted an *Historical Resources Act* (HRA) application to Alberta Culture, Multiculturalism and Status of Women (ACMSW) on 09 September 2020 to initiate a regulatory review for the bridge replacement project (BPTEC & Stantec 2021). The regulatory review of the application resulted in the receipt of HRA approval with conditions issued by ACMSW on 07 October 2020. HRA approval conditions required that documentation of Latta Bridge as a historical structure be completed following the Requirements for Recording and Reporting Historic Structures.

To fulfil the obligations und the HRA and remove the conditions of approval, Stantec documented the Latta Bridge as a historical structure on 26 October 2020 by recording the bridge structure using black and white film (BPTEC & Stantec 2021). Major structural details were recorded photographically and developed as printed photographs and film negatives. A Historic Survey Site (HSS) form was completed for the structure, including details of the bridge's history. Stantec prepared a brief memo outlining the historic structure recording conducted for the bridge and submitted a second HRA to ACMSW on 20 November 2020. ACMSW granted approval for the project on 08 December 2020 (Appendix K).

4.0 THE PROJECT

4.1 Project Description

Four bridge replacement options were considered during preliminary design and assessed on the basis of various criteria, including cost, schedule, constructability, environmental impact, geotechnical risk, maintenance cost, traffic accommodation and maintaining the aesthetics of the existing structure (BPTEC & Stantec 2021). BPTEC and Stantec (2021) recommended that a single-span steel plate girder bridge (Option 1) be constructed to replace the existing structure because it minimizes cost, construction time, constructability, geotechnical and environmental risks. This option is also consistent with the aesthetics of the existing steel frame structure. The City has accepted and approved Option 1 and bridge design is being advanced for a single-span steel plate girder bridge.

The proposed new Latta Bridge Structure will comprise a single-span steel plate girder bridge with conventional abutments (BPTEC & Stantec 2021) (Figure 7, Appendix A and Appendix L). The new bridge aesthetics will be consistent with the existing structure and will be 24.16 m wide and 69.7 m long. It will be constructed in the same footprint and at the same elevation as the existing structure. Compared to the existing bridge that has piers in the ravine, the proposed new bridge will have a wide opening under the bridge and will not require piers in the ravine. The new structure will support a 2.8 m wide sidewalk on the north side of the bridge and a 4.2 m wide shared-use path (SUP) on the south side of the bridge. The new structure will have a roadway width of 15.6 m and will continue to carry four lanes of traffic (two eastbound lanes and two westbound lanes) across Latta Ravine. The substructure will consist of conventional concrete abutments with approach slabs. Abutments will be supported by drilled cast-in-place concrete belled piles. A pile wall extended by three piles outside of the bridge width will be installed along the south ravine slope to improve slope stability. The pile wall depth is still to be determined (BPTEC & Stantec 2021).

The existing bridge will be demolished and disposed of appropriately (BPTEC & Stantec 2021). The lead paint on the existing structure railing surface covering will require containment during demolition. As noted by Thurber (2021), the lead paint must be captured and fully contained to ensure that it is not released into the surrounding environment. It must then be conveyed by a licenced hazardous waste transporter to a licensed waste disposal facility.

The City is actively collaborating with EPCOR regarding adjustment of the combined sewer located northwest of the bridge and associated infrastructure. It has been determined that the manholes will be modified (due to new grading) but the sewer will remain in place and EPCOR Drainage has stated that they are comfortable with the clearance (between bridge abutment/piles and sewer) that is proposed. The BPTEC/Stantec team is collaborating with EPCOR Drainage to develop specifications for protection of the combined sewer during soil grouting and bell pile construction, as well as to determine an emergency/contingency plan should the combined sewer be damaged during construction.

EPCOR Drainage is actively working on the design of combined sewer modifications at the south end of Latta Bridge to resolve the conflict at that location. These modifications are expected to be completed by EPCOR Drainage (under the franchise agreement) in late 2021 or in early spring 2022.

The City does not plan to upgrade the existing maintenance trail beneath the bridge or the viewpoint located to the northeast of the proposed/existing bridge. The existing viewpoint will be modified slightly to suit the new bridge with the widened SUP and associated approach sidewalk; the City is currently looking to incorporate a minor art feature in or near the viewpoint and they envision this may require a concrete base in the order of 2 m wide by 2 m long. At the time of writing this report, the art feature is currently being procured and developed by another City department and will be incorporated into the overall bridge tender and construction work (C. Wiltzen, *pers. comm.*).

Full roadway closure with a detour will be required to demolish the existing structure and install the new bridge (BPTEC & Stantec 2021). The full closure would allow for complete removal and installation of the new structure without the need to stage traffic, reducing the duration of the construction phase. This would also reduce the impact on access points for local residences near the structure. Traffic will be detoured appropriately (BPTEC & Stantec 2021).

4.2 Landscaping

The landscaping plan will include restoration of disturbed areas using native tree, shrub and ground cover species currently found in the project area (BPTEC & Stantec 2021). The project team has met with City Forestry onsite to assess trees that may be directly impacted by construction and will continue to collaborate with City Forestry to ensure compliance with the Corporate Tree Management Policy including preparation of a Tree Protection Plan and a Landscaping Plan. For areas beneath the new bridge and within the shadow area of the bridge that will not support vegetation growth, the City is considering installation of hardscaping such as Class 1M riprap or other similar hardscaping features (C. Wiltzen, *pers. comm.*).

4.3 Construction Schedule

Construction is tentatively scheduled to occur between 01 March 2022 and 31 October 2023, concurrent with the Kinnaird Bridge replacement project. City Forestry to conduct some clearing and grubbing in the project area in January/February of 2022.

4.4 Construction Laydown Area and Access

Four construction laydown areas are proposed (Figures 4-8, Appendix A). One is located on the manicured grass along 91 Street and the top of Latta Ravine, one on the manicured grass and sidewalk north of the bridge on the east side of Jasper Avenue, and two on the south side of the bridge on the east side of Jasper Avenue on the sidewalk and manicured grass. Equipment access to the ravine will be along the informal maintenance trail that begins at 91 Street and extends downslope under the bridge and towards Dawson Park.

As previously noted in Section 1.0 and shown in Appendix C, small temporary easement areas [totalling approximately 3,532.3 m^2 (0.35 ha) in area] will be required to accommodate construction of the proposed new bridge structure.

4.5 Project Phases and Associated Key Activities -

The expected general scope of construction methodology will be as follows (BPTEC and Stantec 2021):

4.5.1 Site Preparation

- Notification of local residents, businesses and institutions of the proposed construction schedule, temporary road closure and detour.
- Coordinate access for project equipment and site security.
- Full closure of the local section of Jasper Avenue to public traffic and install appropriate warning and detour signage.
- Establishment of construction staging areas.
- Removal of existing vegetation (trees and shrubs) within established disturbance boundaries will be completed by the City of Edmonton's Forestry Department in winter 2021/2022 to avoid the breeding bird nesting season (15 February to 20 August).
- All cleared vegetation will be removed from site.
- Remove and stockpile all topsoil prior to any disturbance for reuse.

4.5.2 Bridge Demolition

Bridge demolition and removal operations will comprise the following general steps (BPTEC & Stantec 2021):

- Installation of temporary erosion and sediment control devices.
- Implementation of containment features (e.g., poly wrap or temporary geotextile and/or poly soil coverings).
- Remove and dispose of bridge railings with appropriate containment and disposal of lead paint during coating removal and dismantling operations to ensure it is not released into the surrounding environment.
- Remove and dispose of substructure concrete (deck, sidewalks)
- Remove and dispose of steel superstructure and substructure elements (stringers, floor beams, girders, and pier bents).
- Remove and dispose of concrete substructure elements (abutments and pier pedestals) to a minimum depth of 1 m below final design grade elevation, or as otherwise determined during the detailed design phase.

4.5.3 New Bridge Construction

- Remediation of contaminated soil in the bridge construction footprint.

- EPCOR or the City of Edmonton contractor to relocate or protect and adjust the existing 250/300 mm CSO.
- Complete a subsurface grouting program at each bridge foundation location in advance of foundation construction to fill any coal-seam related voids and prevent future subsidence that could potentially impact the new foundations. Specific details of the grouting program will be determined during detailed design; however, the work would consist of grouting the zone of influence for each foundation element (abutment or pier).
- Construction of a pile wall near the toe of the south headslope to address slope stability issues.
- Construct new bridge.

4.5.4 Landscaping and Lighting

- A landscaping plan will be prepared to address reclamation/restoration of all disturbed areas in the project area that will support vegetation growth (i.e., vegetation is not expected to establish under the bridge due to a lack of light and moisture).
- The area to the north of the bridge that contains non-natives (mostly caragana) are being removed for laydown and access. This area will be planted with a high number of young tree and shrub plant stock. Approximately 80% and 20% will be tree and shrub species, respectively. Species will be selected for their ability to stabilize soil, to sucker and root out easily, and to establish on steep slopes. The entire area will be seeded with native seed mix.
- Restored areas will be fenced until new vegetation is well-established.
- Installation of streetlight poles on the new bridge that meet current standards. Spacing, style, and heights of the new poles are proposed to match existing conditions and lighting levels will meet current City standards.

4.5.5 Project Close-Out/Quality Control

- Work site and access cleanup and restoration of all areas disturbed by construction to pre-construction conditions, as approved by the City.
- All other incidental items as required to complete the work in accordance with the drawings and specifications.
- Final inspection and contract closeout by the City.

4.6 Summary of Environmental Regulatory Approvals

All typically relevant federal, provincial and municipal environmental legislation, bylaws and policies were reviewed for their application to this project. Bylaw 7188 is the only trigger for an environmental assessment. As is often the case, several provincial and federal statutes prohibiting harm to select resources are relevant to project construction. Table 4.1 describes environmental and historical resource legislation and bylaws identified as applicable to this project. Table 4.1 does not consider any non-environmental municipal permits that may be required to undertake the work.

Table 4.1. Summary of Applicable Legislation and Bylaws

Legislation, Bylaw or Policy	Regulatory Agency	Authorization/ Approval/Permit Required	Responsibility, Approval Timeline or Potential Schedule Impact
Municipal			
***North Saskatchewan River Valley Area Redevelopment Plan* (Bylaw 7188)**	City Planning	EIA required. Must be approved by City Council.	Approval anticipated in fall 2021.
***Corporate Tree Management Policy* (C456C)**	City Forestry	Proponent to collaborate with City Forestry regarding unavoidable impact to City owned trees and shrubs in the project area, valuation of and compensation for affected trees/shrubs and protection of nearby trees.	Continued consultation between City and Forestry suggested to ensure full compliance.
City of Edmonton (Bylaw 18100) - EPCOR Drainage Services Bylaw	EPCOR	Permit to discharge into storm sewer system may be required	Contractor would seek permission from EPCOR.
***City of Edmonton Parkland* (Bylaw 2202)**	City of Edmonton	Laydown areas required inside Bylaw 7188 boundary and on lands zoned Metropolitan Recreation Zone (A). Permit required to stage for construction.	City or Contractor to obtain permit once construction dates are known.
Provincial			
Historical Resources Act	Alberta Culture, Multiculturalism and Status of Women (ACMSW)	All projects with the potential to disturb historical, archaeological and palaeontological resources will require Approval.	HRA Approval, including for the historic Latta Bridge, was granted to the City on 08 December 2020.
Wildlife Act	Alberta Environment and Parks	No permitting triggers; however, the Act prohibits disturbing prescribed breeding wildlife such as northern flying squirrels and owls. In this case, this requires either avoiding vegetation removal in the breeding season or undertaking a nest sweep before vegetation removal.	City to schedule vegetation removal. Any vegetation clearing/tree removal between 15 February and 20 August, would require a nest sweep and may result in findings that delay clearing.
Federal			
Migratory Birds Convention Act	Environment and Climate Change Canada	No permitting triggers; however, violation of the *MBCA* can result in penalties.	City to schedule vegetation removal. Any vegetation clearing/tree removal between 20 April and 20 August would

Legislation, Bylaw or Policy	Regulatory Agency	Authorization/ Approval/Permit Required	Responsibility, Approval Timeline or Potential Schedule Impact
			require a nest sweep and may result in nest sweep findings that delay clearing.
Species At Risk Act	Environment and Climate Change Canada	This Act prohibits disturbance to species listed on Schedule 1 of the SARA as endangered, threatened or extirpated and, in some instances, prohibits disturbance to listed species' habitat, **on federal lands**. On non-federal lands, the Act applies only to disturbance of listed endangered, threatened or extirpated *aquatic species* and *migratory birds*.	There is some potential for listed endangered bats to roost in the project area but SARA does not extend protection to those species on these lands. Endangered, threatened or extirpated migratory birds or aquatic species are not expected on project lands.

5.0 PROJECT IMPACTS AND MITIGATION MEASURES

5.1 Assessing Impacts

5.1.1 Potential Impact Identification and Analysis

Based on the environmental context described in Section 3, the following Valued Ecosystem Components (VECs) were identified for impact assessment: geomorphology (slope stability), soils (contaminants), vegetation, wildlife and historical resources. For each VEC, potential impacts to be examined were identified by overlaying the project drawings on mapped resources, reviewing project activities, conferring with multidisciplinary project team members, reviewing project reports and applying our professional experience with impact assessment and construction performance auditing in other, similar, projects. This process resulted in identification of specific potential impacts that warranted assessment.

In addition, we separately examined the potential for the following select project incidents to occur and impact natural resources:

- Release of sediment or other debris on or off-site.
- Release of hazardous/deleterious substances in or outside of the project area and potential for mitigation off-site.

5.1.2 Impact Characterization

Identified potential impacts were characterized according to guidance received from the EIA Terms of Reference (Table 5.1). Potential impacts were characterized with respect to nature (positive or negative, direct or indirect), magnitude (negligible, minor, or major), duration and timing (temporary, permanent or seasonal), geographic extent and likelihood. These criteria were defined as shown in Table 5.1:

Table 5.1: Impact Descriptor Definitions.

Nature of Impact	
Positive Impact	An interaction that enhances the quality or abundance of physical features, natural or historical resources.
Negative Impact	An interaction that diminishes the abundance or quality of physical features, natural resources or historical resources.
Direct	An interaction that results in the loss or reduction of a resource/feature.
Indirect	An interaction that results in off-site impacts, such as sedimentation off-site.
Magnitude	

Negligible Impact	An interaction that is determined to have essentially no effect on the resource. (Such impacts are not characterized with respect to direction duration or confidence.)
Minor Impact	An interaction that has a noticeable effect but does not eliminate a local or regional population, physical feature or affect it beyond a defined critical threshold (where that exists).
Major Impact	An interaction that affects a local or regional population, resource, or physical features beyond a defined critical threshold (where that exists) or beyond the normal limits of natural perturbation.
Duration and Timing	
Temporary Impact	A change that does not persist indefinitely.
Permanent Impact	A change that persists indefinitely.
Seasonal Impact	A change that will terminate or diminish significantly after one season.
Geographic Extent	Extent of area affected. Quantify where feasible.
Likelihood	What is the probability that the impact will occur? Is it likely or unlikely?

When applying these descriptors, we considered the project described in Section 4. No additional mitigation measures were applied at the time of potential impact characterization.

5.1.3 Mitigation Development and Residual Impact Assessment

Mitigation measures were developed for all identified negative impacts. Any impact anticipated to remain following mitigation implementation was termed a residual impact. As with potential impacts, residual impacts were characterized with respect to: nature, magnitude, duration and timing, geographic extent and likelihood.

5.2 Impact Assessment Results and Mitigation Measures

5.2.1 Geomorphology - Slope Stability

Impacts

Thurber's (2021a, Appendix B) geotechnical investigation of existing ground conditions within the LSA identified two potential significant geotechnical issues that pose a risk to construction and long-term stability of the proposed new bridge structure: 1) the presence of underground voids under the project area; and 2) ongoing slope instability at the south ravine headslope. The most significant geotechnical issue is related to abandoned coal mines under the existing bridge and ravine. Evidence of voids was found in several boreholes at the level of coal seams, particularly on the north head slope and in the ravine. Those voids could lead to future ground subsidence, which could compromise the new bridge foundations and result in differential settlement of the structure (BPTEC and Stantec 2021).

The second significant geotechnical issue is related to the stability of the south ravine headslope, which is exhibiting ongoing creep movement towards the ravine. The south headslope may also be moving laterally as a result of landslides east of the bridge. In order to mitigate these potential impacts, BPTEC and Stantec (2021) have incorporated the following measures into design of the new bridge:

- Complete a grouting program at each bridge foundation location in advance of foundation construction to fill any voids and prevent future subsidence.
- Construct a pile wall near the toe of the south headslope.

Since this information was based on preliminary information and further details regarding bridge design and construction will be advanced during detailed design, impacts to slope stability from the proposed project are rated as negative, major, temporary to permanent, local and likely.

Mitigation and Residual Impacts

Thurber (2021a, Appendix B) noted that their report provided preliminary information and that further work will be required during detailed design and construction, including the following main items to further mitigate potential for adverse impacts to slope stability in the project area:

- City should maintain ongoing monitoring of the geotechnical instrumentation (slope inclinometers and piezometers) in the interim during detailed design and construction.
- Foundation design parameters for vertical and lateral loading should be reviewed when further details of the bridge foundations are available.
- Methods of mitigating the effects of the abandoned coal mine workings should be reviewed during detailed design and construction. Details of void grouting should be reviewed and incorporated into the design and construction documents.
- Design of slope stabilization measures should be completed once the details of the bridge abutments are available.
- Final design of abutment slopes should incorporate measures as necessary to address slope erosion, including slope revegetation and need for turf reinforcement mattings.
- Requirements for foundation construction and inspection should be reviewed including need for pile integrity testing depending on the pile type.
- Geotechnical instrumentation requirements for monitoring slope stability should be determined and included in the design and construction documents.

Thurber further notes that the performance of the structures will depend upon the quality of workmanship during construction and recommended that inspections be provided by qualified geotechnical personnel during foundation installation to confirm that the piles are installed in competent bearing material and that the stratigraphy is similar to those that have been assumed for design.

Until these measures are undertaken, and detailed design is completed and reviewed by a geotechnical engineer, residual impacts to slope stability remain negative, major, temporary to permanent, local and likely.

5.2.2 Soil Contaminants

Impacts

The project's Phase II ESA identified the presence of contaminated soils that did not meet Alberta Environment and Parks (AEP) 2019 Tier 1 residential/parkland fine-grained guidelines and recommended further investigations be undertaken. The presence of contaminated soil during construction raises the possibility of improper handling and storage and the spread of contamination to people or resources through wind and water-borne erosion. Unmitigated, this potential impact is generally rated as negative, direct and indirect, minor to major, permanent, local to regional and likely. It is rated as minor to major owing to uncertainty regarding contamination limits.

Mitigation and Residual Impacts

In response to the Phase II ESA, the City has prepared a site-specific risk mitigation plan for soil contamination (Construction Management Plan), a copy of which is provided in Appendix G of this report. That document provides handling procedures for contaminated soil when excavation, soil disturbance or vegetation removal is planned within the areas of known soil contamination. If those procedures cannot be employed, then consultation with City Engineering Services is required. In addition, excavations will be backfilled with clean soil. The plan also requires construction to comply with the BMPs in the City of Edmonton Erosion and Sedimentation Control Guidelines (2005) and the contractor's Erosion and Sediment Control(ESC) plan should be followed. All handling and disposal of contaminated soil within the project area must comply with environmental legislative requirements including those of the *Environmental Protection and Enhancement Act* (*EPEA*) and City requirements. The Construction Management Plan also commits to additional soil sampling during detailed design, following updating of the Construction Management Plan, if required. Finally, the City has committed to additional sampling post-construction but prior to final landscaping to determine the most appropriate follow-up remedial measures.

Measures described above and within the Construction Management Plan remove potential for off-site migration of contaminants, protect worker and public safety and would lead to locally improved soil conditions. The residual impact to local soils is rated as positive.

5.2.3 Vegetation

The following potential impacts to vegetation were identified as needing examination:

- Loss or alteration to native plant communities
- Loss of a Heritage Tree
- Incidental tree damage
- Increase in invasive species or weeds

5.2.3.1 Loss or Alteration to Native Plant Communities

Impacts

A temporary, direct loss of plant communities will result from demolition and construction of Latta Bridge. Only one native plant community, balsam poplar mixed shrubs, was identified within the project area. The other three communities comprised mostly exotic species. Some localized clearing of the native balsam poplar mixed shrub community will be required for this project (Figure 6, Appendix A). Impacts to native vegetation are rated as negative, direct, minor, temporary, local and likely.

Mitigation and Residual Impacts

Efforts will be made to minimize native plant community removal in the project area. In accordance with the *City of Edmonton Corporate Tree Management Policy C456C*, all forested areas on City-owned (public) lands in the project area will be assessed for value by the City of Edmonton Forestry department prior to removal and compensation applied as required. A landscape/reclamation plan will be prepared during detailed design comprising native species similar to existing conditions. With the native landscaping planned, and the maturation of planted trees and shrubs, and compliance with the *Corporate Tree Management Policy*, the residual impact to vegetation will be reduced to negligible over time.

5.2.3.2 Loss of a Heritage Tree

Impacts

If the existing roadway centreline is maintained when the proposed new bridge is constructed, the proposed SUP on the east side of the bridge is expected to encroach on the Manitoba maple Heritage Tree located in the northwest corner of the fenced lot at the southeast corner of the bridge. The exact extents of the impacts to the fenced lot and Heritage Tree will not be known until detailed design advances (BPTEC & Stantec 2021). City Forestry will assess the status of the Heritage Tree. At this time, there is potential that the Heritage Tree will need to be removed to accommodate the SUP, light poles, and an adjusted fence line. Loss of the Heritage Tree is rated as a negative, major, direct, permanent, local and likely impact.

Mitigation and Residual Impacts

Efforts will be made in future design stages to avoid removing the Heritage Tree. If the tree is retained, all mitigation measures for incidental damage to trees, outlined in Section 5.2.3.3, apply. Residual impacts to the Heritage Tree would be negligible.

If the tree is to be removed it will be assessed for value by the City of Edmonton Forestry department prior to removal and compensation applied as required, in accordance with the *City of Edmonton Corporate Tree Management Policy C456*. Owing to the age of the tree and its historical and Heritage Tree status, residual impacts will remain negative, major, direct, permanent, local and likely impact because it cannot be easily replaced.

5.2.3.3 Incidental Tree Damage

Impacts

Demolition and construction activities will take place adjacent trees and native forest, putting trees adjacent to the project disturbance and tree clearing limits at risk of limb, trunk and root damage during construction. The potential for such tree loss or damage is rated as a negative, indirect, minor, permanent, local and likely impact.

Mitigation and Residual Impacts

The successful contractor will be required to prepare a Tree Protection Plan pursuant to the City's *Corporate Tree Management Policy* and the *City of Edmonton Tree Preservation Guidelines*. That plan will include measures to physically protect individual open space trees within 5 m of the project area and natural tree stands within 10 m of the project area. The plan will be reviewed by City Forestry to ensure protection measures are sufficient and City Forestry will likely meet with the contractor on site to discuss protection measures. The contractor will be required to monitor the effectiveness of their protection program and record any incidental damage. To reduce potential for impact on native plant communities during proposed construction, equipment storage, maintenance and refueling in the LSA will be prohibited. With these measures in place, the residual impact is expected to be negligible.

5.2.3.1 Increase in Invasive Species or Weeds

Impacts

Surface disturbance from construction could create ideal conditions for the noxious weed species on site to spread onto the disturbed soils at the work site. In addition, construction equipment could carry in seed and rhizomes of new weed species, which then establish and potentially spread further into the ravine or river valley. Preventing weed establishment is the best and most economical opportunity for weed management. In the absence of mitigation, the spread of weedy species within reclaimed areas will likely occur and will have a negative, direct, minor, local, permanent and likely impact.

Mitigation and Residual Impacts

Precautions such as cleaning equipment before moving into the project area will help reduce the potential transfer and spread of weedy species. In addition, cleared areas will be revegetated with topsoil and an appropriate seed mix and native plantings approved by the City as soon as possible following construction. Some level of weed control will likely be required until desired vegetation becomes established, but the need for such measures can be assessed through monitoring. All short-term weed control measures will be outlined in the contractor's Environmental Construction Operations (ECO) Plan and through implementation of a Weed Control Plan. With proper implementation of these measures, the residual impact will be reduced to negligible.

5.2.4 Wildlife and Wildlife Habitat

The following potential impacts to wildlife and wildlife habitat were identified as needing examination:

- Loss of terrestrial habitat
- Disturbance of breeding wildlife
- Habitat alienation during construction
- Mortality or disturbance of special status wildlife species
- Barriers to Ecological Connectivity/Wildlife Movement

5.2.4.1 Loss of Terrestrial Habitat Due to Clearing Activities

Impacts

Any loss of natural vegetation in the project area represents an associated loss of natural habitat. It is expected that relatively small, localized areas of natural habitat will be cleared adjacent the existing bridge prior to demolition and new bridge construction. The habitat value of areas to be cleared is low to moderate, however, as noted in the vegetation discussion, the majority of habitat loss will be temporary. As a result, the anticipated temporary habitat loss is rated as a negative, direct, minor, local in scale, and likely impact.

Mitigation and Residual Impacts

Applying all mitigation measures outlined in the vegetation section will result in establishment of areas of native plant communities with a reduced exotic/weedy component. This is considered to fully mitigate for the loss, over time. The residual impact is rated as negligible.

5.2.4.2 Disturbance of Breeding Wildlife

Impacts

Any project involving vegetation removal must consider the potential for vegetation clearing or pruning to affect wildlife, particularly from the perspective of legislation compliance. Many species of wildlife are protected by federal and provincial law. The *Migratory Birds Convention Act, 1994* protects migratory birds (as populations and individuals), their nests and eggs anywhere they are found in Canada. The *Wildlife Act* (Alberta) provides for the protection and conservation of wild animals in Alberta and prohibits the wilful molesting, disturbing or destroying of a house, nest or den of prescribed wildlife. Clearing of vegetation during the wildlife breeding season has potential to destroy nests/dens and to disturb or kill wildlife because otherwise mobile adults remain close to nest sites, and young are either restricted to nests, dependent on nests or not yet mobile enough to avoid sudden disturbance.

To protect nests and nesting birds, Environment and Climate Change Canada (ECCC) recommends avoiding vegetation clearing during the period when there is a high probability of nesting activity (i.e., high risk period). In this region (nesting zone B4), ECCC identifies the high probability period (approximately 95%) as 20 April to 20 August.

The provincial government concurs with this recommendation for migratory and other birds but recognizes that the period does not adequately cover nesting owls, which are also protected by the *Wildlife Act.* In the Edmonton region, owls may begin nesting as early as mid-February and may remain on nests into the ECCC-defined high probability period.

There is some potential for owls and other bird species to nest on the bridge or in adjacent vegetation in the Latta Bridge work limits. Therefore, in the absence of appropriate measures (e.g., temporal clearing restrictions or effective nest sweeps), vegetation clearing/tree removal has potential to result in disturbance of active nests or nesting individuals, which could be in conflict with legislation. Should clearing due diligence not be employed, wildlife mortality resulting from clearing could occur. This would be a negative, direct, major, permanent, local and likely impact. It is rated as major because it represents contravention of the law.

Mitigation and Residual Impact

If project scheduling results in vegetation clearing/tree removal or other activities requiring vegetation manipulation that must occur during the period 15 February to 20 August, this would create potential for impacts to wildlife, and mitigation should be implemented. Specifically, if vegetation clearing/removal/pruning must occur during the period 20 April to 20 August, the City shall ensure that the work is preceded by a nest sweep of the work site and buffering adjacent habitat, conducted by a qualified biologist, to a standard compliant with federal and provincial law. If active nests are identified they will be appropriately buffered from disturbance until the nest is no longer active. Similarly, if mature tree removal is required during the period 15 February to 20 April, the City shall ensure that the work is preceded by an owl nest sweep of the work sites and a buffer of adjacent habitat, conducted by a qualified biologist to a standard compliant with provincial law. Identified active nests will be appropriately buffered from disturbance until the nest is no longer active. With these measures in place, breeding wildlife disturbance should be avoided, and the residual impact should be reduced to negligible.

5.2.4.3 Habitat Alienation During Construction

Impacts

Activities and noise associated with construction have potential to disrupt wildlife species using adjacent habitat, leading to habitat alienation in those areas. This effectively reduces the amount of usable habitat available to individuals. However, in this case, this potential impact is rated as minor for the following reasons:

- Most wildlife species in the area are likely already adapted to human disturbance.
- Construction disturbance will be periodic over the construction period, and location specific within the project area.

- Construction will typically occur during daylight or early evening hours, leaving adjacent areas relatively undisturbed for nocturnal species.

Considering all the above, the impact of habitat alienation during construction activities is rated as negative, indirect, minor, temporary, local and likely.

Mitigation and Residual Impacts

Few mitigation measures are available. Work crews will be instructed not to harass wildlife and the contractor's ECO plan will include worker/wildlife encounter protocols. The residual impact of habitat alienation during construction activities is, therefore, also rated as negative, indirect, minor, long-term, temporary, local and likely.

5.2.4.4 Mortality or Disturbance to Special Status Wildlife Species

Impacts

Clearing of mature trees during the period May to September does have some potential to result in individual bat mortality, if day or maternity roost trees are cleared. The potential for mortality of individual, solitary bats that are roosting during daylight hours on trees or the bridge is of limited concern to bat conservation. Disturbance of maternity colonies is of more concern. That said, the probability of disturbance of this project is rated as low for the following reasons: few bats were detected during the acoustic survey and there was no evidence of a maternity colony utilizing the bridge, the area of vegetation to be cleared is small; the trees anticipated to be cleared are primarily smaller deciduous trees and mature conifers, rather than the larger and decaying deciduous trees preferred as roosts; and bat populations in the LSA are expected to be small. Therefore, regardless of when bridge demolition and clearing occurs the project is not anticipated to adversely affect local, ravine bat populations. In addition, disturbance/mortality of individual bats would not contravene the law as this project is not on federal lands and individual day roosts (and maternity roosts) for these species are not currently identified by SARA as critical habitats and are not protected by the provincial *Wildlife Act*. Direct impacts to little brown myotis from the proposed project are, therefore, ranked as negligible.

Mitigation and Residual Impacts

Bat-specific mitigation measures are not warranted but we note that scheduling demolition and vegetation clearing to occur outside the breeding bird period also will significantly reduce the risk to roosting individual bats. The residual impact to little brown myotis from the proposed project is rated as negligible.

5.2.4.5 Barriers to Ecological Connectivity/Wildlife Movement

We completed the Appendix D checklist from the City's Wildlife Passage Engineering Design Guidelines (WPEDG) (City of Edmonton 2010) in support of this project and a copy is provided in Appendix M of this report. Based on the information provided in the checklist relative to the proposed bridge replacement project design, no mitigation measures are required in support of maintaining ecological connectivity and wildlife movement. The proposed replacement bridge will maintain similar conditions for wildlife passage compared to existing conditions for all Ecological Design Groups (EDGs) that might currently move in/out of the short Latta Ravine (e.g., deer, coyote, birds, bats, rodents, etc. and will not introduce new barriers to wildlife movement. The existing bridge is lit at night with streetlights along Jasper Avenue. Those lights will be replaced at the same locations as the existing lights to City Standards and will not introduce new lighting to the ravine and adjacent river valley .

Impacts to ecological connectivity/wildlife movement from bridge replacement are rated as negligible.

Mitigation and Residual Impacts

No additional mitigation measures are required for the proposed bridge replacement at this location and residual impacts remain negligible.

5.2.5 Historical Resources

Impacts

The project received *Historical Resources Act* Approval from ACMSW on 08 December 2020, indicating no further studies are required and the project is not anticipated to affect known historical resources. As with any project involving excavation, there is some potential for this project to intersect with *undiscovered* resources in the area. However, the potential for adverse impacts to *undiscovered* resources is reduced to an acceptable level by the Province's approval. In addition, approval is conditional on cessation of work and reporting to the Province in the event of chance discoveries (Appendix K). The potential for the project to adversely affect historical or archaeological resources is, therefore, rated as negligible.

Mitigation and Residual Impacts

In accordance with ACMSW Standard Requirements under the "*Historical Resources Act*: Reporting the Discovery of Historic Resources" all work will be immediately suspended and ACMSW contacted should potential historical/archaeological resources be discovered during construction. Appropriate follow-up measures would then be implemented. The residual impact to historical resources is rated as negligible.

5.2.6 Project Incidents

5.2.6.1 Release of Hazardous/Deleterious Substances On or Off-Site

Impacts

Fuels, lubricants and other hazardous materials are anticipated on-site. Spills or releases can occur during refueling, as a result of equipment failure (e.g., leaking hose), accidents, or improper storage/containment at sites. Spills can cause localized contamination of soils, plant communities, wildlife habitat on and off site and if they enter catch basins, they could travel to the NSR. Most spills would likely be small in nature, but if uncontrolled, spills could spread over large areas. Small spills are anticipated at most construction sites. Large spills are more preventable. Spill migration is particularly likely on the relatively steep

Latta Ravine slopes. Unprotected catch basins in the project area that lead into the City's storm sewer system have the potential to capture unmitigated releases of deleterious materials and transmit them to downstream water bodies including the NSR. Catch basins are especially vulnerable where they are situated at the foot of unprotected slopes where long slopes produce higher flow velocities and can capture higher flow volumes that could overwhelm insufficient protective measures.

The existing Latta Bridge structure contains lead paint. There is potential for lead paint chips to fall off the structure during demolition and contaminate the environment below if debris from the bridge is not contained during demolition.

If appropriate plans and practices are not put into place, the impact of a hazardous or deleterious substance spill could be negative, direct and indirect, minor to major, permanent, local and likely impact on local resources such as plants, soils, surface water and potentially fish in the NSR.

Mitigation and Residual Impacts

The contractor will be required to comply with City of Edmonton's Enviso system. In addition, for the construction period, the contractor will be required to provide a spill prevention and emergency response plan and a hazardous waste management plan. The plans must also include construction monitoring protocols and frequency. During demolition there must be proper containment measures in place to capture all debris from entering the environment. With these measures in place the residual impact should be negligible.

5.2.6.2 Release of Sediment or Other Debris On or Off-site

Impacts

Bridge demolition and construction activities will result in the removal of vegetation and exposing of bare soil surfaces, likely for extended periods of time. Construction activities on exposed soils can result in erosion and loss of top-soils and sub-soils, degradation of top-soil quality, weakened slope stability, or introduce sediments through the City's storm sewer system. In areas where existing vegetation cover is cleared, exposed soils are susceptible to fluvial (surface water) erosion in wet conditions, and, to a lesser extent, aeolian (wind) erosion in dry conditions. The clearing of vegetation on steep slopes will expose soils that are especially susceptible to erosion resulting from surface runoff given high slope gradients. Eroded soils can accumulate in downslope undisturbed vegetated areas and in the ravine bottom. If mitigation measures (controls and clean-up measures) are not put into practice, the impact on vegetation and habitat would be negative, direct and undirect, minor to major, permanent, local and likely.

Mitigation and Residual Impacts

The contractor will be required to comply with City of Edmonton's Enviso system. In addition, for the construction period, the contractor will be required to prepare a site-specific temporary ESC plan, to City of Edmonton specifications, and a site-specific care of water plan. These plans will also include monitoring protocols and frequency. With these plans in place the residual impact of sediment or other debris release off site should be negligible.

5.3 Cumulative Effects

The cumulative effects study area was defined as the local study area centered on Latta Bridge. The assessment considered past projects, known present projects and publicly announced future projects.

5.3.1 Past Projects

As noted in the historic overview provided in Section 2 the development footprint in the project area has remained essentially unchanged since the early 2000's, comprising a combination of City roadways, residential, commercial, manicured areas and natural vegetation.

5.3.2 Present Projects

We are unaware of current projects taking place in this area.

5.3.3 Future Planned Projects

We are unaware of known planned projects in this area.

5.3.4 Conclusion

As the proposed project represents a stand-alone project and comprises the replacement of an existing bridge, it is not anticipated to act as a catalyst for additional future development in this area. The proposed project, therefore, has no potential to result in impacts that act cumulatively with impacts of past, present or identified planned (future) projects.

6.0 ENVIRONMENTAL MONITORING

This EIA identifies a few monitoring commitments for the City:

- Pursuant to the City of Edmonton's Enviso program, Environmental Construction Operations (ECO) Plan monitoring during site preparation and construction phases of the project must be completed weekly.
- Monitoring is required by the Erosion and Sediment Control Plan, to be undertaken by a Certified Professional in Erosion and Sediment Control (CPESC) or equivalent.
- Monitor implementation and efficacy of the Tree Protection Plan.
- Ongoing slope stability monitoring of the geotechnical instrumentation (slope inclinometers and piezometers.
- Monitor implementation of a Weed Control Plan.
- Monitoring should include all laydown areas identified in Figure 2, Appendix A.

7.0 PUBLIC, INDIGENOUS AND STAKEHOLDER ENGAGEMENT

The following information is a summary based on the public engagement summary provided in BPTEC and Stantec (2021). A copy of Stantec's Stakeholder Engagement and Communication Report (2021) is provided in Appendix N.

City identified directly and potentially affected stakeholders to exchange preliminary Latta Bridge replacement project information in autumn 2021. Stakeholders included adjacent property and business owners, City agencies and boards who advise infrastructure projects, environmental organizations, and river valley user groups. A total of 18 stakeholders was identified for engagement during preliminary design. Subsequently, a Stakeholder Engagement, Communications and Media Plan was developed, along with invitations and a presentation. Letters of invitation to meet with the project team were sent to thosese stakeholders via Canada Post on 19 January 2021. Additional outreach to follow up on invitations was conducted by email and phone, as well as letters that were hand delivered. Of the 18 stakeholders invited, nine (9) accepted the offer to meet with the project team, while others appreciated receiving information that they could communicate to their members or organization.

Key stakeholders included:

- Edmonton Arts Council
- Boyle Street (Street Outreach Team)
- Paths for People
- River Valley Alliance
- River Valley Conservation Coalition
- Edmonton Historic Board
- Royal Canadian Legion
- Cromdale Plaza
- Rivergate
- Viewpoint
- ALM Holdings
- Catholic Social Services
- Friends of Kinnaird Ravine
- Boyle Street, Parkdale/Cromdale, McCauley, Bellevue and Riverdale Community Leagues
- Adjacent residences and businesses
- Internal City of Edmonton Stakeholders

In total, nine (9) stakeholder meetings were conducted with 22 participants between 16 February and 24 March 2021. One-on-one stakeholder meetings were conducted with the following organizations:

- Paths for People (16 February 2021)
- Royal Canadian Legion (18 February 2021)

- River Valley Conservation Coalition (05 March 2021)
- Edmonton Arts Council (18 March 2021)
- Boyle Street Outreach Team (19 March 2021)
- River Valley Alliance (23 March 2021)
- Edmonton Historical Board (March 24, 2021)

Businesses, residences, and community leagues adjacent to the bridge were invited to participate in two virtual group meetings. These occurred on the following dates:

- Community Leagues (18 February 2021)
- Residences and Businesses (25 February 2021)

At each meeting, the project team presented information about the proposed Latta bridge project, including a project overview, the potential impacts, timelines and next steps. The presentation was formatted to encourage discussion and allowed multiple opportunities to collect stakeholder feedback and answer questions. As a result of stakeholder meetings, six themes were generated and are discussed below.

Access During Construction

Stakeholders requested to have signage and detour information well in advance of construction to notify residents, businesses, commuters and trail users in the area. Conversations informed the project team that the unofficial trail beneath Latta Bridge is popular and provides well-used access to Dawson Park. Stakeholders requested detour signage specifically for Dawson Park access.

Traffic Calming and Pedestrian Safety

Pedestrian safety and accessibility was important to all stakeholders. The Community Leagues expressed the desire for traffic calming in their neighborhoods. They discussed how lane width, speed, pedestrian safety and accessibility could improve neighborhood safety. Some stakeholders asked if the number of lanes on the bridge could be reduced to two.

Displacement and Safety of Vulnerable Populations

Construction impacts affecting vulnerable people living in the river valley were discussed in detail with Boyle Street Community Services Street Outreach Team and Catholic Social Services.

The Street Outreach Team indicated that Latta Bridge is a popular gathering place where clients can take shelter from the elements. It was requested that an alternate safe gathering space be allocated for vulnerable people who are displaced as a result of the project. The Street Outreach Team will suggest an appropriate alternate site and share communications for construction notification and detours with their clients.

To provide safety to vulnerable people during construction the Street Outreach Team proposed daily site sweeps to make sure that no one entered or is sleeping in the construction site and providing education and awareness training for construction workers. The City committed to continuing this conversation to develop a mitigation plan for vulnerable populations.

Catholic Social Services operates a women's shelter to the southeast of Latta Bridge, and they shared a number of concerns with the project team. The property encroachment means the fence and the only tree (Latta Heritage Tree) in their playground will be removed. The tree and fence provide and privacy for clients. Discussion with the project team included temporary fencing during construction, as well as fence and tree replacement. If possible, the existing tree will be preserved.

Catholic Social Services also identified that noise due to construction activities would impact their clients' quiet and calm environment at the shelter. Catholic Social Services currently lease the building from the City and they questioned whether the building would be impacted due to vibration caused by construction.

Tree and Vegetation Removal

Stakeholders shared that they value the trees and vegetation in the ravines and the North Saskatchewan River Valley. They requested the City only remove trees needed for construction, and replace trees that are removed following construction.

History and Art

Discussions with Edmonton Arts Council and the Historical Society generated ideas about preserving historical elements of the existing Latta Bridge including the Latta plaque and date stones. It was suggested that the Latta Bridge be replaced with a steel rather than concrete as a "historical nod" to the Latta family who were blacksmiths.

Public art will be based on the city-based percentage of the growth amount of the project. Locations for art may include the open grassed areas along Jasper Avenue where pedestrians can approach and interact with the artwork.

From these meetings, the project team has committed to the following:

- Provide information regarding detours and construction access to the Royal Canadian Legion.
- Confirm the allocation amount for public art with the Arts Council.
- Work with Boyle Street Outreach to develop mitigation plan for vulnerable peoples.
- Follow up with Boyle Street Outreach team regarding training for construction workers.
- Project websites will be updated as design progresses.

Next steps regarding stakeholder engagement include a second round of engagement prior to construction in spring 2022, and a public information session prior to construction in spring 2022. Construction notification will also occur in spring 2022.

8.0 CONCLUSIONS

8.1 Impact and Sensitivities

This EIA has shown that with the described mitigation measures applied, all but three adverse impacts related to the construction phase of the project can be mitigated such that adverse residual impacts are reduced to negligible. The key sensitivities identified for the proposed project, therefore, are:

- slope stability issues resulting from voids and ongoing slope instability at the south ravine headslope,
- loss of a Heritage Tree, and
- habitat alienation during construction.

Based on available preliminary information, the project is anticipated to result in a negative residual impact related to slope stability. Significant slope stability issues have been identified at the site resulting from voids caused by historical coal mining in the area and ongoing slope instability at the south ravine headslope. Future work, including detailed design of the bridge and foundations, slope stabilization measures, determination of methods to mitigate the effects of abandoned coal mine workings including void grouting, requirements for foundation construction and ongoing slope stability monitoring need to be completed. Since final design remains unknown at this time and specific slope stability mitigation measures need to be further advanced, the residual impact rating is negative, major, temporary to permanent, local and likely.

A large Manitoba maple located within the fenced yard of an apartment building to the southeast of Latta Bridge, within the LSA, was planted in 1906 by the Latta family and has been designated a Heritage Tree by the Heritage Tree Foundation. If the tree is to be removed, owing to the age of the tree and its historical and Heritage Tree status, residual impacts are rated as negative, major, direct, permanent, local and likely impact because it cannot be easily replaced. Efforts will be made during detailed design to avoid removing the Heritage Tree.

The project is anticipated to result in one temporary negative residual impact related to wildlife during construction. Construction activities and related noise have the potential to result in wildlife habitat alienation in adjacent areas. Activities and noise associated with construction phases have potential to disrupt wildlife species using adjacent habitat, leading to habitat alienation in those areas. This effectively reduces the amount of usable habitat available to individuals. Few mitigation measures are available; however, work crews will be instructed not to harass wildlife and the contractor’s ECO plan will include worker/wildlife encounter protocols.

Considering the above, and that communication with City stakeholders remains open during project development, we are of the opinion that the proposed project does not require additional modifications to proceed responsibly, with respect to environmental impacts.

8.2 EIA Limitations

This EIA has few limitations as site access was granted and field studies were undertaken at seasonally appropriate times. Impact characterizations are, however, predicated on the assumption that the City's construction contractor will develop environmental controls intended to induce excellent environmental performance during construction.

8.3 Summary of Key Mitigation Measures

The following represents a list of key mitigation measures that are important action items for future project stages. All mitigation measures should be included in the Contractor's ECO Plan.

- The City must ensure that the construction contractor adheres to all the mitigation measures listed in Section 5.2.1 and distilled here to mitigate potential impacts to slope stability.
    - Conduct ongoing monitoring of geotechnical instrumentation regarding slope stability
    - Ensure qualified geotechnical personnel conduct quality control inspections during foundation installation

- The City must ensure that the construction contractor adheres to all mitigation measures listed in Section 5.2.2 and distilled here to address soil contamination and ensure compliance with EPEA and City requirements:
    - Adhere to the site-specific risk mitigation plan for soil contamination

- The City must ensure that the construction contractor adheres to all the mitigation measures listed in Section 5.2.3 and distilled here to address vegetation loss and ensure compliance with the *Corporate Tree Management Policy*:
    - Prepare a Tree Protection Plan
    - Revegetate exposed soils promptly
    - Discourage weed establishment
    - Ensure Contractor implements weed control and monitoring during the warranty period.

- The City must ensure that they, as proponent, and the retained contractor adhere to all mitigation measures listed in section 5.2.4 to mitigate potential wildlife impacts and ensure compliance with all Provincial and Federal legislation pertaining to wildlife. Note that vegetation clearing timing is a critical issue.

- The City must ensure that the construction contractor adheres to all mitigation measures listed in section 5.2.5. to mitigate potential historical (archaeological and palaeontological) impacts and ensure compliance with the *Historical Resources Act*.

- The City must ensure that the construction contractor adheres to all mitigation measures listed in Section 5.2.6 and distilled here to mitigate impacts to project incidents.
    - Prepare a detailed spill prevention and emergency response plan

8.4 Summary of Outstanding City Environmental Permitting Requirements

The following environmental permitting requirements remain the responsibility of the City and must be completed prior to construction start:

- North Saskatchewan River Valley Area Redevelopment Plan (Bylaw 7188) - EIA approval - anticipated in autumn 2021
- City of Edmonton Parkland Bylaw (Bylaw 2202) – City (or contractor) to undertake

All of the above mitigation and permitting actions are summarized, by project phase in Appendix O.

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9.1 Personal Communications

Lausen, Cori, Ph.D., Associate Conservation Scientist, Wildlife Conservation Society Canada

Schutta, M, P.Eng., Engineering Project Manager, Transportation Planning & Design, City of Edmonton

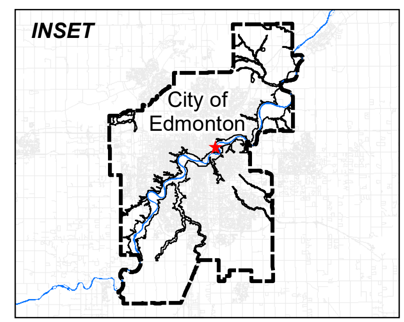
Wilkinson, Lisa, M.Sc., Provincial Bat Specialist. AEP. Communication in 2018 with Andra Bismanis of Spencer Environmental. Edmonton. Alberta.

Wiltzen, Chuck, P.Eng., Director - Senior Bridge Planning Engineer, BPTEC Engineering Ltd.

Appendix A: Figures

Figure 1. Project Location
Latta Bridge Replacement

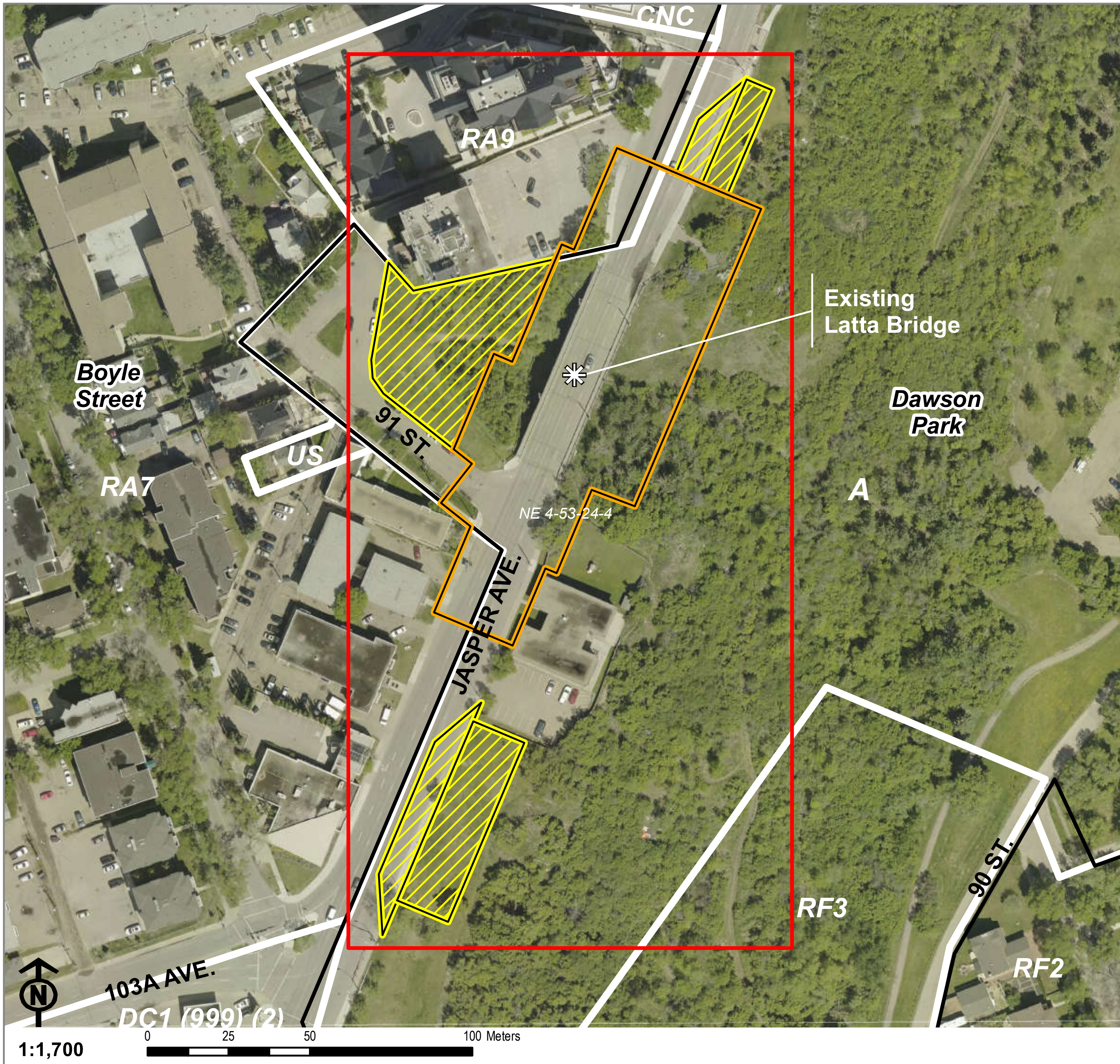
Legend
- Local Study Area
- Bylaw 7188 Boundary (COE 2008)



Map Date: 19 August 2021
Imagery Mosaic: May-July 2020 (COE)

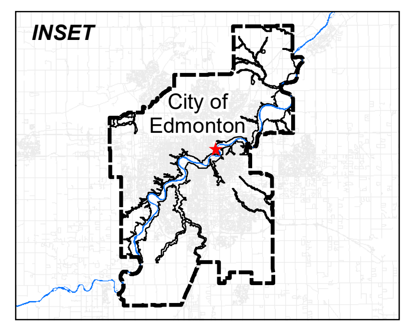
SPENCER ENVIRONMENTAL MANAGEMENT SERVICES LTD.

Figure 2.
City of Edmonton Land Use Zoning
Latta Bridge Replacement



Legend

- Local Study Area
- Bylaw 7188 Boundary (COE 2008)
- Work Limits*
- Laydown Area*
- Zoning (COE 2020)



Map Date: 19 August 2021
Imagery Mosaic: May-July 2020 (COE)

SPENCER ENVIRONMENTAL MANAGEMENT SERVICES LTD.

*Preliminary design data provided by BPTEC Engineering and Stantec Inc. (2021).

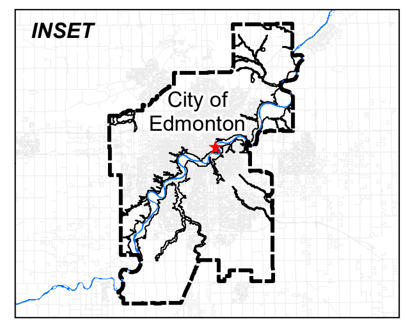
Figure 3.
EIA Local and Expanded Study Areas
Latta Bridge Replacement

Legend

Local Study Area

Bylaw 7188 Boundary (COE 2008)

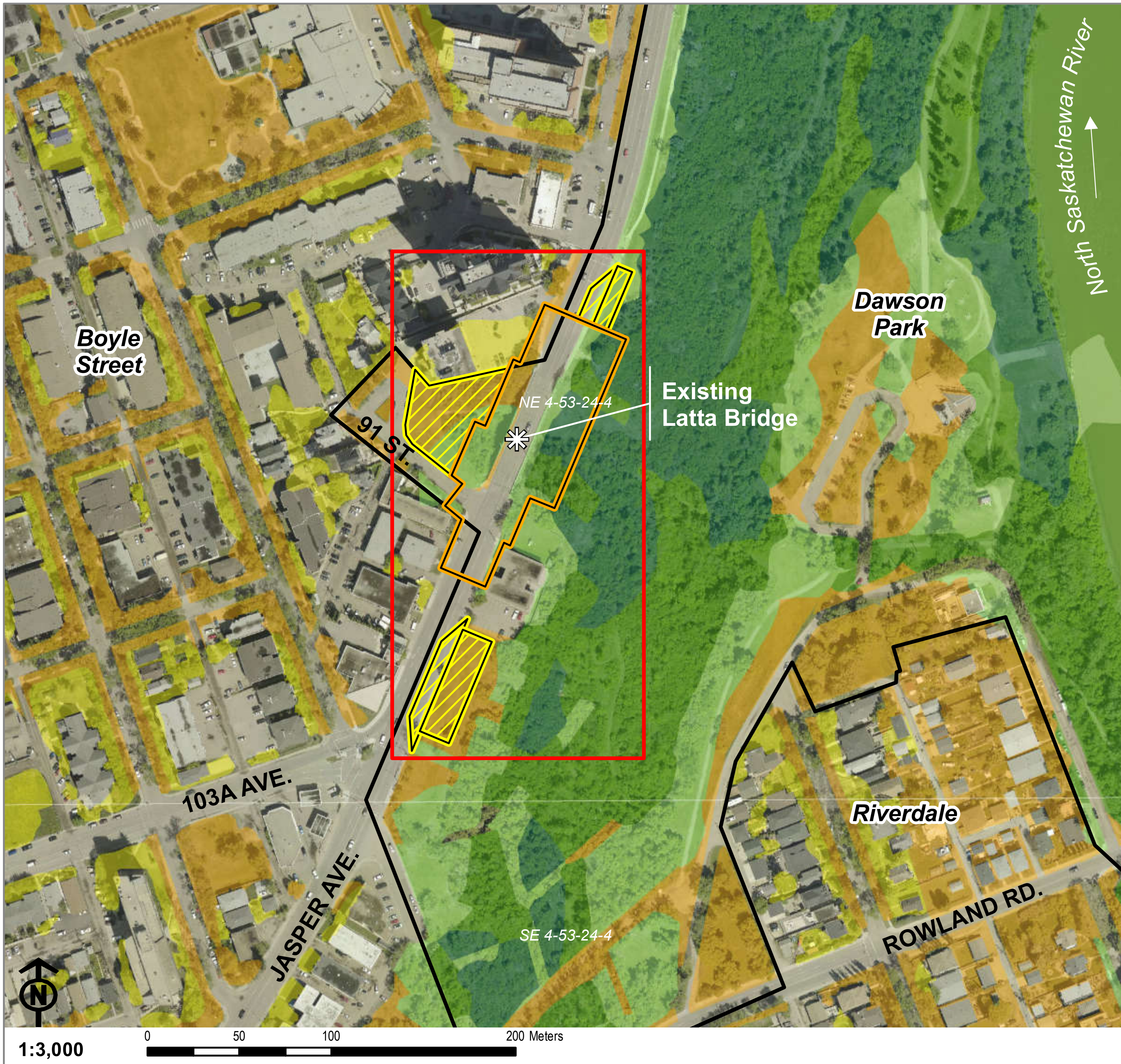
*Map extent reflects the Expanded Study Area.



Map Date: 19 August 2021
Imagery Mosaic: May-July 2020 (COE)

SPENCER ENVIRONMENTAL MANAGEMENT SERVICES LTD.

Figure 4.
City of Edmonton Environmental Sensitivities – Original (2016)
Latta Bridge Replacement

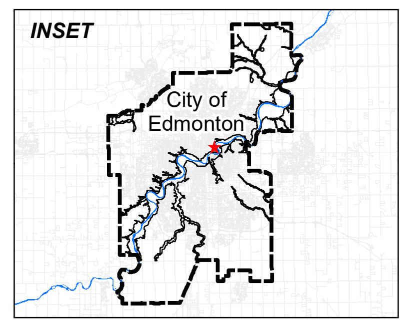


Legend

- Local Study Area
- Bylaw 7188 Boundary (COE 2008)
- Work Limits*
- Laydown Area*

Environmental Sensitivity**

- Extremely High Value
- Very High Value
- High Value
- Moderate Value
- Low Value



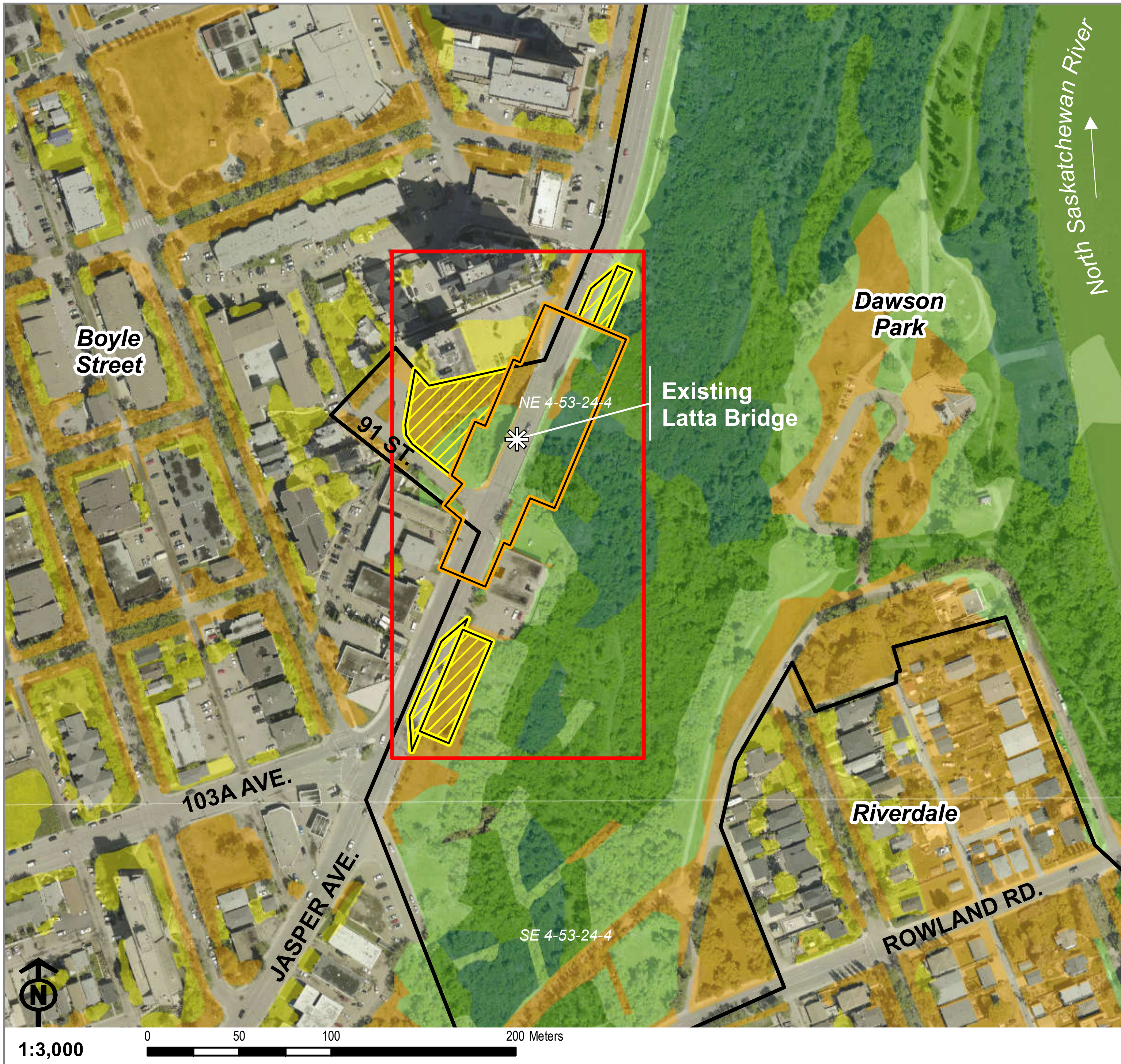
Map Date: 19 August 2021
Imagery Mosaic: May-July 2020 (COE)

SPENCER ENVIRONMENTAL MANAGEMENT SERVICES LTD.

*Preliminary design data provided by BPTEC Engineering and Stantec Inc. (2021).
**City of Edmonton Environmental Sensitivity Project (Solstice Canada, 2016).

Figure 5. City of Edmonton Environmental Sensitivities – Updated (2021)

Latta Bridge Replacement

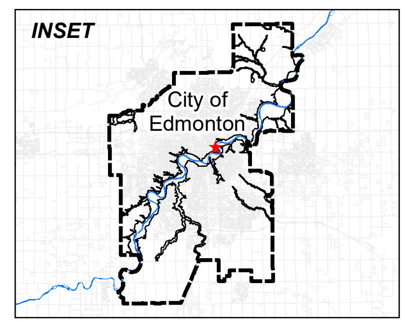


Legend

- Local Study Area
- Bylaw 7188 Boundary (COE 2008)
- Work Limits*
- Laydown Area*

Environmental Sensitivity**

- Extremely High Value
- Very High Value
- High Value
- Moderate Value
- Low Value

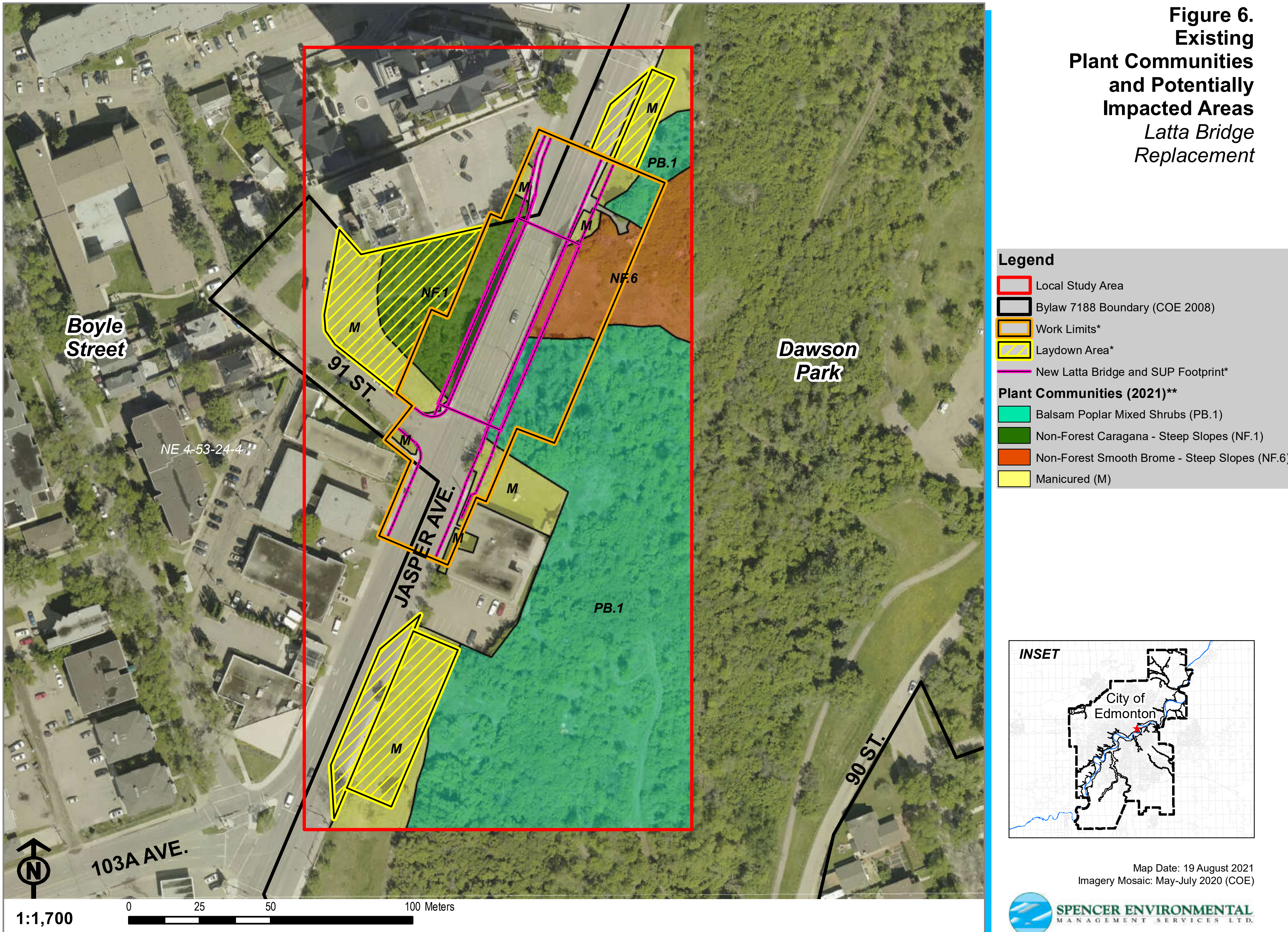


Map Date: 19 August 2021
Imagery Mosaic: May-July 2020 (COE)

SPENCER ENVIRONMENTAL MANAGEMENT SERVICES LTD.

*Preliminary design data provided by BPTEC Engineering and Stantec Inc. (2021).
**Update of City of Edmonton Environmental Sensitivity Project (Solstice Canada, 2016) data based on site-specific survey data conducted by Spencer Environmental (2021).

Figure 6.
Existing Plant Communities and Potentially Impacted Areas
Latta Bridge Replacement

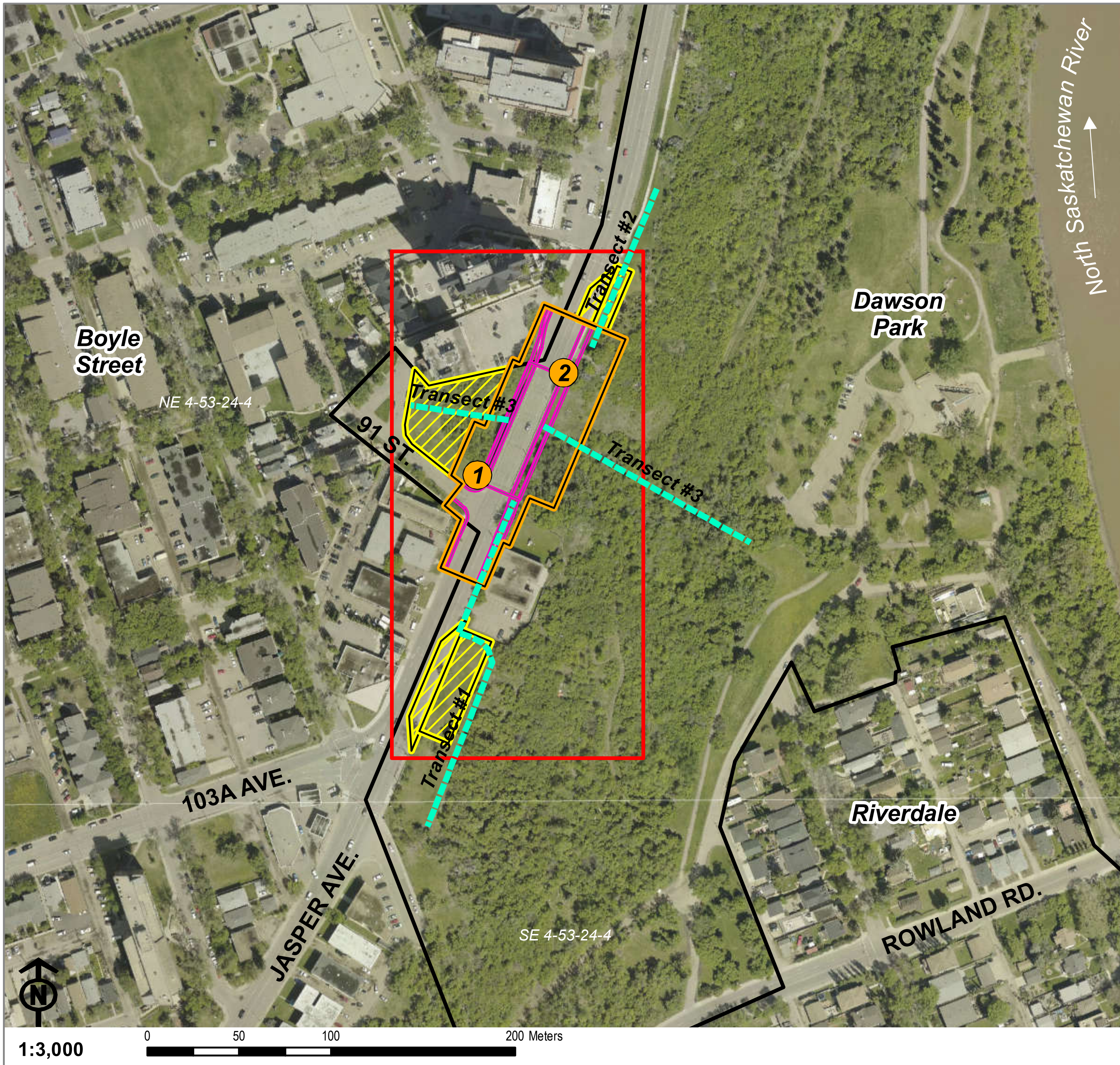


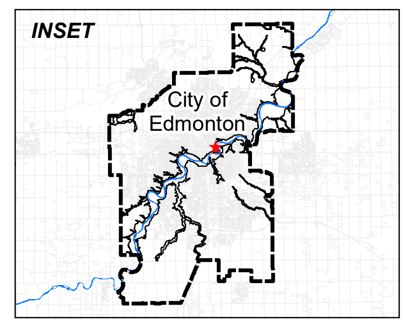
Map Date: 19 August 2021
Imagery Mosaic: May-July 2020 (COE)

SPENCER ENVIRONMENTAL MANAGEMENT SERVICES LTD.

*Preliminary design data provided by BPTEC Engineering and Stantec Inc. (2021).
**Plant community classification follows the Urban Ecological Field Guide for the City of Edmonton, Alberta, Canada (City of Edmonton 2015).

Figure 7.
Wildlife Survey Locations
Latta Bridge Replacement



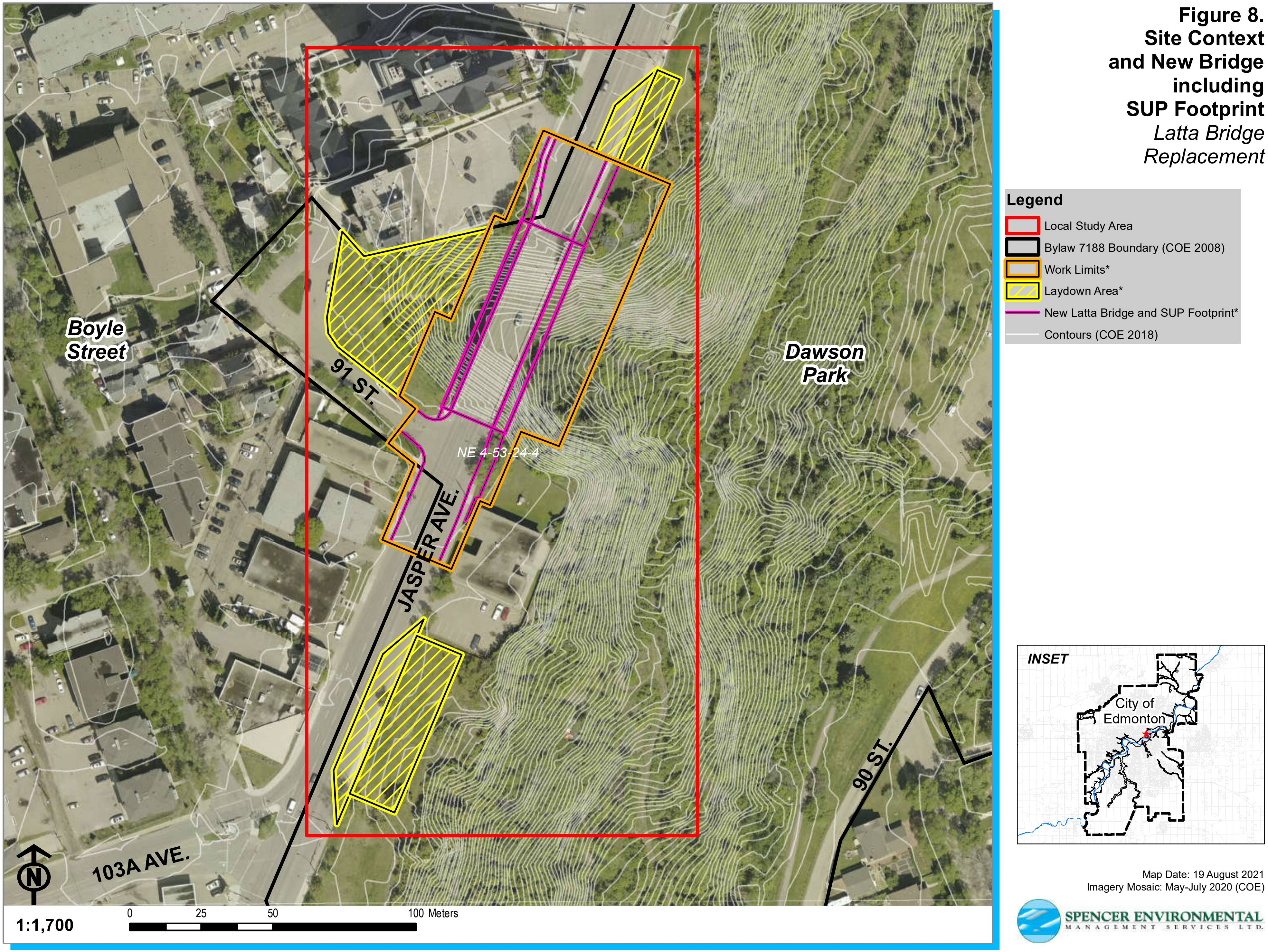


Map Date: 19 August 2021
Imagery Mosaic: May-July 2020 (COE)

SPENCER ENVIRONMENTAL MANAGEMENT SERVICES LTD.

*Preliminary design data provided by BPTEC Engineering and Stantec Inc. (2021).

Figure 8.
Site Context and New Bridge including SUP Footprint
Latta Bridge Replacement



Map Date: 19 August 2021
Imagery Mosaic: May-July 2020 (COE)

SPENCER ENVIRONMENTAL MANAGEMENT SERVICES LTD.

*Preliminary design data provided by BPTEC Engineering and Stantec Inc. (2021).

Appendix B: Geotechnical Report (Thurber 2021a)

LATTA BRIDGE REPLACEMENT
JASPER AVENUE NEAR 91 STREET NW
EDMONTON, ALBERTA
GEOTECHNICAL INVESTIGATION

THURBER ENGINEERING LTD.

LATTA BRIDGE REPLACEMENT
JASPER AVENUE NEAR 91 STREET NW
EDMONTON, ALBERTA
GEOTECHNICAL INVESTIGATION

Report

to

BPTEC

José G. Pineda, M. Eng., P. Eng.
Project Engineer

Date: January 12, 2021
File: 29077

Robin Tweedie, M.Sc., P.Eng.
Review Principal

THURBER

TABLE OF CONTENTS

THURBER

STATEMENT OF LIMITATIONS AND CONDITIONS

APPENDICES

APPENDIX A

Drawing 29077-1 – Site Plan Showing Test Hole Locations
Drawing 29077-2 – Stratigraphic Cross-Section A-A’
Drawing 29077-3 – Stratigraphic Cross-Section B-B’
Drawing 29077-4 – Surficial Geology Map
Drawing 29077-5 – Bedrock Topography Map
Drawing 29077-6 – Historical Air-Photos

APPENDIX B

Symbols and Terms
Modified Unified Soils Classification System
Rock Material Description
Test Hole Logs

APPENDIX C

Geotechnical Laboratory Testing

APPENDIX D

Summary of Piezometer Readings and Slope Inclinmeter

APPENDIX E

Coal Mine Drawings

APPENDIX F

Slope Stability Results

APPENDIX G

Previous Geotechnical Investigations Results

1. INTRODUCTION

This report presents the results of a geotechnical investigation carried out by Thurber Engineering Ltd. (Thurber) for the Latta Bridge replacement project located on Jasper Avenue near 91st Street, Edmonton, Alberta.

The scope of the geotechnical investigation was outlined in our proposal to Mr. Scott Donald., P.Eng., of the BPTEC Engineering Ltd. (BPTEC) dated June 3, 2020. Authorization to proceed with the investigation was received from Mr. Chuck Wiltzen, P. Eng. of BPTEC in a subconsultant agreement executed on August 28, 2020.

An environmental overview and Phase II Environmental Site Assessment were carried out in conjunction with this project and those results will be presented in a separate report.

This report supersedes our draft report dated November 27, 2020 and provides additional information and addresses the comments received from the City of Edmonton (City) in correspondence dated December 14, 2020.

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. PROJECT BACKGROUND

The Latta Bridge was originally constructed as a trestle bridge over the Latta Ravine in 1911. Coal mining in the area started in 1910 and continued until the mid-1920's. Mine subsidence in the 1920's caused significant settlement of the bridge structure. An attempt was made to infill the ravine in 1928 to eliminate the need for a bridge; however, ongoing subsidence from collapsing coal mines ended that effort. The bridge was replaced with the current five-span steel structure in 1936 once coal mine subsidence appeared to have stabilized. The bridge was rehabilitated in 1977 and again in 2004.

It is understood that there has been ongoing distress to the bridge particularly at the south abutment as a result of potential head slope movements and/or ground subsidence which has caused deformation to the south abutment and lateral loading along the bridge. The 2004 rehabilitation included replacement of the strip seal joints and a portion of the bridge wall at the south abutment to accommodate the ongoing ground movement. Cracks on the road have been observed at the south abutment likely due to ground movement. It is understood that similar movements have not been noted at the north abutment to date.

A preliminary geotechnical investigation, consisting of drilling three boreholes and installing slope inclinometers and vibrating wire piezometers to check for potential slope movements, was conducted in March 2020. The results of the preliminary geotechnical investigation were presented to the City during the spring and fall of 2020 and were incorporated into this report. Pertinent information obtained during this previous investigation is presented herein for completeness.

3. SCOPE OF WORK

It is understood that the City is planning to replace the existing Latta Bridge over the next few years. Thurber's scope of work was to obtain additional information on the subsurface conditions to assist with the design of the new bridge foundations and slope stabilization. Briefly, this consisted of the following tasks:

- Drill three test holes to determine subsurface conditions.
- Prepare a geotechnical assessment report summarizing the results of the field work and providing preliminary bridge foundations and slope stability measures.

It is understood that further analyses and recommendations will be required once more details on the bridge layout and loading are available.

4. METHODOLOGY

4.1 Field Program

The geotechnical investigation was carried out in two phases as follows:

- Phase 1 was completed directly for the City in April 2020 and consisted of drilling three test holes (TH20-1 to TH20-3) and installing geotechnical instrumentation.
- Phase 2 was completed for the BPTEC project team in September 2020 and consisted of drilling three test holes (TH20-4 to TH20-6).

Prior to mobilizing to site, the underground utilities were located through Alberta One Call and private locates were conducted by Alberta Hotline Inc. OSCAM and project review permits were obtained prior to commencement of drilling for both phases

A summary of the geotechnical field program undertaken is presented in Table 4.1. Further details are provided in the following sections:

TABLE 4.1
SUMMARY OF GEOTECHNICAL INVESTIGATION PROGRAM

TEST HOLE	AUGER INTERVAL (m)	CORE INTERVAL (m)	GEOTECHNICAL / ENVIRONMENTAL INSTRUMENTATION
TH20-1	0 – 27.5	27.5 - 41.9	VW - 65160 VW - 65162 SI20-1
TH20-2	0 – 17.2	17.4 – 45.4	VW - 65159 VW - 65161 SI20-2
TH20-3	0 – 10.4	8.5 – 29.0	-
TH20-4	0 – 27.2	27.2 – 40.8	50 mm monitoring well in upper 12 m
TH20-5	0 – 25.6	25.6 – 41.1	50 mm monitoring well in upper 13 m
TH20-6	0 – 15.0	15.0 – 29.2	50 mm monitoring well in upper 12 m

Notes:
1. Depth Intervals measured from below ground surface.
2. VW = Vibrating wire piezometer
3. SI = slope inclinometer.

4.2 Phase 1 – April 2020 (TH20-1 to TH20-3)

The field drilling program was carried out using two different drill rigs. Two test holes (TH20-1 and TH20-2) were drilled using a truck-mounted auger/rotary drill rig with solid stem augers supplied by Garrity and Baker Drilling Inc. of Edmonton, Alberta.

One additional test hole (TH20-3) was drilled within the ravine slopes using a track-mounted auger/coring rig supplied by All Service Drilling Inc. of Nisku, Alberta. Drilling operations occurred between March 21 to April 6, 2020.

The test holes were first advanced through the overburden soil deposits using auger drilling methods to obtain samples of the soils overlying bedrock and confirm the depth to bedrock. Following auger drilling, each test hole was cored from near the top of bedrock until the target depth was reached.

The subsurface conditions were visually logged in the field by Thurber geotechnical technicians. Standard Penetration Tests (SPT's) were conducted at select intervals in the auger test holes. Bedrock core samples were logged in the field, wrapped in plastic to prevent moisture loss, and transported to Thurber's Edmonton laboratory for analysis. The field log of the bedrock core included a description of the rock, measurements of core recovery and RQD (rock quality designation), and the presence and angle of fractures and jointing.

Test holes TH20-1 and TH20-2 were then completed with a full depth slope inclinometer and two vibrating wire piezometers. The instrumented bore holes were backfilled with cement-bentonite grout and details of the geotechnical instrumentation are provided on the test hole logs in Appendix B. Test Hole 20-3 was backfilled with cuttings.

Excess soil cuttings and drilling fluid were removed by the drilling contractors either by truck or hydrovac. Flush-mount covers were installed at the two instrumentation locations. Survey of the three test hole locations and elevations was carried out by COE and this information is provided on the test hole logs.

4.3 Phase 2 Drilling – September 2020 (TH20-4 to TH20-6)

The field drilling program was carried out using two different drill rigs supplied by All Service Drilling Inc. of Nisku, Alberta. Two test holes (TH20-4 and TH20-5) were drilled on the road using a truck-mounted auger/coring drill rig and one test hole (TH20-6) was drilled within the ravine slopes using a track-mounted auger/coring rig. Drilling operations occurred between October 9 to 12, 2020.

The test holes were first advanced through the overburden soil deposits using auger drilling methods to obtain samples of the soils overlying bedrock and confirm the depth to bedrock. The subsurface conditions were visually logged in the field by Thurber geotechnical technicians. Standard Penetration Tests (SPT's) were conducted at select intervals in the auger test holes.

Following auger drilling, each test hole was continuously cored from near the top of bedrock until the target depth was reached. Bedrock core samples were logged in the field, wrapped in plastic to prevent moisture loss, and transported to Thurber's Edmonton laboratory for analysis. The field log of the bedrock core included a description of the rock, measurements of core recovery and RQD (rock quality designation), and the presence and angle of fractures and jointing.

Monitoring wells were installed in separate holes located a few meters from each drilling location to depths ranging between 12 and 13 m below ground surface. The annulus between the wells and test hole walls were backfilled with sand to approximately 0.3m above the slotted screen, followed by bentonite chips to ground surface.

Excess soil cuttings and drilling fluid were removed by the drilling contractors either by truck or hydrovac. Flush-mount covers were installed at the two new locations on the road.

4.4 Laboratory Testing

Laboratory testing included moisture content determination, visual description, and classification of all soil samples. In addition, Atterberg Limits, grain size analyses, and water-soluble sulphate content tests were conducted on selected soil samples.

The bedrock core samples were visually logged in Thurber's Edmonton laboratory and moisture contents were determined at selected intervals. In addition, advanced laboratory testing including unconfined compression tests and direct shear tests were undertaken on selected samples.

Results of the field and laboratory tests are presented on the test hole logs in Appendix B and the laboratory test results are presented in Appendix C. Laboratory Index Test Results (Atterberg Limits and gradation analyses), compressive strength test results, and direct shear test results and are summarized in Section 6.3 and presented on Tables 6.1 to 6.3, respectively.

A description of the symbols and terms used on the soil logs, the rock logging terms used on the core hole logs and the Modified Unified Soils Classification charts are presented in Appendix B.

4.5 Instrumentation Readings

4.5.1 Slope Inclinometers

Two slope inclinometers (TH20-1 and TH20-2) were installed at the south and north abutments respectively during the previous geotechnical investigation in April 2020 as reported in Thurber's geotechnical report dated May 7, 2020. Locations of the instrumentation are presented on Drawing No 29077-1.

The slope inclinometers were initialized on March 24, 2020. and subsequently read on July 17, 2020 and most recently on September 28, 2020, by Mr. Tim Craplewe, C.E.T. of Thurber Engineering Ltd.

The SIs were read using an RST Digital Inclinometer probe with a 2 ft. wheelbase and an RST Pocket PC readout. Inclinometer reading depths were defined as per cable markings with respect to the top of the inclinometer casings.

Results of the SI readings are presented in Section 6.4.

4.5.2 Piezometer Readings

The two shallow VWP's (VWP20-1A and VWP20-2A) that were installed at depths of about 12.2 m below ground surface.

The two deep VWP's (VWP20-1B and VWP20-2B) that were installed at depths of about 33.5 m below ground surface. The piezometers were read using an RST piezometer reader.

Results of the piezometer readings are presented in Section 6.4.

5. GEOLOGIC SETTING

The uplands at the Latta bridge site are underlain by glaciolacustrine deposits consisting primarily of clay and silt with minor amounts of sand, overlying clay till, empress formation (preglacial sands), and bedrock of the Edmonton formation in descending order.

The bedrock consists of upper cretaceous non cemented clay shale, sandstone, and siltstone, with thin coal layers and bentonite seams.

The valley slopes below the bridge site are underlain by colluvium consisting of the slumped mixture of glaciolacustrine, clay till, and bedrock (Kathol and McPherson 1975). Clay fill was also encountered in the ravine in TH20-3 and TH20-6, which is consistent with the history of this site indicating that previous attempts were made to infill the ravine.

The river terrace deposits along the river's edge below the uplands are underlain by alluvial sand silt and gravel, overlying bedrock.

The interpreted surficial geology in the vicinity of the bridge site is presented in Drawing No. 29077-4 in Appendix A. The surficial geology is based on available geological information contained in the reference map from C.P. Kathol and R.A. McPherson. "Urban Geology of Edmonton." Bulletin 32. Alberta Research Council. Published 1975, and also geological interpretations based on our review of the LiDAR mapping of the area.

6. SITE DESCRIPTION

6.1 Surface Conditions

The Latta Bridge crosses a ravine that is approximately 70 m wide and 12 m deep at the crossing location. The ravine slopes are generally covered with matured trees. The north and south ravine slopes at the bridge location slope at about 24 degrees and 28 degrees respectively (2.2H:1V and 1.9H:1V, respectively). The ravine deepens to about 13 m at an overall slope of approximately (1.9H:1V) along the south bank in the north-east direction. The above-mentioned bank slope inclinations and heights are shown on the Stratigraphic Cross-sections A-A' and B-B' in Appendix A.

A visual inspection of the south slope indicates that many of the mature trees have curved trunks indicating that there is past creep movements on the south side of the bridge. There were also indications of potential historical landslides in this area as the slope was uneven and appeared to contain several slide blocks. It was not possible to inspect the north slope to the same degree as the type of vegetation on the north side did not allow a visual assessment of potential creep movement.

There were no indications of current active movement of the south headslope. There was a 1.8 m high near-vertical feature at the toe of the headslope which could be indicative of a previous landslide toe roll; however, it could also be a feature of previous construction activities at the bridge. There was an exposed retaining wall in the southeast corner just below the east-most column of the first pier. This wall is supported on 280 mm-diameter cast-in-place concrete piles. Loss of soil has resulted in a void below the wall up to 950 mm high.

This wall is not shown on any of the historical drawings; however, based on historical photos, it appears to have been constructed as a retaining wall to retain the upper part of the slope. It is not known if the purpose of the wall was merely to retain soil for grading reasons or if it was necessary for the support of the pier footing at that location. There was a crack in the abutment wall level with the top of the abutment seat which may indicate movement of the abutment in toward the ravine.

The concrete columns supporting the first pier did not show any signs of movement and the steel columns of the second pier were also vertical. There was a noticeable crack in the roadway asphalt leading up to the south abutment spanning both lanes which is in a similar location to previously reported settlement/instability cracks.

The trees on the slope on either side of the north abutment did not show indications of slope movements. The northeast slope is grassed and there were no obvious cracks on the slope. The steel columns of the third pier (counting from the south) were vertical. The concrete columns of the fourth pier did not show any signs of distress; however, the bearing plates on the tops indicated that the bridge have shifted to the north since they were installed. In addition, the steel girders were in contact with the north abutment headwall indicating northward movement of the bridge structure. It is understood that there is a gap at the south headwall as it was recast during the 2004 rehabilitation work.

There were several locations where erosion gullies were forming. These are due to uncontrolled flow of runoff on the slope and should be addressed during the bridge reconstruction.

6.2 Subsurface Conditions

6.2.1 Generalized Stratigraphy

Subsurface conditions encountered during the drilling program are summarized on the test hole logs in Appendix B. Stratigraphic cross sections A-A and B-B showing the interpreted soil and bedrock profile encountered in the test holes are also provided in Drawings 29077-2 and 29077-3 in Appendix A.

The generalized stratigraphy consists of the following strata, in descending order:

- Clay fill
- Clay and clay till containing sand lenses
- Empress sand
- Clay shale and sandstone bedrock containing frequent coal and bentonite seams.

Further summary descriptions of the soil conditions encountered during drilling are provided in the following sections.

6.2.2 South Abutment

At the location of TH20-1 and TH20-5, near the south abutment, the stratigraphy consisted of asphalt / concrete and granular fill overlying a firm to stiff high plastic clay fill layer, overlying clay till containing sand layers, overlying Empress Formation sand, overlying bedrock consisting of clay shale with interbedded layers of sandstone and coal.

Three distinct coal seams were noted, that are referred to herein as the upper, middle, and lower seams on the stratigraphic cross-sections. The coal layers appeared intact in both test holes. No recovery was noted at the lower coal seam at about elevation 623 m in TH20-1; however, this is believed to be a result of the drilling process rather than evidence of a void at that location.

6.2.3 North Abutment

At the location of TH20-2 and TH20-4, near the north abutment, the stratigraphy consisted of asphalt and granular and firm to stiff high plastic clay fill layer, overlying clay till containing sand layers, overlying Empress Formation sand, overlying bedrock consisting of clay shale with interbedded layers of coal and sandstone.

The upper coal seam is missing as the Empress sand stratum is deeper at this location. In addition, there is evidence of mining of the middle coal seam in both test holes 20-2 and 20-4, as voids and low recovery were noted in both test holes. This is consistent with the known mining activities at the bridge site, as discussed in Section 8.

6.2.4 Piers

At the location of TH20-3 and TH20-6, at the bottom of the ravine, the stratigraphy consisted of loose gravel fill and/or over firm to very stiff clay fill layer, overlying clay till, overlying Empress Formation sand, overlying bedrock consisting of clay shale with interbedded layers of coal and sandstone.

A void is indicated in the middle coal seam in TH20-3, which is indicative of past mining activity, as noted above.

6.2.5 Material Properties

Following is a summary of the material properties identified in the main soil strata:

6.2.5.1 Gravel Fill

The gravel fill was beige, sandy, and contained traces of silt, bricks, glass, and debris. One SPT "N" value obtained in the gravel fill was five blows per 300 mm penetration, indicating a loose state. The natural water content of the gravel fill ranged between 14 and 18 percent.

6.2.5.2 Clay Fill

The clay fill was generally high plastic, grey, contained varying amounts of silt, sand, organics and occasionally gravel. SPT "N" values obtained in the clay fill ranged between six to 17 blows per 300 mm penetration, indicating a firm to very stiff consistency. The natural water content of the clay fill ranged between about 24 and 38 percent.

The results of a direct shear test conducted on the clay fill are summarized on Table 6.3 and also presented in Appendix C. The results indicated peak strength properties of c_p' = 53 kPa and Φ_p' = 13°, and residual strength properties of c_r' = 0 kPa and Φ_r' =9°.

6.2.5.3 Clay Till

The clay till was generally dark brown, medium plastic contained varying amounts of sand, traces of silt, coal, oxides, and gravel, and frequent sand layers. The natural water content of the clay till ranged between about 15 and 25 percent. SPT "N" values obtained in the clay till ranged between 11 to 47 blows per 300 mm penetration, indicating a stiff to very hard consistency.

The results of two direct shear tests conducted on the clay till are summarized on Table 6.3 and also presented in Appendix C.

- The first test was conducted on an sandy clay till sample obtained from TH20-4 from 5.3 to 5.8 m depth, during the Phase 1 investigation and indicated peak strength properties of c_p' = 18 kPa and Φ_p' = 33°, and residual strength properties of c_r' = 0 kPa and Φ_r' =33°.
- The second direct shear test was conducted on a clay till sample from TH20-6 from 8.5 to 9.0 m during the Phase 2 investigation and indicated peak strength properties of c_p' = 16 kPa and Φ_p' = 28°, and residual strength properties of c_r' = 0 kPa and Φ_r' =27°.

It should be noted that the clay till stratum frequently contains cobbles and boulders which can affect pile installations.

6.2.5.4 Empress Sand

The natural water content of the sands and gravels ranged between about 4 and 20 percent. SPT "N" values obtained in the sands and gravels layers ranged between 24 to over 100 blows per 300 mm of penetration, indicating that the sand is in compact to very dense state.

6.2.5.5 Bedrock

The bedrock consisted primarily of clay shale with interbedded sandstone, coal seams and thin bentonite seams.

The clay shale was grey to dark grey or brown, silty, carbonaceous, slightly to highly weathered contained trace amount of coal fragments, with lamination of sandstone, siltstone, and bentonite. The sandstone was typically grey, fine grained, silty, and contained trace coal laminations. The siltstone was typically grey and contained trace clay shale and coal laminations.

The natural water content of the bedrock ranged typically in the range of 15 to 25 percent. SPT "N" values recorded in the bedrock ranged from 30 to greater than 100 blows per 300 mm penetration, indicating a hard to very hard consistency in soil mechanics terminology.

Core recovery (REC) of the bedrock ranged from about 10 to 95 percent and rock quality designation (RQD) measurements varied from 10 to 100 percent. The core recoveries and RQD values were typically lowest in the coal layers reflecting the fractured nature of the coal and also the loss of the middle coal layer in several of the bore holes.

The results of direct shear and unconfined compressive strength tests performed on selected bedrock samples are summarized in Tables 6.2 and 6.3.

Three coal seams were encountered in the bore holes, as shown on the test hole logs and stratigraphic cross-sections. The coal seams appear to be relatively flat lying with a slight dip to the southwest, and are described as follows:

- An upper seam was encountered in TH20-1, TH20-3, TH20-5 and TH20-6 at depths ranging between about 25 m to 28 m below the bridge deck at approximate elevations 635 to 637 m and was absent in TH20-2 and TH20-4 due to the deeper Empress sand at this location.
- A middle seam was encountered in five of the six bore holes at depths ranging from about 28 to 31 m below the bridge deck elevations at approximate elevations 628 to 633 m. The middle coal seam was missing in TH20-2, drilled at the north abutment during the Phase 1 investigation.
- A lower seam was found in four of the six test holes at depths ranging from 33 m to 38 m below bridge deck at approximate elevations 624m to 626 m. The coal seam was missing in TH20-1 drilled during Phase 1 at the south abutment and TH20-2 drilled during the Phase 2 investigation did not penetrate to the depth of the lower coal seam.
- The coal seam thicknesses ranged from between 0.3 m to 1.5 m.

There was no recovery of portions of the middle coal seam in TH20-2, TH20-4 on the north bank and TH20-3 in the ravine indicating the potential absence of the coal seam due to the former abandoned coal mine working. It is believed that this seam is the mined “Weaver Seam” referred to in Section 8, below.

6.3 Summary of Laboratory Testing

6.3.1 General

Atterberg limits and grain size analyses are shown on the test hole logs and on Table 6.1. For bedrock samples, index testing was conducted on “blenderized” samples.

TABLE 6.1
LABORATORY INDEX TESTING

LOCATION	DEPTH	GRAIN SIZE				ATTERBERG LIMIT			DESCRIPTION (USC)
		GRAVEL	SAND	SILT	CLAY	L.L(%)	P.L(%)	P.I(%)	
TH20-1	2.3					79	27	52	Clay Fill (CH)
TH20-1*	34.1	-	-	62.4	37.6	70	27	43	Clay Shale (CH)
TH20-2	4.6	-	1.2	47.3	51.5	80	31	49	Clay Fill (CH)
TH20-2	5.7	4.3	43.7	36.2	15.8	29	14	15	Clay Fill (CL)
TH20-4	2.3	-	2.3	51.5	46.2	68	26	42	Clay (CH)
TH20-4	5.3	0.5	40.2	48.8	10.2	27	15	12	Clay Till (CL)
TH20-6	5.5	-	1.6	32	66.4	77	32	45	Clay Fill (CH)
TH20-6	8.5	0.7	32.9	43.5	22.9	38	18	20	Clay Till (CI)

*Sample was prepared by mixing in a blenderizer to thoroughly break down the bedrock material and provide a more representative estimate of clay fraction and liquid limit.

6.3.2 Unconfined Compression Tests

Six unconfined compression tests (ASTM Method D2166) were conducted on relatively undisturbed bedrock core samples and Shelby tube samples of clay as summarized in the following Table 6.2. The undrained shear strengths were between 158 kPa and 2116 kPa in the bedrock and between 60 kPa and 65 kPa in the clay. The unconfined compression test results are also presented in Appendix C.

TABLE 6.2
UNCONFINED COMPRESSIVE STRENGTH TESTING RESULTS

PARAMETER	TH20-1	TH20-1	TH20-2	TH20-2	TH20-4	TH20-6
Depth	34.4 – 35.6	41.1 – 41.3	29.7 – 29.9	27.8 – 28.0	2.3 – 2.7	5.5 – 5.9
Soil Type	Clay Shale	Clay Shale	Clay Shale (bentonitic)	Clay Shale	Clay	Clay
Initial Moisture Content (%)	17.8	14.8	20.5	15.6	33.7	36.4
Dry Density (kg/m^3)	1775	1911	1663	1883	1411	1359
Wet Density (Kg/m^3)	2021	2194	2004	2177	1887	1854
Undrained Shear Strength (kPa)	158	2,116	366	1,537	65	60
Axial Strain (%)[(1)]	1.6	2.8	5.4	3.0	4.6	2.0

Note: [(1)] – At Failure

THURBER

6.3.3 Direct Shear Tests

Direct shear tests (ASTM Method D3080) were conducted on representative samples of clay fill, clay till and clay shale. Peak and residual values were determined for each test and the test results are provided in Appendix C and are summarized in Table 6.3.

The normal stress intervals shown in Table 6.3 were chosen to determine a Mohr-Coulomb failure envelope over the stress range representative of the current stress state of the sample.

TABLE 6.3
DIRECT SHEAR TEST RESULTS

PARAMETER		TH20-1	TH20-2	TH20-4	TH20-6
Depth (m)		34.1 – 34.2	4.6 – 5.2	5.3 – 5.8	8.5 – 9.0
Soil Type		Clay Shale	Clay Fill	Clay Till	Clay Till
Liquid Limit (%)*		70	80	27	38
Plastic Limit (%)*		27	31	15	18
Initial Moisture Content (%)		18	39	14	20
Applied Normal Stress Values (kPa)		300, 600, 900	100, 200, 400	60, 120, 240	90, 180, 360
Peak	Φ' (°)	30	13	33	28
	c' (kPa)	20	53	18	16
Residual	Φ' (°)	11	9	33	27
	c' (kPa)	0	0	0	0

Note: * - Atterberg limits conducted on blenderized samples.

6.4 Instrumentation Monitoring

6.4.1 Slope Inclinometers

Slope Inclinometer (SI) plots for A and B directions are presented in Appendix C and are summarized below. The plots provide cumulative and incremental movements in the A and B directions. The A direction is in the downslope direction (i.e. parallel to the bridge longitudinal axis) and is shown on Drawing No 29077-1. The B direction is perpendicular in the clockwise direction (cross-slope).

Cumulative movements were less than 5 mm in both inclinometers in the monitoring results to date. These movements are most likely due to minor movement of the casing within the bore holes and do not appear to indicate a trend of slope movements at this time.

THURBER

6.4.2 Piezometers and Monitoring Wells

Seepage, water levels, and sloughing conditions were observed during drilling and at completion of the auger test holes. For the bedrock coring test holes, this data was not observed as the test holes were drilled using wet rotary methods. It should be noted that the coring at TH20-1 required significant quantities of water due to loss of circulation, presumably into fractured coal layers.

Four vibrating wire piezometers were installed during the Phase 1 investigation and three standpipe piezometers were installed during the Phase 2 investigation. The vibrating wire piezometers were completed with a sand pack, grout, and bentonite seal to surface. The standpipe piezometers were backfilled with soil cuttings and a bentonite seal was provided at ground surface.

The water levels recorded in the piezometers and wells are shown on the test hole logs and summarized in the following Tables 6.4 and 6.5.

TABLE 6.4
SUMMARY OF GROUNDWATER LEVEL MEASUREMENTS
IN VIBRATING WIRE PIEZOMETERS

TEST HOLE	TIP DEPTH (m BGS) / ELEVATION (m)	WATER LEVEL / ELEVATION March 24, 2020 (m)	
TH20-1 VW65160	12.2 / 649.8	8.7	653.0
TH20-1 VW65162	33.5 / 628.2	33.5	628.2
TH20-2 VW65159	12.2 / 649.3	12.2	649.2
PN10-4	33.5 / 627.9	33.5	627.9

Notes: BGS = Below Ground Surface.
All elevations are geodetic.

TABLE 6.5
SUMMARY OF GROUNDWATER LEVEL MEASUREMENTS
IN STANDPIPE PIEZOMETERS

TEST HOLE	TIP DEPTH (m BGS) / ELEVATION (m)	WATER LEVEL / ELEVATION October 24, 2020 (m)	
TH20-4	12.2 / 649.1	9.2	652.1
TH20-5	13.0 / 648.0	9.2	651.8
TH20-6	12.3 / 638.9	Dry	-

Notes: BGS = Below Ground Surface.
All elevations are geodetic.

These results indicate a perched water level in the overburden soils between about elevation 649 and 653 m, which are within the clay till as shown on the attached stratigraphic Cross-Section A-A' Drawing No. 29077-2.

Groundwater level readings to date on the deep piezometers installed in the bedrock indicated no groundwater pressure at the tips. Groundwater measurements on the deep piezometer indicated that the piezometer was dry. On this basis the groundwater table within the bedrock is below approximate elevation 628 m.

It should be noted that these are relatively short-term readings and the stabilized water level could be higher. Groundwater levels fluctuate seasonally and may rise in times of high precipitation. Therefore, the groundwater levels at the time of construction may differ from those noted above. Future groundwater readings should be taken in conjunction with slope inclinometer readings.

6.4.3 Instrumentation Summary

The recorded minor slope movements at the tops of the SI casings are most likely due to minor movement of the casing within the bore holes during setting-up and do not appear to reflect slope movements at this time.

The groundwater levels measured in the shallow piezometers showed a minor increase of about 0.1 m from the previous readings obtained on July 17, 2020. The deep piezometers continued to show no groundwater pressure at the tips.

It is understood that the City's geotechnical group will take over the SI readings in the future pending bridge replacement.

6.5 Frost Design

The surficial silty clay material at this site are moderately susceptible to frost action. The expected depth of frost penetration has been estimated for the averaged soil properties for the clay materials encountered in the test holes for both the mean annual Air Freezing Index (AFI) of 1,440^{o}C and the 50 year return period Air Freezing Index of 2,400 ^{o}C days. The mean annual frost penetration depth of the clay soils is estimated to be about 1.6 m, and the penetration for a 50-year return period is about 2.4 m. The 50-year frost penetration depth would be considerably deeper, up to 3 m deep, if granular fill is used for backfilling of utility trenches or other excavations.

The 50-year return period depth is generally used for design purposes. The estimated depth of frost penetration is for a uniform soil type with no snow cover. The depth of frost penetration may be reduced if turf or snow cover is present.

7. SUMMARY OF GEOTECHNICAL SITE ASSESSMENT

Results of the geotechnical investigation indicate that the following main geotechnical issues will need to be addressed during the design and construction of the Latta Bridge replacement project:

1. The bridge site is situated over abandoned coal mine workings, as addressed in Section 8. There is evidence of coal extraction and resulting voids were noted in several test holes indicating that the old coal mine workings in this area were likely located at elevations between 625 and 635 m (i.e. average depth of about 30 m below the bridge deck).
2. Bridge foundations will need to be designed and installed taking account of the former abandoned coal mine workings. While the risk of further subsidence is considered low, it is recommended that a grouting program be undertaken at each bridge foundation location in advance of foundation construction to fill any voids and prevent future subsidence that could potentially impact the new bridge foundations. This is addressed in Section 10.1.
3. The site history and recent site observations noted in Section 6.1 indicate past slope instability at the south abutment, which appear to be due to slow, ongoing creep movements. Results of the slope stability analyses indicate that the south abutment slope does not have adequate stability factor of safety. Slope enhancement measures will be required to improve the south abutment slope stability to acceptable level. These may include flattening the head slope or by reinforcing the existing head slope to improve the stability. Slope reinforcement may be provided by a structural pile wall of tie backs. Preliminary slope stability assessment and recommendations are provided in Section 9.
4. Pile foundations are required for support of the new bridge or culvert structure. Pile foundation choices are expected to include bored cast in place concrete belled piles founded in the clay till; bored cast in place concrete piles founded in the bedrock; and driven steel piles founded in the hard bedrock. Recommendations for pile foundations are presented in Section 10. The pile foundations are conditional on grouting of voids in advance of foundation construction.
5. Shallow footings are not expected to be a feasible option as the near surface soils consist of relatively weak fills and lacustrine clays which have low bearing resistance and may result in unacceptable settlements. Spread footings could be founded in the very stiff clay till at approximate elevation 655 m; however, this would result in relatively deep foundation excavations.

8. ABANDONED COAL MINE WORKINGS GEOTECHNICAL ASSESSMENT

A review of the Alberta energy and utilities board records ("Coal Mine Atlas" 4th Edition, March 2004) was carried out to provide relevant information on the former coal mining operations in the vicinity of Latta bridge.

The Penn/Chinook mines nos. 632 and 147 was an extensive underground mine and extended below the ravine and Latta bridge site. According to the coal mine record, it was opened in 1915 using the room-and-pillar extraction methods and operated up until closure in 1930. A portion of the record drawing showing the underground coal mine workings in the vicinity of Latta ravine is shown on Drawing No. 25233-g2 included in Appendix E. Location of the abandoned coal mine workings are also shown on Drawing No. 29077-5 in Appendix A.

The City of Edmonton archival information indicates that Mine No. 632 extracted coal from two seams; one under the Latta bridge at a depth of about 27.5 m (90 feet +/-) or approximate elevation 630 m; and the other further south at depths ranging from 18 m to 76 m (60 to 250 feet +/-). It is presumed that these mined seams were the “Weaver” seam at the upper level, and the “Clover bar” seam at the lower level. These seams are referred to in the Coal Mining Atlas of Edmonton by R. Spence Taylor (1975) and also in the publication titled “*Edmonton Beneath our Feet*” by John D. Godfrey, first printed in 1993.

Bedrock contours shown on Drawing No. 29077-5 were inferred based on Andriashek 1987 and from boreholes data from the following geotechnical reports:

- *Bernard, Curtis, Hoggan. Engineering & Testing Ltd. Foundation and Stability Investigation Proposed Latta Ravine Road. City of Edmonton. 1961.*
- *R.M. Hardy & Associates Ltd. Preliminary Soils Report Re Proposed Latta Ravine Road, Edmonton, Alberta. 1958.*

The results of the previous investigations such as bore hole logs and advanced laboratory testing are presented in Appendix G.

The results of the current geotechnical investigation appear to match well with the available historical information indicating that the old coal mine workings in this area were likely located at elevations between 625 and 635 m (i.e. average depth of about 30 m below the bridge deck).

Based on the results of this investigation, the coal seams appear relatively intact in TH20-1 located on the south side of the ravine, suggesting either that the coal mining did not extend to that location, or possibly that the test hole was drilled through a “coal pillar”. In contrast, in the north side and in the middle of the ravine there was little to no recovery within the middle coal seam in TH20-2, TH20-4 and TH20-3, respectively.

Field observation during the field drilling program indicated frequent loss of circulation and poor core recoveries within the coal seams at elevations ranging between 622 and 634 m. Loss of drilling fluid and poor bedrock core recoveries appeared to occur in the zone of bedrock significantly disturbed by previous mining activities in the area.

Designers of the future Latta Bridge replacement will need to consider the impact of the abandoned coal mine workings on the new bridge foundations. Recommendations for the bridge foundations are presented in Section 10 including recommended mitigation measures to reduce the potential impacts of future mine subsidence.

9. ABUTMENT SLOPE STABILITY ASSESSMENT

9.1 General

The site history and recent site observations noted in Section 6.1 indicate past slope instability at the south abutment, which appear to be due to slow, ongoing creep movements. The south abutment appears to be moving primarily northwards towards the ravine; however, there may also be a lateral component to the movement as a result of landslides located east of the bridge as shown on Drawing No. 29077-4.

9.2 Stability Analysis

9.2.1 General

Limit equilibrium slope stability analyses were carried out using SLOPE/W computer program to assess the current state of stability of the bridge headslopes. The stability analyses were carried out for the slope sections A-A' and B-B' generated using the LiDAR mapping and are shown on Drawing No. 29077-2 and -3 in Appendix A. The stability analyses were carried out using generalized soil stratigraphy and groundwater levels obtained from the results of this investigation.

9.2.2 Shear Strength Parameters

The soil strength parameters used in the stability analyses were based on the results of laboratory shear tests, index tests, and correlations with soil properties obtained on similar Edmonton soils in the published literature. The shear strength parameters used in the analyses are presented in Table 9.1.

TABLE 9.1
EFFECTIVE SOIL PARAMETERS USED IN SLOPE STABILITY ANALYSES

SOIL TYPE	EFFECTIVE STRENGHTH PARAMETERS		UNIT WEIGHT (kN/m^3)
	COHESION (kPa)	FRICTION ANGLE (°)	
Clay Fill	10	13	19
Clay Till	5	30	21
Sand	0	34	20
Clay Shale	10	26	19

9.2.3 Piezometric Conditions

The groundwater levels in the clay and clay till strata were based on measurements taken in the piezometers and monitoring wells up to date. Seasonal variability, and the potential increase of groundwater levels within the project site, were also taken into consideration by modelling the stability analysis with a piezometric water level up to 1 m above those measured in the piezometer at the time of this investigation.

9.2.4 Stability Analysis Results

Results of the stability analyses are presented in Table 9.2 and the stability analysis plots are presented in Appendix F.

TABLE 9.2
SUMMARY OF SLOPE STABILITY ANALYSES RESULTS

CASE	DESCRIPTION	FACTOR OF SAFETY
1	Section B-B' – South Bank – 12 m height at 1.9H:1V	1.35
2	Section B-B' – South Bank – Pile Wall (175 KN/m unfactored lateral force)	1.52
3	Section B-B' – South Bank – Slope portion in front of the pile wall	1.53
4	Section B-B'' – South Bank – Slope portion behind the pile wall	1.71
5	Section A-A' – North Bank – 10 m height inclined at 2.2H:1V	1.66

Results of the slope stability analyses indicate that the south abutment slope has an estimated factor of safety of about 1.35 (Case 1) whereas the flatter north abutment slope has an estimated factor of safety of about 1.66 (Case 5).

A target factor of safety of 1.5 should be considered for long term stability of the bridge abutment slopes. On this basis, the north slope with a height of about 10 m and inclined at about 2.2H:1V is considered acceptable. However, the south slope is less than the recommended target factor of safety of 1.5 for bridge headslope stability.

The south abutment slope stability could be improved to acceptable level by flattening the head slope or by reinforcing the existing head slope to improve the stability. Flattening the head slope would increase the bridge length and hence is expected to be less desirable. Further analyses can be undertaken if required to evaluate potential requirements for flattening the head slope if this appears desirable.

To increase the factor of safety of the existing south slope geometry, a pile wall is recommended approximately 9 m north of the south abutment as shown in Cases 2, 3, and 4 of the slope stability analysis. The pile wall will need to be designed to sustain an unfactored lateral force of 175 kN/m in order to obtain the required slope factor of safety. The pile wall would extend the entire length of the bridge abutment plus a few meters at either end, to be confirmed during detailed design.

Other slope reinforcement methods including inclined ground anchors could also be used to improve the abutment slope stability and could be considered during detailed design.

Further evaluation and recommendations can be provided when the design for the bridge has advanced to appropriate level.

10. BRIDGE FOUNDATIONS

10.1 General

It is understood that the choice and details of the bridge replacement are currently under evaluation and no details of the bridge layout or loading are currently available. It is understood that options being considered at the preliminary design stage may include single-span, multi-span and arch type structures.

The following sections provide preliminary recommendations for foundation selection and design parameters. It is expected that the final choice of foundation will depend on load requirements, accessibility for piling equipment, ease of construction as well as economic and scheduling considerations.

The major geotechnical consideration is the presence of abandoned coal mine workings at the bridge site. Although the mining was discontinued in the 1930's and it is anticipated that most subsidence has occurred in the intervening years, there is evidence of voids in several of the bore holes, particularly in the north abutment area (i.e. TH20-2 and TH20-4) and in the ravine (i.e.TH20-3) at the level of the coal seam where the coal was extracted.

While the risk of further subsidence is considered low, it is recommended that a grouting program be undertaken at each bridge foundation location in advance of foundation construction to fill any voids and prevent future subsidence that could potentially impact the new bridge foundations.

Preliminary details of a grouting program including ballpark costs were obtained from a local Ground Improvement Specialty Contractor. The program would typically consist of determining the zone of influence of each foundation element then advancing primary and secondary grout holes to fill the voids and solidify the ground under and around each foundation element. The primary holes would first be advanced around the perimeter of the influence zone and a thick grout would be injected under pressure to provide a barrier around the interior grout zone.

Once the perimeter grout holes are completed, interior holes would be pressure grouted with a more flowable grout to fill the voids. Following completion of the primary holes, secondary holes would be drilled in a grid pattern between the primary holes to infill any remaining voids. under the foundation. Depending on the grout take, a third level of grout holes (tertiary grouting) could be undertaken to fill any remaining voids under the foundation elements. Post grouting investigation including core hole drilling can be undertaken to verify that the voids have been completely filled.

A similar program was recently used to deal with underground coal mine workings on several bridges of the Northeast Anthony Henday Drive. (ref. Soliman M. and Walter D.J.; Design of Bridge Foundations over Abandoned underground Coal Mine Workings in Edmonton, Canadian Geotechnical conference, 2016). Further details of ground improvement by grouting can be provided when the bridge design has advanced.

Grouting of the coal mine workings will avoid potential for future collapse and settlement of the ground above the coal mine workings. Hence potential downdrag effects on piles extending through the coal mine workings need not be considered in the pile foundation design.

Alternative treatment for deep piles extending through the abandoned coal seams would consist of installing permanent steel casings around each pile extending from the ground surface to the bottom of the mined coal seam in order to reduce potential downdrag loads transmitted to the piles and to protect the pile from potential lateral loads that could develop in the event of ground subsidence. The space between the outer casing and the inner pile would be backfilled with rounded uniform pea gravel to reduce negative shear stresses that could be transmitted to the pile in the case of a mine collapse. The pea gravel would also be designed to provide the required lateral support for the pile. This type of treatment would work best with an inner steel pile (i.e. driven pipe pile or H-section pile). This method was also used for several bridge foundations on the Northeast Anthony Henday Drive. (ref. Soliman M. and Walter D.J. 2016).

Providing the above measures are adequately implemented during construction, we do not anticipate any additional bridge foundation settlement other than the expected pile settlement due to dead and live loading. Pile settlement should be addressed once pile types and design loads are known.

In the case of an arch type structure, the additional fill placement could result in additional coal mine subsidence and settlement of the structure. It may therefore be necessary to undertake grouting under the entire arch structure footprint in order to solidify and voids and reduce the risk of future structure settlement.

10.2 Bridge Foundation Types

The following bridge foundation types may be considered:

- Bored cast in place concrete belled piles founded in the clay till at approximate elevation 645 m.
- Bored cast in place concrete piles founded in the bedrock below the middle coal seam at approximate elevation 625 m
- Driven steel piles driven to practical refusal in the hard bedrock below about elevation 635 m.

Preliminary details of these foundation options are provided in the following sections. A comparison of each foundation type, including advantages and disadvantages is provided in Table 10.1.

Shallow footings are not expected to be a feasible option as the near surface soils consist of relatively weak fills and lacustrine clays which have low bearing resistance and may result in unacceptable settlements. Spread footings could be founded in the very stiff clay till at approximate elevation 655 m; however, this would result in relatively deep foundation excavations. Further recommendations for this option can be provided if it appears feasible.

TABLE 10.1
COMPARISON OF FOUNDATION TYPES FOR LATTA BRIDGE REPLACEMENT

DESCRIPTION	ADVANTAGES	DISADVANTAGES
Belled Cast in Place Concrete Piles Founded in Clay Till at approximate elevation 645 m	Relatively conventional foundation type for abutment support. Piles founded above the coals seam so should not have difficulties of penetrating through former coal mine workings	May not be practical option for supporting piers due to shallow clay till cover in ravine May require temporary casing to advance through sand layers Will require grouting of voids associated with abandoned coal mine workings
Cast in Place Concrete Piles Founded in Clayshale Bedrock at suggested minimum basing depth of 625 m	Provide high capacity piles potentially reducing the number of pile supports for each foundation element.	Will require temporary casing to advance through sand layers May require grouting of voids associated with abandoned coal mine workings/ alternatively casing through coal mine workings to isolate shaft from ground above coal mine workings
Driven Steel Piles Founded in Very Dense Sand or Bedrock	Relatively conventional foundation type.	The effects of noise and driving vibrations need to be considered for driven steel piles at this site. Will require grouting of voids associated with abandoned coal mine workings

10.3 Belled Cast in Place Concrete Piles Founded in Clay Till

Belled cast-in-place end bearing piles founded in the clay till at an approximate elevation of 645 m are considered suitable foundation types for both north and south abutments. This option may not be practical for supporting intermediate piers in the event of a multiple span bridge due to the shallow depth of clay till under the ravine bottom.

It should be noted that sand layers may be expected in the clay till deposits and will require the use of casing to prevent sloughing of the sand layer above and within the clay till during pile installations.

As noted in Section 10.1 above, grouting of the coalmine workings is recommended prior to foundation construction to avoid potential future differential settlement associated with ground subsidence above the abandoned coal mine workings.

End bearing piles founded in the clay till at approximate elevation 645 m may be designed based on an ultimate end bearing resistance of 1,200 kPa and factored ULS end bearing resistance of

480 kPa based on a geotechnical resistance factor of 0.4. Shaft friction should not be included in the design of end bearing piles founded in the clay till.

Further recommendations for design and construction of belled concrete piles are provided in Section 10.5.

10.4 Cast in Place Concrete Piles Founded in Clayshale Bedrock

Straight shaft piles may be founded in the clay shale bedrock at a suggested minimum basing elevation of 625 m. Straight shaft rock socketed piles may be designed based on a combination of shaft friction and end bearing resistance using the values presented in Table 10.2.

TABLE 10.2
RECOMMENDED ULS SKIN FRICTION AND END BEARING VALUES
FOR CAST-IN-PLACE CONCRETE PILES

APPROX. DEPTH B.G.S. (m)	APPROX. ELEVATION (m)	SOIL TYPE	SKIN FRICTION (kPa)			END BEARING (kPa)	
			ULTIMATE	ULS FACTORED COMPRESSION (GRF** = 0.4)	ULS FACTORED TENSION (GRF** = 0.3)	ULTIMATE	ULS FACTORED (GRF** = 0.4)
0 – 2*	661 - 659	Clay/ Clay Fill	0	0	0	N/A	N/A
2 – 6	659 - 655	Clay / Clay Till	40	16	12	N/A	N/A
6 – 18	655 – 643	Clay Till	80	32	24	N/A	N/A
18 – 26	643 – 635	Sand	100	40	32	N/A	N/A
26 – 31	635 – 630	Bedrock	150	60	45	N/A	N/A
> 31	Below 630	Bedrock	200	80	60	3,000	1,200

* Depth of 2.0 m or the thickness of fill, whichever is greater.
**Geotechnical Resistance Factor

It should be noted that the piles will extend through sand and gravel deposits below the clay till and also pervious coal seams within the bedrock. Temporary casings will be required to advance the piles through the sand and gravel layer and underlying coal seams.

Alternatively, slurry piles using polymer slurry to stabilize the bore holes may be preferable to reduce potential piling difficulties of casing through the various pervious strata.

As noted above, grouting of the coalmine workings under the abutment and pier foundations is recommended prior to foundation construction to avoid potential future differential settlement associated with ground subsidence above the abandoned coal mine workings. This is also desirable to avoid problems with loss of concrete into coal mine workings during pouring of the piles. Other mitigation methods, involving isolating the pile shafts from the ground above the coal mine workings using steel casings can also be considered.

Recommendations for the cast-in-place concrete piles founded in bedrock are provided in the following section.

10.5 General Recommendations for Cast-in-Place Concrete Piles

The following recommendations are provided for design and installation of cast-in-place concrete piles.

a) Where cast in place concrete end bearing piles are founded in the clay till, the bell diameter to shaft diameter ratio should not exceed 3:1, and the bell should not be sloped at more than 30° to the vertical.

b) A minimum edge-to-edge spacing of 300 mm is recommended in the case of belled piles to reduce potential construction problems. Piles within two bell diameters for belled piles should not be drilled or poured consecutively within the same 24-hour period in order to allow the concrete in the adjacent pile to set.

c) Straight shaft piles founded in bedrock should be installed at a suggested minimum spacing of 2.5 diameters centre to centre spacing.

d) A minimum pile shaft diameter of 600 mm is recommended to deal with potential obstructions such as cobbles or boulders that may be encountered during pile installations. It is expected that larger diameter piles will be required to sustain the design vertical and horizontal loads.

e) Longitudinal reinforcement is required through the pile shaft length to resist potential uplift forces on the pile due to frost action and seasonal moisture variations. If piles are designed as tension elements or are left exposed to freezing temperatures, the pile reinforcing should be designed to resist the anticipated uplift stresses.

f) Temporary steel casing(s) will be required to extend the pile holes through the sand and gravel layers, and coal seams for the deeper piles. Where sand or gravel layers are encountered at or above pile basing depth, it will be necessary to provide steel casing and extend the pile bases deeper into self- supporting soil.

g) Alternatively, tremie piles using polymer grouts may be used for installing deep piles into the bedrock, providing that all voids resulting from coal mining activities are grouted up prior to pile installations.

h) Pile integrity testing such as Thermal Integrity Profiling (TIP) or cross-hole seismic testing will be required to verify the integrity of the deep pile installations installed using tremie methods.

i) All pile excavations should be thoroughly cleaned and visually inspected by qualified geotechnical personnel prior to pouring of the concrete to ensure a satisfactory base has been achieved. No water, slough or disturbed material should be allowed to remain in the pile excavations.

j) Concrete should be poured immediately after drilling of the pile hole to reduce the risk of groundwater seepage and sloughing soil.

k) Cobbles and boulders may be present within the clay, clay till, or sand and gravel layers which could hamper augering if encountered in the pile hole.

l) The concrete materials and methods of concrete construction should be as per CSA A23.1-09/A23.2-09.

10.6 Driven Steel Piles Founded in Very Dense Sand or Bedrock

Driven steel piles (H-section or pipe piles) may be considered for support of the bridge foundations. The effects of noise and driving vibrations is a specific consideration for driven steel piles at this site.

The piles should be driven to practical refusal in the very dense sand and gravel or underlying clay shale bedrock. It is expected that the piles will penetrate several meters into the bedrock, and tip elevations are expected to be between 630 to 635 m, assuming the piles are driven with appropriate driving energies.

As the pile tips are expected to meet refusal above the former coal mine workings it is essential that grouting of the coalmine workings under the abutment and pier foundations is carried out prior to foundation construction to avoid potential future differential settlement associated with ground subsidence above the abandoned coal mine workings and loss of pile tip support.

Driven steel piles may be designed based on a combination of shaft friction and end bearing resistance using the values presented in Table 10.3.

TABLE 10.3
RECOMMENDED ULS SKIN FRICTION AND END BEARING VALUES FOR DRIVEN STEEL PILES

APPROX. DEPTH B.G.S. (m)	APPROX. ELEVATION (m)	SOIL TYPE	SKIN FRICTION (kPa)			END BEARING (kPa)	
			ULTIMATE	ULS FACTORED COMPRESSION (GRF** = 0.4)	ULS FACTORED TENSION (GRF** = 0.3)	ULTIMATE	ULS FACTORED (GRF** = 0.4)
0 – 2*	661 - 659	Clay/ Clay Fill	0	0	0	N/A	N/A
2 – 6	659 - 655	Clay / Clay Till	40	16	12	N/A	N/A
6 – 18	655 – 643	Clay Till	80	32	24	N/A	N/A
18 – 26	643 – 635	Sand	100	40	30	N/A	N/A
26 – 31	Below 635	Bedrock	150	60	45	6000	2400

* Depth of 2.0 m or the thickness of fill, whichever is greater.
**Geotechnical Resistance Factor

A minimum pile spacing of 3D (centre to centre spacing) is preferred for large pile groups (H-section or steel pipe piles) to reduce potential interference between piles during pile driving.

Where necessary, pile spacing may be reduced to 2.5 diameters (centre to centre spacing) recognizing that there is greater potential for interaction and heave of adjacent piles during driving.

Pipe piles should be driven open ended to reduce potential installation difficulties and reduce potential heave of adjacent piles. Pile driving shoes or tip reinforcement should not be necessary for steel piles driven into the very hard bedrock at this site.

Steel piles should be driven with a hammer of appropriate size and rated energy depending on the pile size and load requirements. The proposed driving system should be approved in advance of construction and set criteria should be determined by Wave Equation Analysis of Piles (WEAP) based on the design load requirements and pile driving system utilized.

The maximum driving energy should generally not exceed about 600 J per square cm of steel cross-sectional area to avoid damage to the pile section. Pile wall thicknesses should be chosen to withstand the maximum applied driving stresses, where the driving stresses are generally limited to 0.9 times the yield stress of the steel. Based on past experience, the following typical minimum wall thicknesses are recommended in Table 10.4 for driven steel pipe piles for Steel Grade 3 (ASTM A252).

TABLE 10.4
RECOMMENDED MINIMUM PILE WALL THICKNESS
FOR DRIVEN STEEL PILES

PILE DIAMETER (mm)	RECOMMENDED MINIMUM PILE WALL THICKNESS (mm)
324	9.5
406	9.5
508	12.7
610	12.7
762	15.9

It is understood that steel H-piles are commonly used at abutment locations. The pile sizes and thicknesses should be determined based on design pile loading requirements and also the expected driving stresses.

The required pile wall thicknesses should be checked using Wave Equation Analyses when more details of expected design loads, depths of installation and hammer energies are available.

Steel pile installations should be inspected by qualified geotechnical personnel. Pile driving records should be maintained during driving of all piles and should be assessed by driving analyses (i.e. Wave Equation Analysis) to confirm that the design capacity of the piles are met. Dynamic testing using Pile Driving Analyser (i.e. PDA tests) should be conducted on selected production piles (typically about five percent of all pile) to verify the pile capacities and set criteria used for pile acceptance.

10.7 Concrete Grade Beams and Pile Caps

When pile foundations are used, grade beams or pile caps may be required to transfer the structure loads onto the tops of the piles. If the bases of the grade beam and pile caps are located within the design depth of frost penetration, precautions should be taken to prevent heaving of the grade beam and pile cap due to frost penetration or alternatively the piles and pile cap should be designed to resist the resulting uplift pressures.

The recommended construction procedure for preventing heave under the grade beams and pile caps involves placement of a layer of crushable non-degradable void filler (such as Beaver Plastic Frost Cushion or equivalent) at least 150 mm thick under the pile cap. In this method, the pile cap, grade beam, and the piles should be designed to withstand the upward heave forces equal to the crushing strength of the void form.

10.8 Cement Type

Five sulphate tests were conducted to determine the water-soluble sulphate ion (SO_4) content of soil samples recovered from the test holes. These tests indicated the presence of 0.02 to 0.21 percent water-soluble sulphate content in the soil samples (or the site is within a known sulphate area with concentrations between 0.2 and 2.0 percent).

As per the guidelines of Table 3 of CSA Standard A23.1-19, the subsurface concrete at this site may be exposed to a “Severe” degree of exposure (Exposure Class S-2) to sulphate attack and would require the use of CSA Type HS or HSb Portland cement (regular or blended high sulphate-resistant hydraulic 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 0.45 with the specified minimum 56-day compressive strength of 32 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.

Please note that as per CSA A23.1-19 Clause 4.1.1.6.3, calcium chloride or any admixture formulation containing chloride ions shall not be used in the subsurface concrete, which falls under exposure classification “S-1" and “S-2" as defined in Table 3. Also, other calcium salts used as an accelerating admixture should be avoided as they may increase the severity of the sulphate attack.

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.

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10.9 Seismicity

The site can be classified as Class D according to the classification as per Table 4.1.8.4A if the National Building Code (2019).

11. FURTHER WORK

This preliminary report was provided before any details on the bridge type selection (bridge or culvert), number of spans and foundation elements (i.e. abutments and piers), foundation types and design loading were available.

Further work will be required during detailed design and construction, including the following main items:

1. City should maintain ongoing monitoring of the geotechnical instrumentation (slope inclinometers and piezometers) in the interim during detailed design and construction.

2. Foundation design parameters for vertical and lateral loading should be reviewed when further details of the bridge foundations are available.

3. Methods of mitigating the effects of the abandoned coal mine workings should be reviewed during detailed design and construction. Details of void grouting should be reviewed and incorporated into the design and construction documents.

4. Design of slope stabilization measures should be completed once the details of the bridge abutments are available.

5. Final design of abutment slopes should incorporate measures as necessary to address slope erosion, including slope revegetation and need for turf reinforcement mattings.

6. Requirements for foundation construction and inspection should be reviewed including need for pile integrity testing depending on the pile type.

7. Geotechnical instrumentation requirements for monitoring slope stability should be determined and included in the design and construction documents.

12. CONSTRUCTION INSPECTION

The performance of the structures will depend upon the quality of workmanship during construction. This is particularly important in regard to foundation installations where variations in soil conditions could occur. Therefore, it is recommended that inspection be provided by qualified geotechnical personnel during foundation installation to confirm that the piles are installed in competent bearing material and that the stratigraphy is similar to those that have been assumed for the design.

13. LIMITATIONS AND USE OF REPORT

There is a possibility that this report may form part of the design and construction documents for information purposes. This report was issued before any final design or construction details have been prepared or issued. Therefore, differences may exist between the report recommendations and the final design, in the contract documents, or 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 on 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, and safety and equipment capabilities.

14. REFERENCES

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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.

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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 29077-1 – Site Plan Showing Test Hole Locations

Drawing 29077-2 – Stratigraphic Cross-Section A-A'

Drawing 29077-3 – Stratigraphic Cross-Section B-B'

Drawing 29077-4 – Surficial Geology Map

Drawing 29077-5 – Bedrock Topography Map

Drawing 29077-6 – Historical Air-Photos

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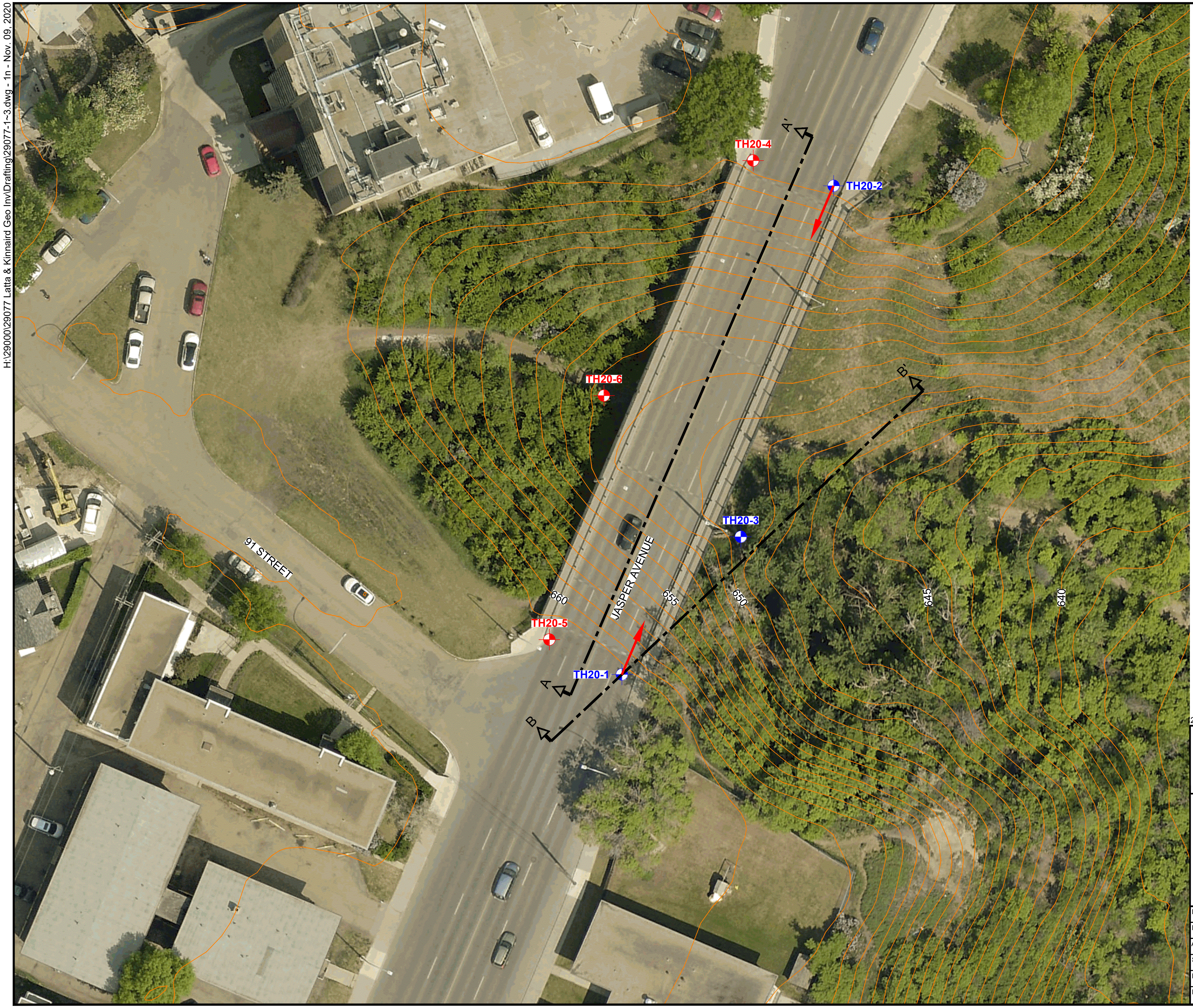

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LEGEND

- APPROXIMATE TEST HOLE LOCATION
- EXISTING TEST HOLE LOCATION
- GROUND SURFACE CONTOUR (1m INTERVAL)
- SLOPE INCLINOMETER A DIRECTION

0 5 10 15 20 25 30m
SCALE 1:500

2019 AIR PHOTO FROM THE CITY OF EDMONTON

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SITE PLAN SHOWING APPROXIMATE
TEST HOLE LOCATIONS

DWG No. 29077-1

DRAWN BY	ML
DESIGNED BY	JGP
APPROVED BY	RWT
SCALE	1:500
DATE	NOVEMBER 2020
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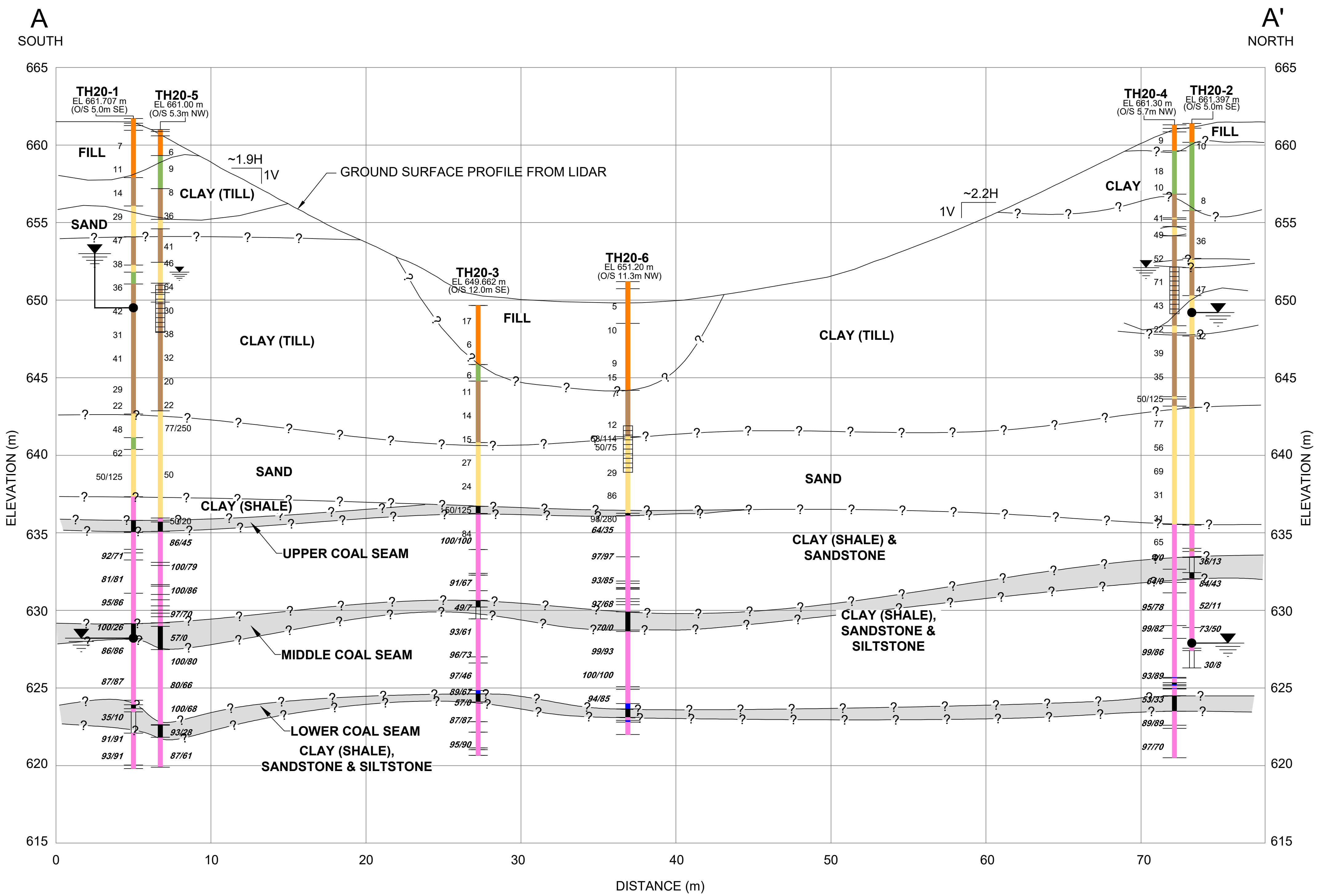

LEGEND

- 38/13 RECOVERY / RQD %
- 15 SPT N VALUE
- WATER LEVEL IN PIEZOMETER (MARCH 24, 2020)
- PNEUMATIC PIEZOMETER TIP
- VIBRATING WIRE PIEZOMETER TIP
- TOPSOIL
- FILL
- CLAY
- CLAY TILL
- SAND, GRAVEL
- SILT
- COAL
- BENTONITE
- NO RECOVERY
- CLAY SHALE / SANDSTONE (POSSIBLY RAFTED)

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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STRATIGRAPHIC CROSS - SECTION A - A'

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APPROVED BY	RWT
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DATE	NOVEMBER 2020
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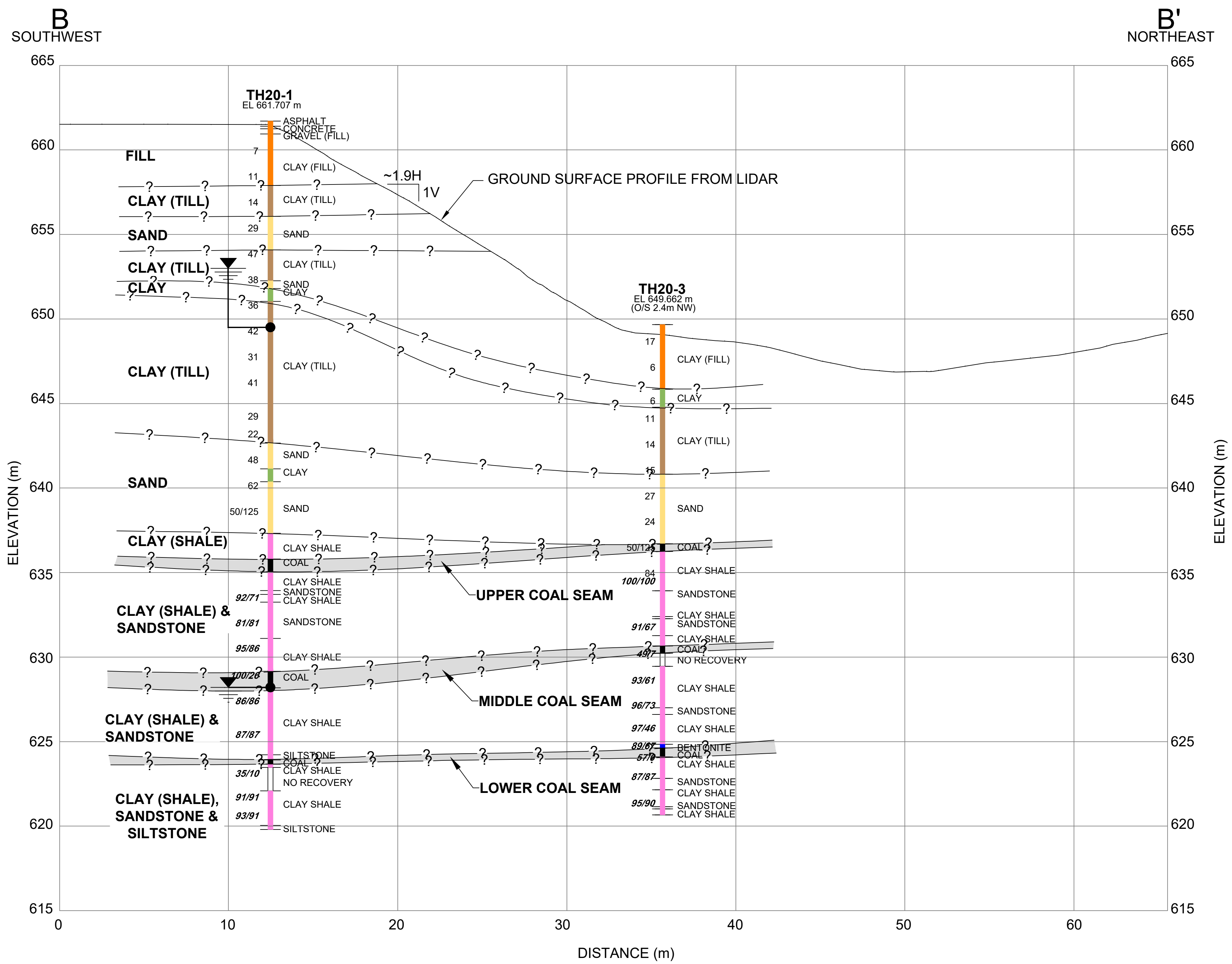

LEGEND

38/13 RECOVERY / RQD %

15 SPT N VALUE

WATER LEVEL IN PIEZOMETER (MARCH 24, 2020)

PNEUMATIC PIEZOMETER TIP

VIBRATING WIRE PIEZOMETER TIP

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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STRATIGRAPHIC CROSS - SECTION B - B'

DWG No. 29077-3

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APPROVED BY	RWT
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DATE	NOVEMBER 2020
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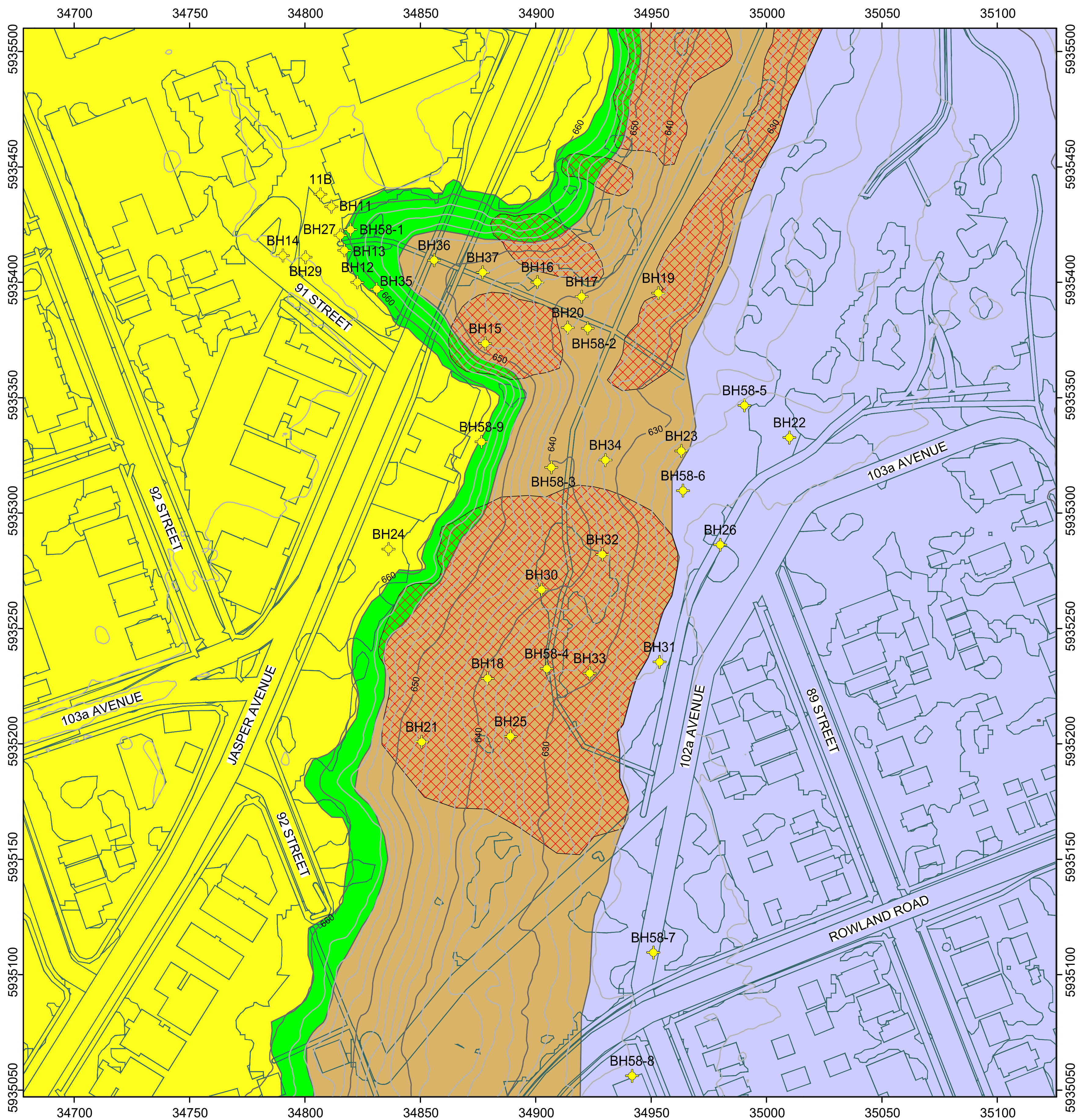

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LEGEND

ACTIVE SLOPE MOVEMENT. MOSTLY NATURAL SLOPE DISTURBED BY CONSTRUCTION, MINING OR OTHER ACTIVITIES, AND LATER DEVELOPED SLOPE MOVEMENT IN RANGE FROM CREEP TO LANDSLIDE.

COLLUVIUM: WEATHERED AND GRAVITATIONALY MOVED GLACIOLACUSTRINE DEPOSITS. SLOPE UNDER SHALLOW GRADUAL, SEASONAL CREEP MOVEMENT. LOWER GLACIOLACUSTRINE DEPOSITS ALONG THE CONTACT WITH GLACIAL TILL IS AREA OF GROUNDWATER DISCHARGE. GROUNDWATER

COLLUVIUM:WEATHERED AND GRAVITATIONALY MOVED MIXTURE OF TILL AND GLACIOLACUSTRINE DEPOSITS COVERING GLACIAL TILL: MIXTURE OF CLAY, SILT WITH SOME SAND AND GRAVEL AND COBLES

GLACIOLACUSTRINE DEPOSITS: LAYERED SILT, SAND AND CLAY.

ALLUVIUM: LAYERED SILT, SAND, CLAY AND GRAVEL

BOREHOLES: BERNARD, CURTIS, HOGGAN ENGINEERING & TESTING LTD. 1961

0 20 40 60 80 100 120m

SCALE 1:2000

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SURFICIAL GEOLOGY MAP

DWG No. 29077-4

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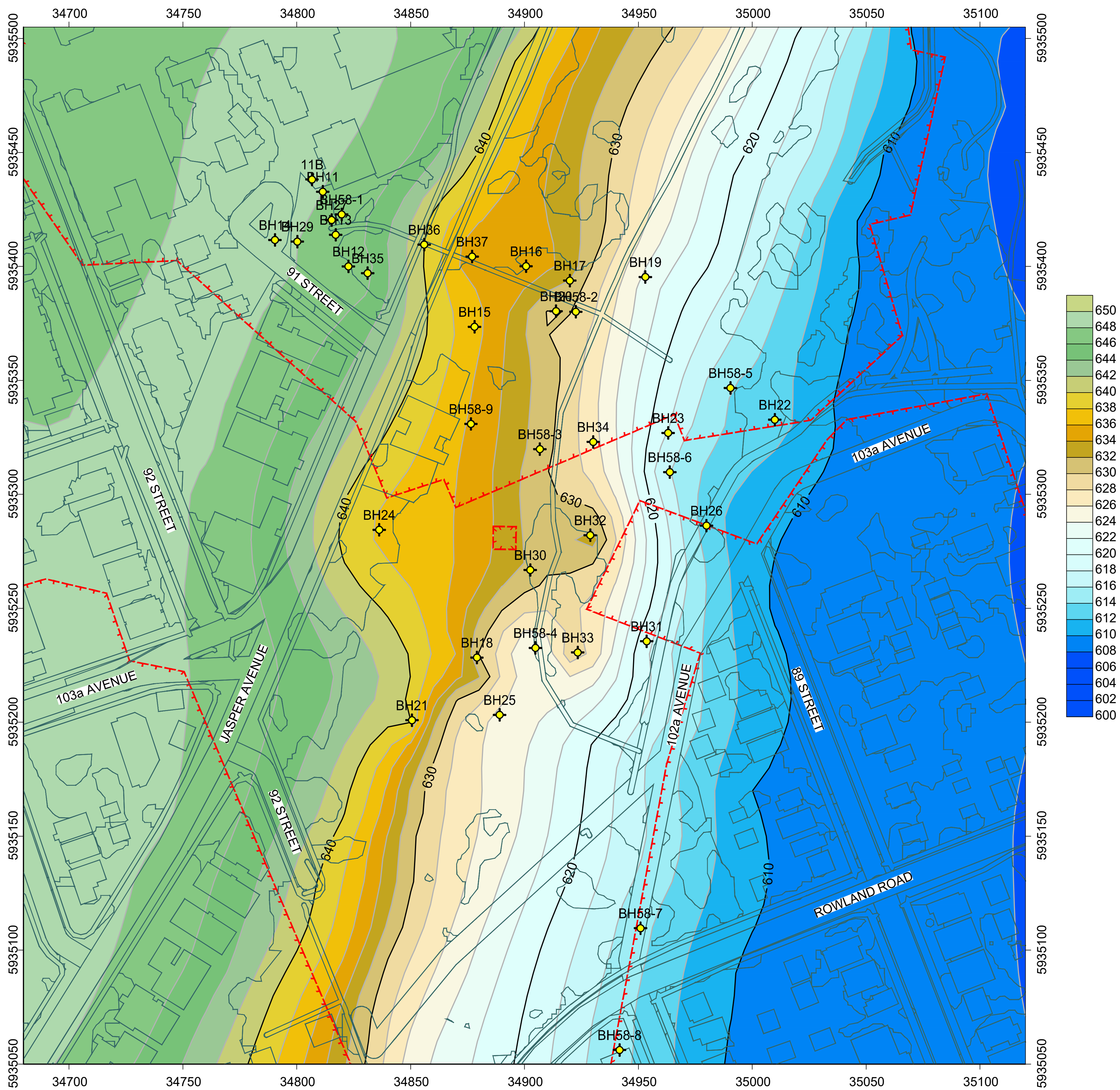

N
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LEGEND

BOREHOLES: BERNARD, CURTIS, HOGGAN ENGINEERING & TESTING LTD. 1961

COAL MINES

0 20 40 60 80 100 120m
SCALE 1:2000

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BEDROCK TOPOGRAPHY MAP

DWG No. 29077-5

DRAWN BY	ML
DESIGNED BY	JGP
APPROVED BY	RWT
SCALE	1:2000
DATE	NOVEMBER 2020
FILE No.	29077

THURBER ENGINEERING LTD.

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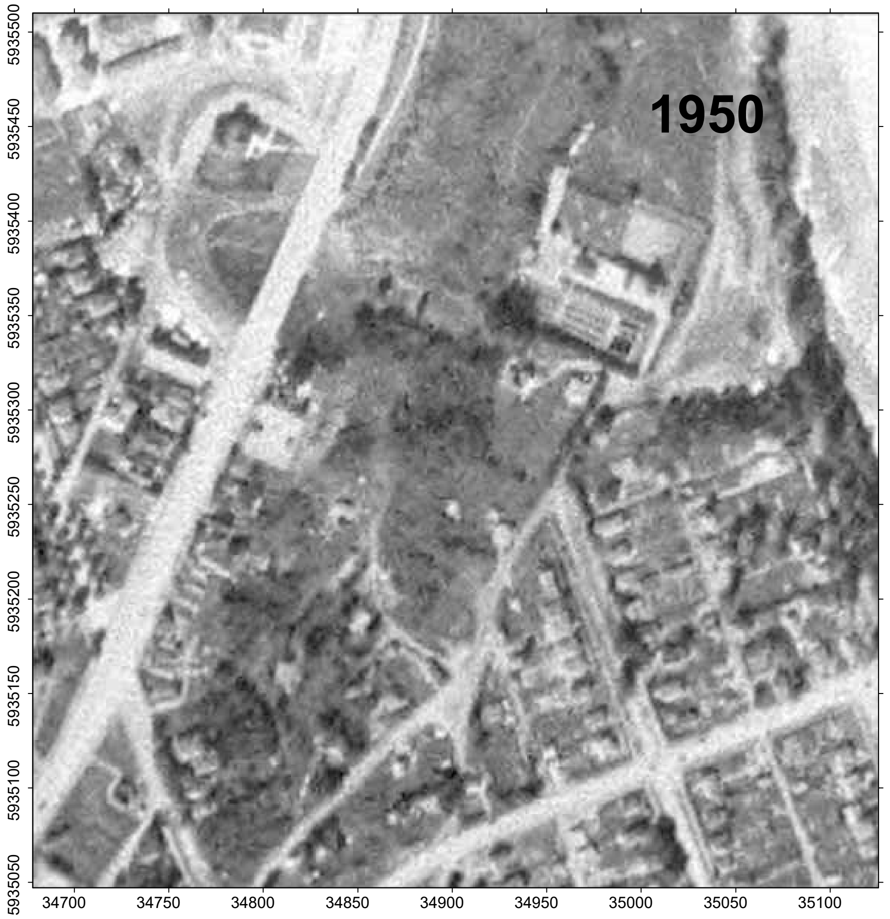

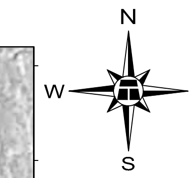

0 50 100 150 200 250m

SCALE 1:4000

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HISTORICAL AIR PHOTOS

DWG No. 29077-6

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DESIGNED BY	JGP
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SCALE	1:4000
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APPENDIX B

Symbols and Terms

Modified Unified Soils Classification System

Rock Material Description

Test Hole Logs

SYMBOLS AND TERMS USED ON TEST HOLE LOGS

1. VISUAL TEXTURAL CLASSIFICATION OF MINERAL SOILS

CLASSIFICATION	APPARENT PARTICLE SIZE	VISUAL IDENTIFICATION
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)

DESCRIPTIVE TERM	APPROXIMATE UNDRAINED SHEAR STRENGTH		APPROXIMATE SPT * 'N' VALUE
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	Modified from	15 to 30
Hard	200 - 300 kPa	National Building	Greater than 30
Very Hard	Greater than 300 kPa	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)

DESCRIPTIVE TERM	STANDARD PENETRATION TEST (SPT) (Number of Blows per 300 mm)	
Very Loose	0 - 4	
Loose	4 - 10	
Compact	10 - 30	Modified from
Dense	30 - 50	National Building
Very Dense	Over 50	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

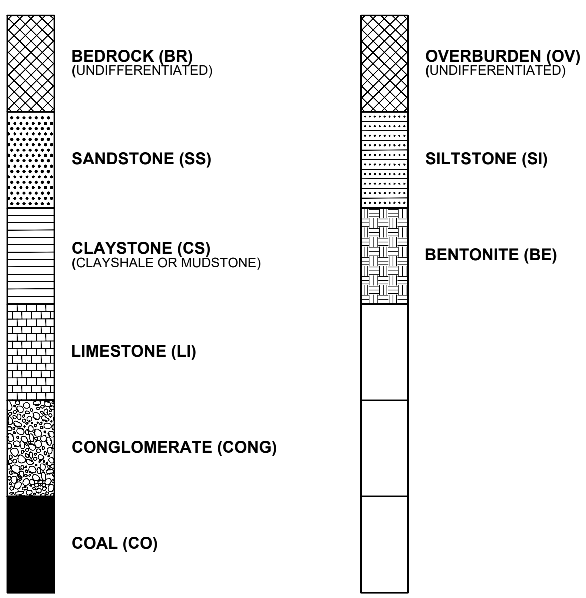
'and'	35% to 50% of each size group
'sandy'	20% to 35%
'some'	10% to 20%
'trace'	Less than 10%
'mixture'	Soils containing three or more size groups within 20% of each other and each group greater than 10%

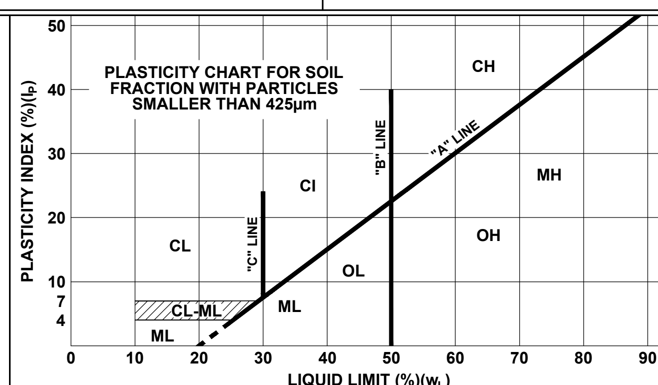
THURBER ENGINEERING LTD.

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	**CLEAN GRAVELS** (LITTLE OF NO FINES)	GW		WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	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 12% GM, GC, SM, SC; 5% to 12% Borderline cases requiring use of dual symbols	$C_U = \frac{D_{60}}{D_{10}} > 4$; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3
			GP		POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES		NOT MEETING ALL GRADATION REQUIREMENTS FOR GW
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM		SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES		ATTERBERG LIMITS BELOW "A" LINE I_P LESS THAN 4 — Above "A" line with I_P between 4 and 7 are borderline cases requiring use of dual symbols
			GC		CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE "A" LINE I_P MORE THAN 7
	SANDS MORE THAN HALF COARSE GRAINS SMALLER THAN 4.75mm	**CLEAN SANDS** (LITTLE OR NO FINES)	SW		WELL GRADED SANDS, GRAVELLY-SANDS, LITTLE OR NO FINES		$C_U = \frac{D_{60}}{D_{10}} > 6$; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3
			SP		POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES		NOT MEETING ALL GRADATION REQUIREMENTS FOR SW
		SAND WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM		SILTY SANDS, SAND-SILT MIXTURES		ATTERBERG LIMITS BELOW "A" LINE I_P LESS THAN 4 — Above "A" line with I_P between 4 and 7 are borderline cases requiring use of dual symbols
			SC		CLAYEY SANDS, SAND-CLAY MIXTURES		ATTERBERG LIMITS ABOVE "A" LINE I_P MORE THAN 7
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	**CLASSIFICATION IS BASED UPON PLASTICITY CHART** (see below)	
		$w_L > 50\%$	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**	





THURBER ENGINEERING LTD.

MODIFIED UNIFIED CLASSIFICATION SYSTEM FOR SOILS

(MODIFIED BY PFRA, 1985)

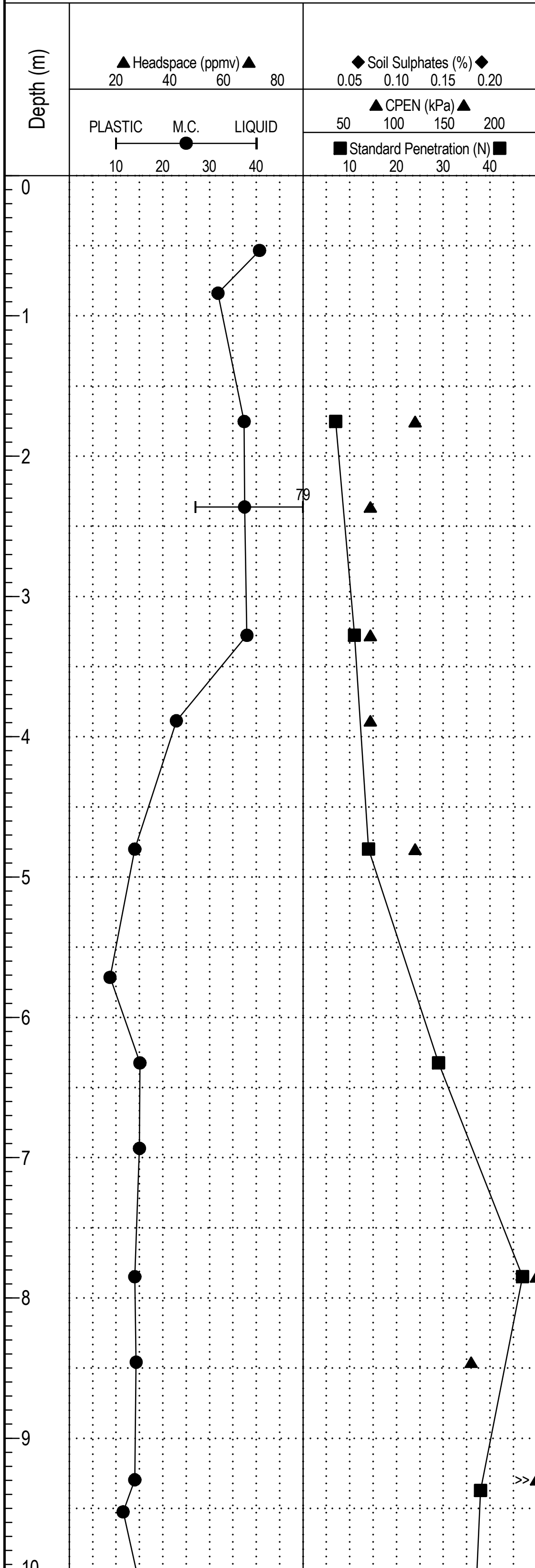
Revised October 22, 2019

PHASE I DRILLING (APRIL 2020)
TEST HOLES TH20-1 TO TH20-3

PROJECT: LATTA BRIDGE	DRILLING COMPANY: Garritty & Baker Drilling Inc	BOREHOLE NO: **TH20-1**
CLIENT: City of Edmonton	DRILLING METHOD: Mud Rotary / Coring	PROJECT NO: 28330
START DATE: 2020-3-21	UTM ZONE: N5935375.215, E34851.143	ELEVATION: 661.71 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND



SAMPLE TYPE	SPT (N) RQD/REC (%)	USC	SOIL DESCRIPTION
			ASPHALT
			CONCRETE
Auger		SC	GRAVEL (FILL) dark brown, silty, fine sand mixed
Auger		CI	CLAY (FILL) firm, dark brown, silty, trace fine sand, gravel, and oxides
Drive	7	CH	
Auger		CH	-dark brown to dark grey
Drive	11	CH	-stiff
Auger		CI	CLAY (TILL) stiff, dark brown, silty, some fine sand, trace gravel, oxides, and coal
Drive	14	CI-CL	-fine sandy
Auger		SP	SAND compact, dark brown, silty, fine grained, trace fine gravel
Drive	29	CI	-clay till lenses at 6.2 - 6.4m
Auger		CI	-very silty, some clay lumps
Drive	47	CI	CLAY (TILL) hard, dark brown to dark grey, silty, fine sandy, trace gravel, oxides, and coal
Auger		CI	
Drive	38	CL	
		SP-SM	SAND brown, silty, fine grained

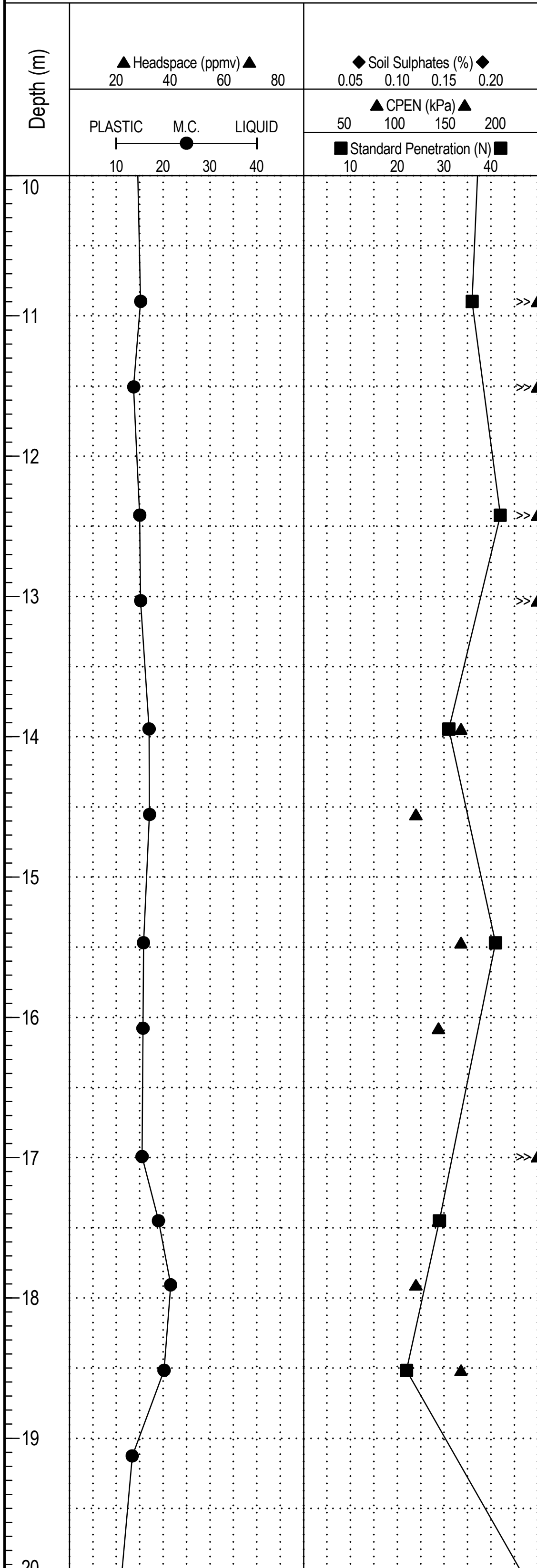
SLOPE INCLINOMETER | VW | VW | ELEVATION (m): 661, 660, 659, 658, 657, 656, 655, 654, 653, 652

THE CITY OF Edmonton
Transportation Engineeering Services Section
THURBER ENGINEERING LTD.
LOGGED BY: GS
REVIEWED BY: XW / RWT
COMPLETION DEPTH: 41.9 m
COMPLETION DATE: 20-3-22

PROJECT: LATTA BRIDGE	DRILLING COMPANY: Garritty & Baker Drilling Inc	BOREHOLE NO: **TH20-1**
CLIENT: City of Edmonton	DRILLING METHOD: Mud Rotary / Coring	PROJECT NO: 28330
START DATE: 2020-3-21	UTM ZONE: N5935375.215, E34851.143	ELEVATION: 661.71 (m)

SAMPLE TYPE: Shelby Tube | Drive Sample | Auger Sample | No Recovery | A Casing | Cored Sample

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND



SPT (N) RQD/REC (%)	USC	SOIL DESCRIPTION
	CI	CLAY brown to dark brown, very silty, fine sand mixed, trace oxides
36	CI	CLAY (TILL) hard, dark brown to dark grey, silty, fine sandy, trace gravel, oxides, and coal
	CI	
42	CI	-dark grey, some fine sand, trace fine sand lenses
	CI	
31	CI	-trace gypsum crystals
	CI	
41	CI	
	CI	
	CI	
29	CH	-very stiff
	CI	
22	CI	
	SC	SAND dense, dark brown, silty, fine grained, trace coal and clay lumps

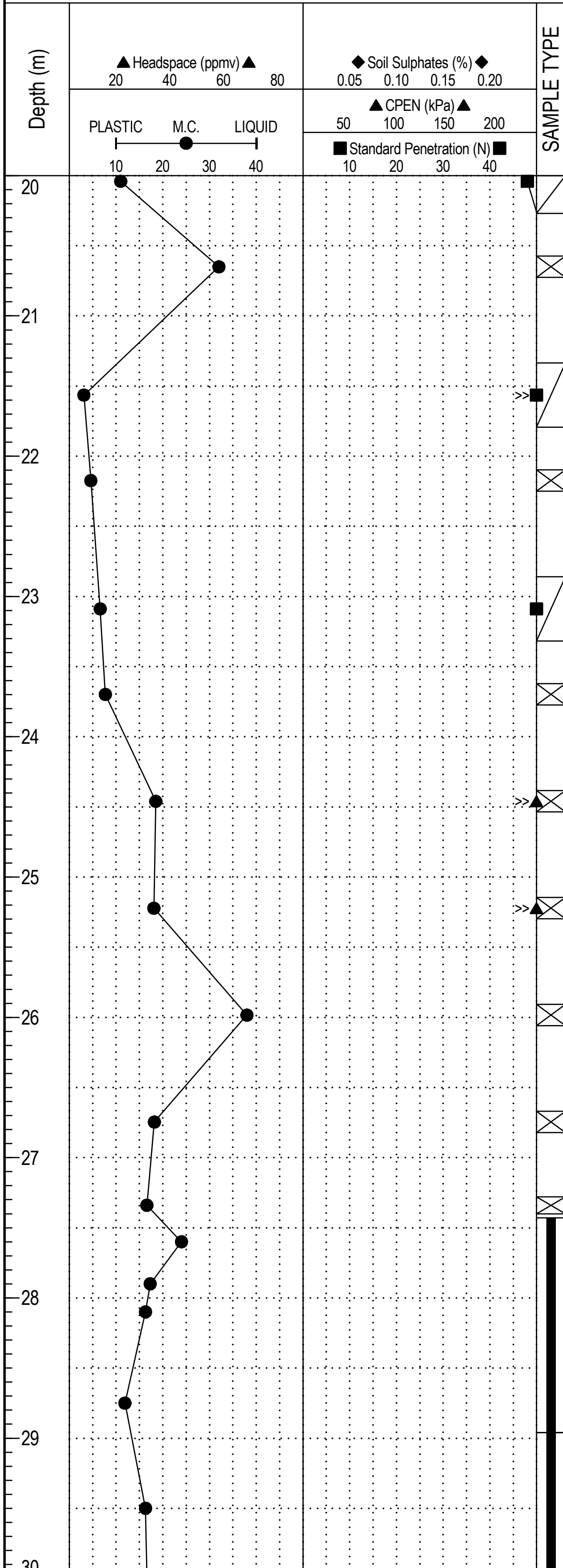
SLOPE INCLINOMETER | VW | VW | ELEVATION (m): 651, 650, 649, 648, 647, 646, 645, 644, 643, 642

STANDPIP 28330-CITY OF ED-VW-ROCK.GPJ CITY OF EDMONTON.GDT 20-11-13

PROJECT: LATTA BRIDGE	DRILLING COMPANY: Garritty & Baker Drilling Inc	BOREHOLE NO: **TH20-1**
CLIENT: City of Edmonton	DRILLING METHOD: Mud Rotary / Coring	PROJECT NO: 28330
START DATE: 2020-3-21	UTM ZONE: N5935375.215, E34851.143	ELEVATION: 661.71 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

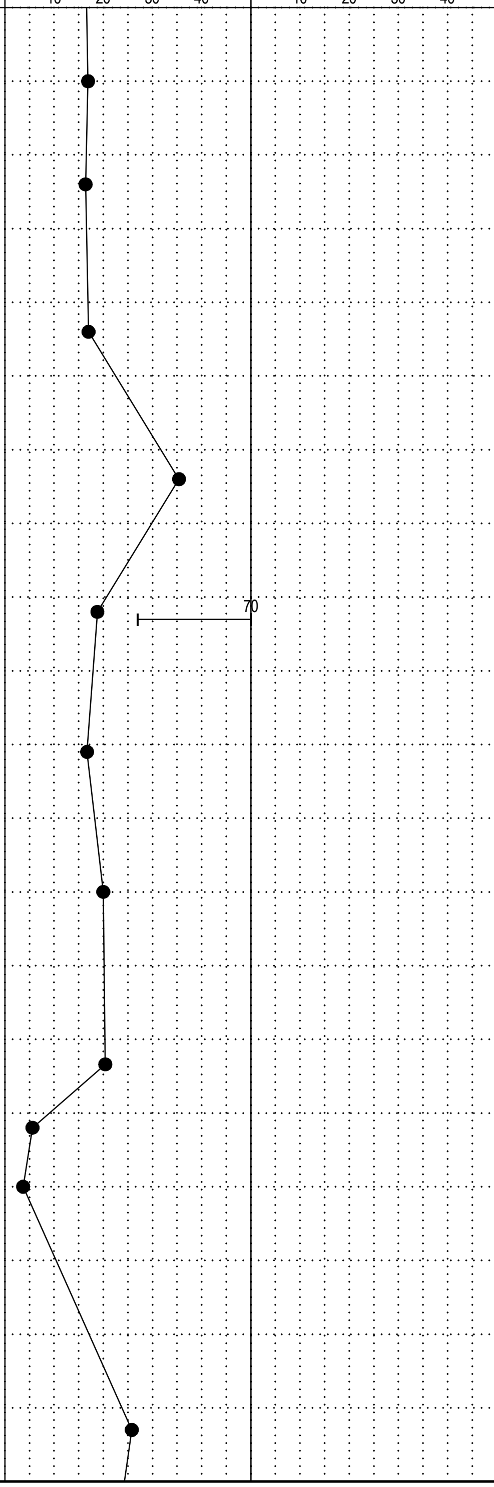


Depth (m)	SPT (N) RQD/REC (%)	USC	SOIL DESCRIPTION	ELEVATION (m)
20	48	SP	SAND - CONTINUED	
		CI	CLAY, dark brown to black, silty, fine sandy, coal mixed	641
21				
	62	SP	SAND very dense, brown, silty, fine grained, trace gravel	640
22		SP		
				639
23	50/125	SM		
		SM	-trace clay lumps	638
24		CS-CH	CLAY SHALE grey to dark grey, silty, some fine sand lenses	637
25		CS-CH		
				636
26		COAL	COAL, black, some fine sand	
		SI-CI	CLAY SHALE brown, silty, some fine sand lenses, trace silt deposits	635
27		SI-CI	-extremely weak, fresh, dark grey, trace fine sand lenses, occasional coal stringers	634
28	71/92		SANDSTONE, extremely weak, fresh, grey, silty, fine grained, trace coal stringers and clay shale lenses / laminations	
			CLAY SHALE, extremely weak, fresh, dark brown to dark grey, silty, some sandstone lenses interbedded -gravelly	633
29	81/81		SANDSTONE, extremely weak, fresh, grey, silty, fine grained, trace clay shale lenses interbedded to 28.50m, occasional black coal laminations	632
30				

SLOPE INCLINOMETER | VW | VW

PROJECT: LATTA BRIDGE	DRILLING COMPANY: Garritty & Baker Drilling Inc	BOREHOLE NO: **TH20-1**
CLIENT: City of Edmonton	DRILLING METHOD: Mud Rotary / Coring	PROJECT NO: 28330
START DATE: 2020-3-21	UTM ZONE: N5935375.215, E34851.143	ELEVATION: 661.71 (m)

SAMPLE TYPE	Shelby Tube	Drive Sample	Auger Sample	No Recovery	A Casing	Cored Sample
BACKFILL TYPE	BENTONITE	PEA GRAVEL	SLOUGH	GROUT	DRILL CUTTINGS	SAND



Depth (m)	SPT (N) RQD/REC (%)	SOIL DESCRIPTION	ELEVATION (m)
30		-trace thin clay shale lenses and coal lenses / inclusions -dark brown clay shale lenses at 29.92 - 29.94m	
	86/95	CLAY SHALE, extremely weak, fresh, dark grey, silty, some light grey fine sandstone lenses interbedded, bedding at 90° TCA -cemented siltstone nodules at 30.62 - 30.65m -light grey, bentonitic fine sandstone lenses at 31.49 - 31.59m -dark brown, silty -trace coal inclusions	631 630
31 32	26/100	COAL, extremely weak, fresh, black, fractured	629
33 34	86/86	CLAY SHALE, very weak, fresh, dark brown to dark grey, carbonaceous, trace coal and sandstone lenses -dark greenish grey, silty, occasional fine sandstone lenses -extremely weak, dark greenish grey - dark brown, silty, thin bedding at 90° TCA -c'_{peak} = 20kPa, $Ø'_{peak}$ = 30° $c'_{residual}$ = 0kPa, $Ø'_{residual}$ = 12° -Gravel = 0%, Sand = 0% Silt = 62.4%, Clay = 37.6% -siltstone lenses at 34.23 - 34.28m -Dry density = 1775kg/m³, Cu = 157.8kPa -dark brown, silty, carbonaceous, trace coal fragments at 35.63 - 35.77m	628 627 626 625
35 36 37	87/87	SILTSTONE, weak, fresh, brown - light brown, cemented	624
		COAL, extremely weak, fresh, black, fractured	
38	10/35	CLAY SHALE, extremely weak, fresh, dark brown, silty, carbonaceous, some coal inclusions NO RECOVERY	623
39		CLAY SHALE, extremely weak, fresh, dark greenish grey - dark brown, occasional coal	622
40			

PROJECT: LATTA BRIDGE	DRILLING COMPANY: Garritty & Baker Drilling Inc	BOREHOLE NO: **TH20-1**
CLIENT: City of Edmonton	DRILLING METHOD: Mud Rotary / Coring	PROJECT NO: 28330
START DATE: 2020-3-21	UTM ZONE: N5935375.215, E34851.143	ELEVATION: 661.71 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

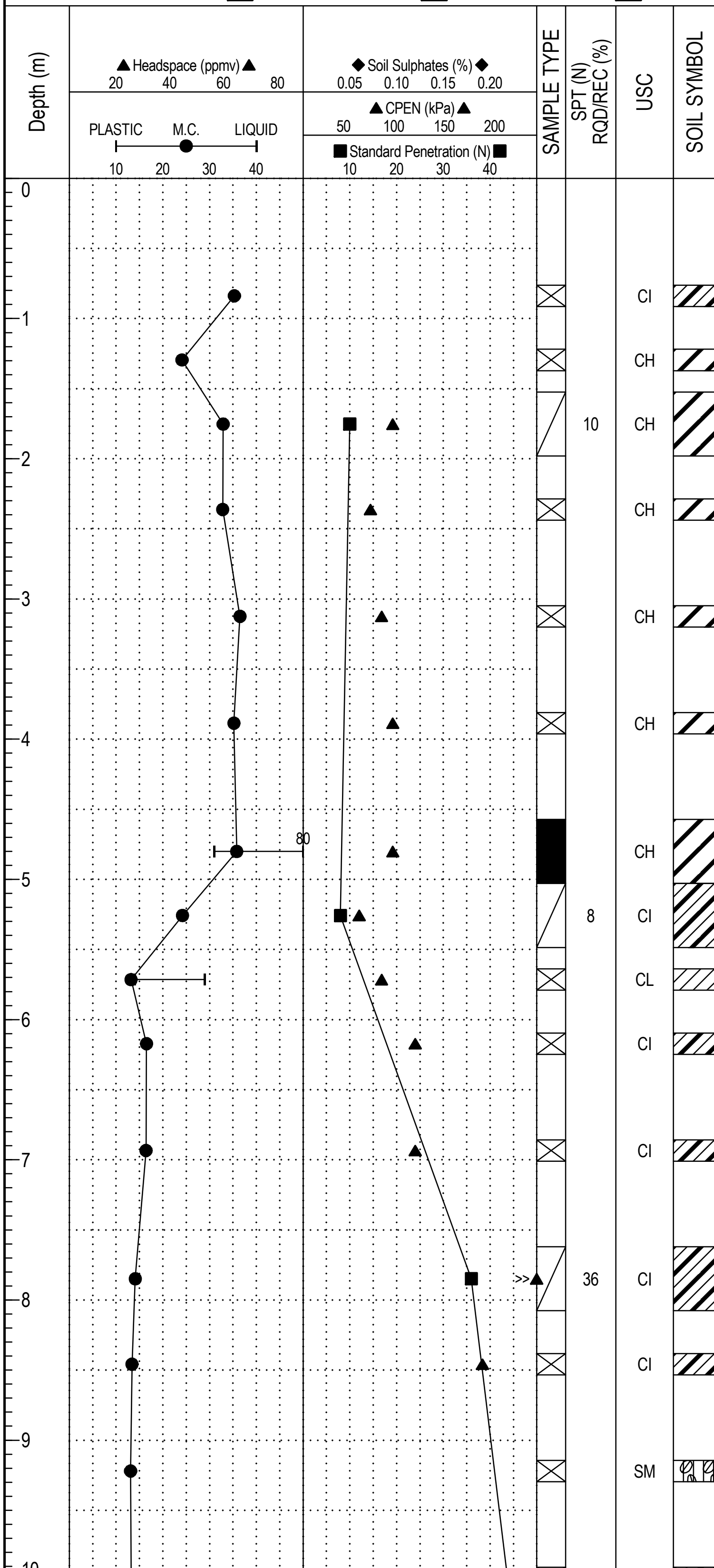
Depth (m)	SPT (N) RQD/REC (%)	SOIL DESCRIPTION	ELEVATION (m)
40	91/91	inclusions, thin bedding at 90° TCA -dark brown to dark grey, silty, trace coal and sandstone lenses up to 50mm thick	
			621
41	91/93	-Dry density = 1911kg/m³, Cu = 2116.1kPa	
			620
		SILTSTONE, extremely weak, fresh, light grey, fine sandy, thin bedding at 90° TCA	
42		END OF TEST HOLE AT 41.9m UPON COMPLETION: Slope indicator and two vibrating wire piezometers (VW65160 and VW65162) installed WATER LEVEL BELOW GROUND SURFACE: VW65160: -March 24, 2020 = 8.7m	
			619
43			
			618
44			
			617
45			
			616
46			
			615
47			
			614
48			
			613
49			
			612
50			

Chart column headings: ▲ Headspace (ppmv) ▲ 20 40 60 80; PLASTIC M.C. LIQUID 10 20 30 40; ◆ Soil Sulphates (%) ◆ 0.05 0.10 0.15 0.20; ▲ CPEN (kPa) ▲ 50 100 150 200; ■ Standard Penetration (N) ■ 10 20 30 40; SAMPLE TYPE; USC; SOIL SYMBOL; SLOPE INCLINOMETER; VW; VW

PROJECT: LATTA BRIDGE	DRILLING COMPANY: Garritty & Baker Drilling Inc	BOREHOLE NO: **TH20-2**
CLIENT: City of Edmonton	DRILLING METHOD: Mud Rotary / Coring	PROJECT NO: 28330
START DATE: 2020-3-23	UTM ZONE: N5935437.871, E34878.276	ELEVATION: 661.40 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND



SOIL DESCRIPTION

ASPHALT

CLAY (FILL)
dark brown to black, silty, trace fine sand and gravel

CLAY
stiff, dark brown, silty, trace fine sand and oxides

-dark brown to dark grey

-dark grey, trace gypsum crystals

-c'_{peak} = 53kPa, $Ø'_{peak}$ = 13°
$c'_{residual}$ = 0kPa, $Ø'_{residual}$ = 9°
-Gravel = 0%, Sand = 1.2%
Silt = 47.3%, Clay = 51.5%
-dark brown, very silty, some fine sand and silt lenses
-Gravel = 4.3%, Sand = 43.7%
Silt = 36.2%, Clay = 15.8%

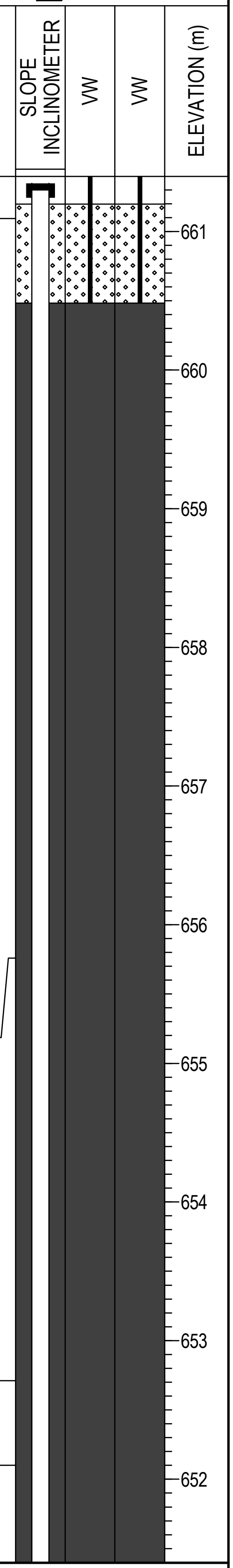
CLAY (TILL)

dark brown to dark grey, silty, some fine sand, trace gravel, oxides, and coal
-fine sandy
-very silty

-hard

SAND
brown, silty, fine grained, trace oxides, coal, and clay lumps

CLAY (TILL)
hard, dark brown to dark grey, very silty, fine sandy, some CL clay, trace gravel and coal



STANDPIP 28330-CITY OF ED-VW-ROCK.GPJ CITY OF EDMONTON.GDT 20-11-13

THE CITY OF Edmonton — Transportation Engineeering Services Section

THURBER ENGINEERING LTD.

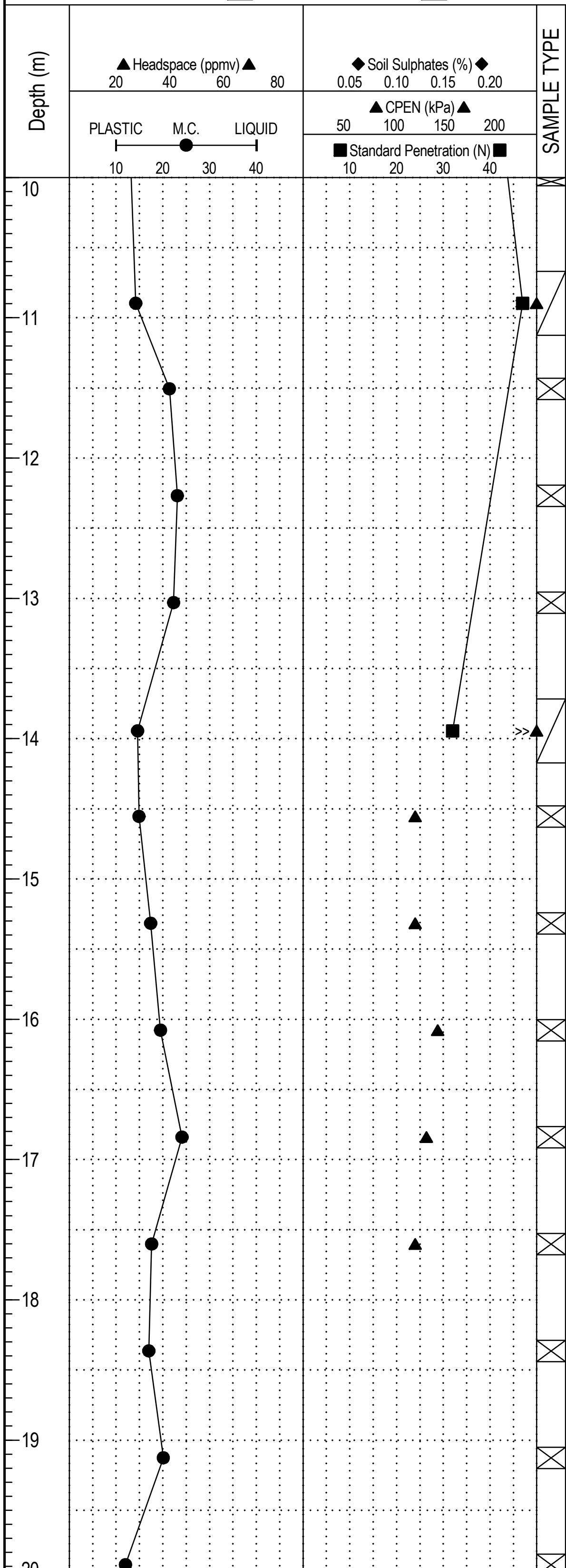
LOGGED BY: GS | REVIEWED BY: XW / RWT

COMPLETION DEPTH: 35.1 m
COMPLETION DATE: 20-3-23

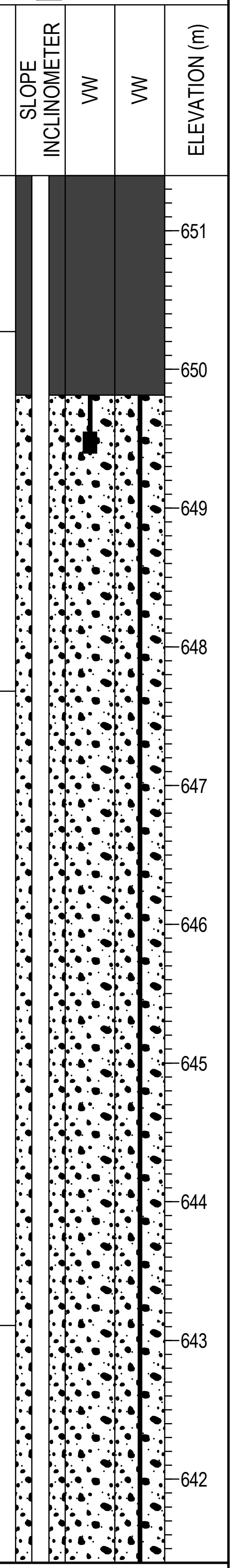
PROJECT: LATTA BRIDGE	DRILLING COMPANY: Garritty & Baker Drilling Inc	BOREHOLE NO: **TH20-2**
CLIENT: City of Edmonton	DRILLING METHOD: Mud Rotary / Coring	PROJECT NO: 28330
START DATE: 2020-3-23	UTM ZONE: N5935437.871, E34878.276	ELEVATION: 661.40 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND



Depth (m)	SPT (N) RQD/REC (%)	USC	SOIL DESCRIPTION
10		CI	CLAY (TILL) - CONTINUED
	47	CI	-trace fine sand lenses
11		SM	SAND brown, silty, fine grained, some silt
12		SM	
13		SP-SM	
14	32	CI	CLAY (TILL) hard, dark grey, silty, trace fine sand and gravel
		CI	
15		CI	-trace fine sand lenses
16		CI	
		CI-CH	
17		CI	-some silt deposits
18		SM	SAND dark brown, very silty, fine grained, silt mixed, some clay lumps, trace oxides
19		SM	-trace coal
20		SM	-brown, silty, trace clay lumps



PROJECT: LATTA BRIDGE	DRILLING COMPANY: Garritty & Baker Drilling Inc	BOREHOLE NO: **TH20-2**
CLIENT: City of Edmonton	DRILLING METHOD: Mud Rotary / Coring	PROJECT NO: 28330
START DATE: 2020-3-23	UTM ZONE: N5935437.871, E34878.276	ELEVATION: 661.40 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

Column headings: Depth (m); ▲Headspace (ppmv)▲ 20 40 60 80; PLASTIC M.C. LIQUID 10 20 30 40; ◆Soil Sulphates (%)◆ 0.05 0.10 0.15 0.20; ▲CPEN (kPa)▲ 50 100 150 200; ■Standard Penetration (N)■ 10 20 30 40; SAMPLE TYPE; SPT (N) RQD/REC (%); USC; SOIL SYMBOL; SOIL DESCRIPTION; SLOPE INCLINOMETER; VW; VW; ELEVATION (m)

Depth (m)	SPT (N) RQD/REC (%)	USC	SOIL DESCRIPTION	ELEVATION (m)
20			SAND - CONTINUED	
				641
		SM		
21				
		SM		640
22		SM		
				639
23		SM		
				638
		SP-SM		
24				
		SM		637
25				
		SM	-trace gravel and silt deposits	
				636
26		SS-CI	SANDSTONE grey to brown, silty, fine grained, some oxides, trace clay shale	
				635
		SS-CI		
27				
		SS-CI		634
			CLAY (TILL), dark grey, silty, some fine sand, trace gravel	
28			CLAY SHALE, extremely weak, fresh, dark brown, silty, trace sandstone lenses	
	13/36			
			COAL, black	633
			NO RECOVERY	
29			COAL, black, clay shale mixed	
			CLAY SHALE, extremely weak, fresh, dark brown, silty, trace coal stringers and silt deposits	632
	43/84		-dark grey, trace silt laminations	
30				

PROJECT: LATTA BRIDGE	DRILLING COMPANY: Garritty & Baker Drilling Inc	BOREHOLE NO: **TH20-2**
CLIENT: City of Edmonton	DRILLING METHOD: Mud Rotary / Coring	PROJECT NO: 28330
START DATE: 2020-3-23	UTM ZONE: N5935437.871, E34878.276	ELEVATION: 661.40 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

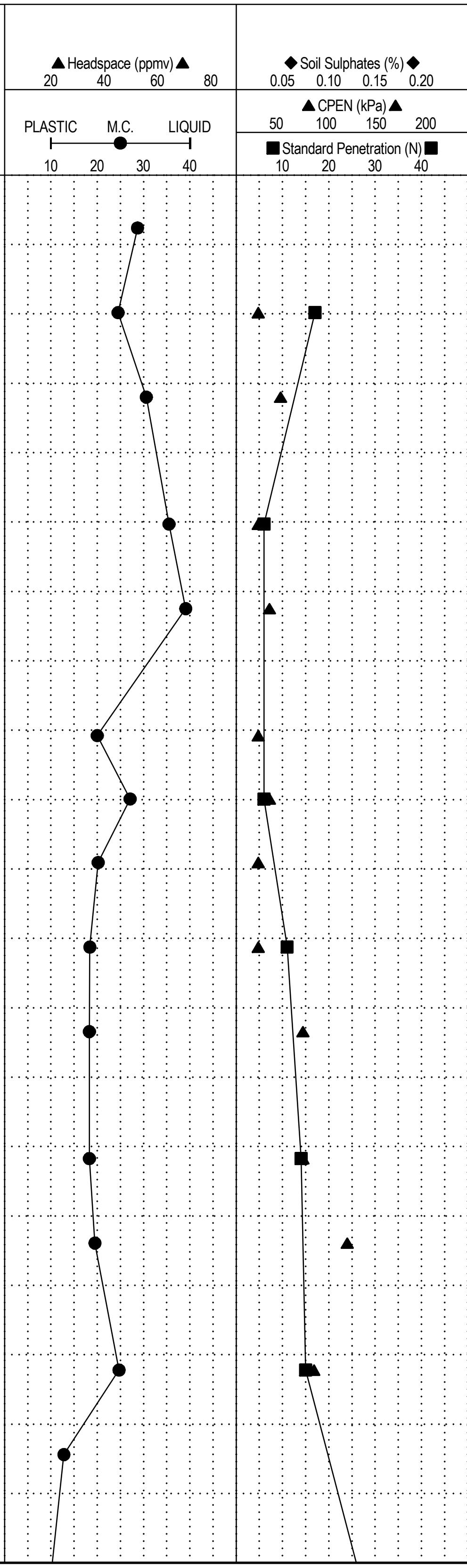
Depth (m)	SPT (N) RQD/REC (%)	SOIL DESCRIPTION	ELEVATION (m)
30		-Dry density = 1663kg/m³, Cu = 365.8kPa	631
		-grey to dark brown, trace siltstone nodules, occasional sandstone laminations	
31	11/52		630
		-dark brown, carbonaceous, trace coal fragments	
32		-trace sandstone laminations	
	50/73	SANDSTONE extremely weak, fresh, grey, silty, fine grained, soe clay shale laminations, some clay shale lenses from 33.20 - 33.36m	629
33			628
		CLAY SHALE, extremely weak, fresh, dark grey, silty, some sandstone laminations, trace light grey cemented siltstone nodules	
34	8/30	NO RECOVERY	627
35		END OF TEST HOLE AT 35.1m UPON COMPLETION: Slope indicator two vibrating wire piezometers (VW65159 and VW65161) installed WATER LEVEL BELOW GROUND SURFACE: VW65159: -March 30, 2020 = 12.2m	626
36			625
37			624
38			623
39			622
40			

Chart axes: Headspace (ppmv) 20 40 60 80; PLASTIC M.C. LIQUID 10 20 30 40; Soil Sulphates (%) 0.05 0.10 0.15 0.20; CPEN (kPa) 50 100 150 200; Standard Penetration (N) 10 20 30 40. Columns: SAMPLE TYPE, USC, SOIL SYMBOL, SLOPE INCLINOMETER, VW, VW.

PROJECT: LATTA BRIDGE	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-3**
CLIENT: City of Edmonton	DRILLING METHOD: Auger / Coring	PROJECT NO: 28330
START DATE: 2020-4-6	UTM ZONE: N5935392.862, E34866.381	ELEVATION: 649.66 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND



Depth (m)	SPT (N) RQD/REC (%)	USC	SOIL DESCRIPTION	ELEVATION (m)
0		CI	CLAY (FILL) dark brown, silty, trace fine sand, gravel, and rootlets	
1	17	CI	-some organics	649
		CI	-some bricks, trace fine sand lenses	648
2	6	CI	-firm	647
3		CI	-dark brown to dark grey, trace coal	646
4		CI	CLAY firm, dark brown, silty, some fine sand and silt	
	6	CI	-trace coal	645
5		CI	CLAY (TILL) stiff, dark brown, silty, some fine sand, trace gravel, oxides, and coal	
	11	CI	-some fine sand lenses	644
6		CI	-trace fine sand	643
7	14	CI	-dark brown to dark grey	
		CI	-trace fine sand lenses	642
8	15	CH	-very stiff	641
9		SM	SAND brown silty, fine grained	640
10				

STANDPIP 28330-CITY OF ED-VW-ROCK.GPJ CITY OF EDMONTON.GDT 20-11-13

THE CITY OF Edmonton — Transportation Engineeering Services Section

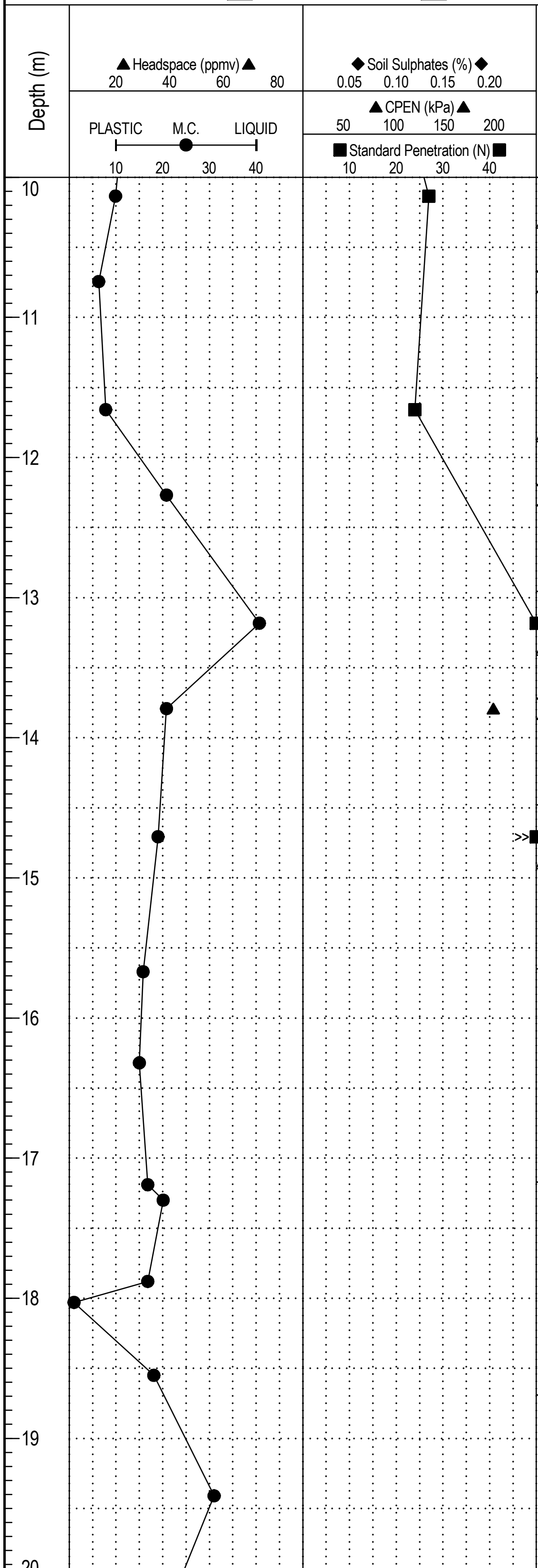
THURBER ENGINEERING LTD.

LOGGED BY: GS	REVIEWED BY: XW / RWT	COMPLETION DEPTH: 29.0 m COMPLETION DATE: 20-4-6

PROJECT: LATTA BRIDGE	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-3**
CLIENT: City of Edmonton	DRILLING METHOD: Auger / Coring	PROJECT NO: 28330
START DATE: 2020-4-6	UTM ZONE: N5935392.862, E34866.381	ELEVATION: 649.66 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

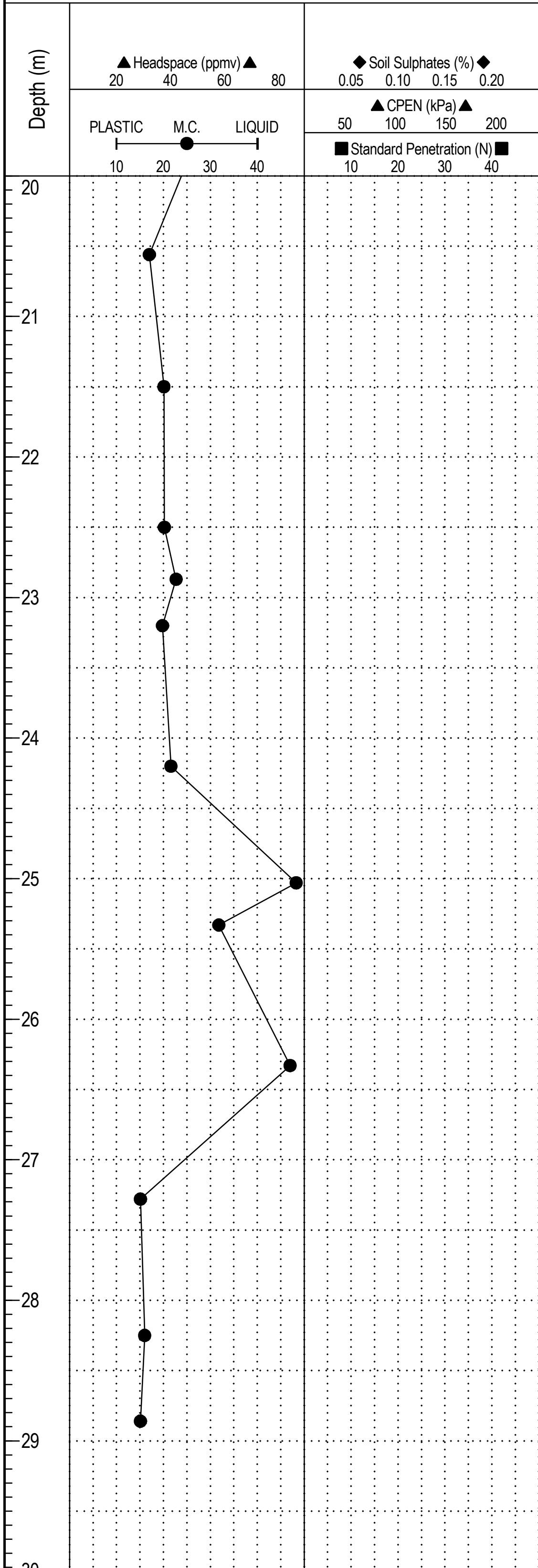


Depth (m)	SPT (N) RQD/REC (%)	USC	SOIL DESCRIPTION	ELEVATION (m)
10.0	27	SM	SAND - CONTINUED -compact, trace gravel and coal	
10.6		SM		639
11.6	24	SM		638
12.3		CI-CL	-some clay lumps and gravel, trace cobbles	637
13.2	50/125	COAL	COAL, very hard, black	
13.8		CS-CH	CLAY SHALE very hard, dark grey, silty, some coal, trace oxides and fine sand	636
14.7	84	CS-CH	-dark grey, trace coal	635
15.6			-extremely weak, fresh, dark brown, trace sandstone lenses	634
15.8	100/100		SANDSTONE extremely weak, fresh, grey, silty, fine grained, bentonitic, trace clay shale lenses, occasional coal laminations	633
17.3			CLAY SHALE, extremely weak, fresh, dark brown, silty, trace coal and sandstone	632
17.7	67/91		SANDSTONE extremely weak, fresh, grey, silty, fine grained, some clay shale lenses, trace coal laminations and siltstone lenses	
18.4			Siltstone, very weak, fresh, light brown, cemented	
18.6			CLAY SHALE, extremely weak, fresh, dark brown to dark grey, silty, trace siltstone lenses	631
19.0			-dark grey, trace silt deposits and coal	
19.2			-dark brown	
19.4	7/49		COAL, extremely weak, fresh, black, fractured	
19.6			NO RECOVERY	630

PROJECT: LATTA BRIDGE	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-3**
CLIENT: City of Edmonton	DRILLING METHOD: Auger / Coring	PROJECT NO: 28330
START DATE: 2020-4-6	UTM ZONE: N5935392.862, E34866.381	ELEVATION: 649.66 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND



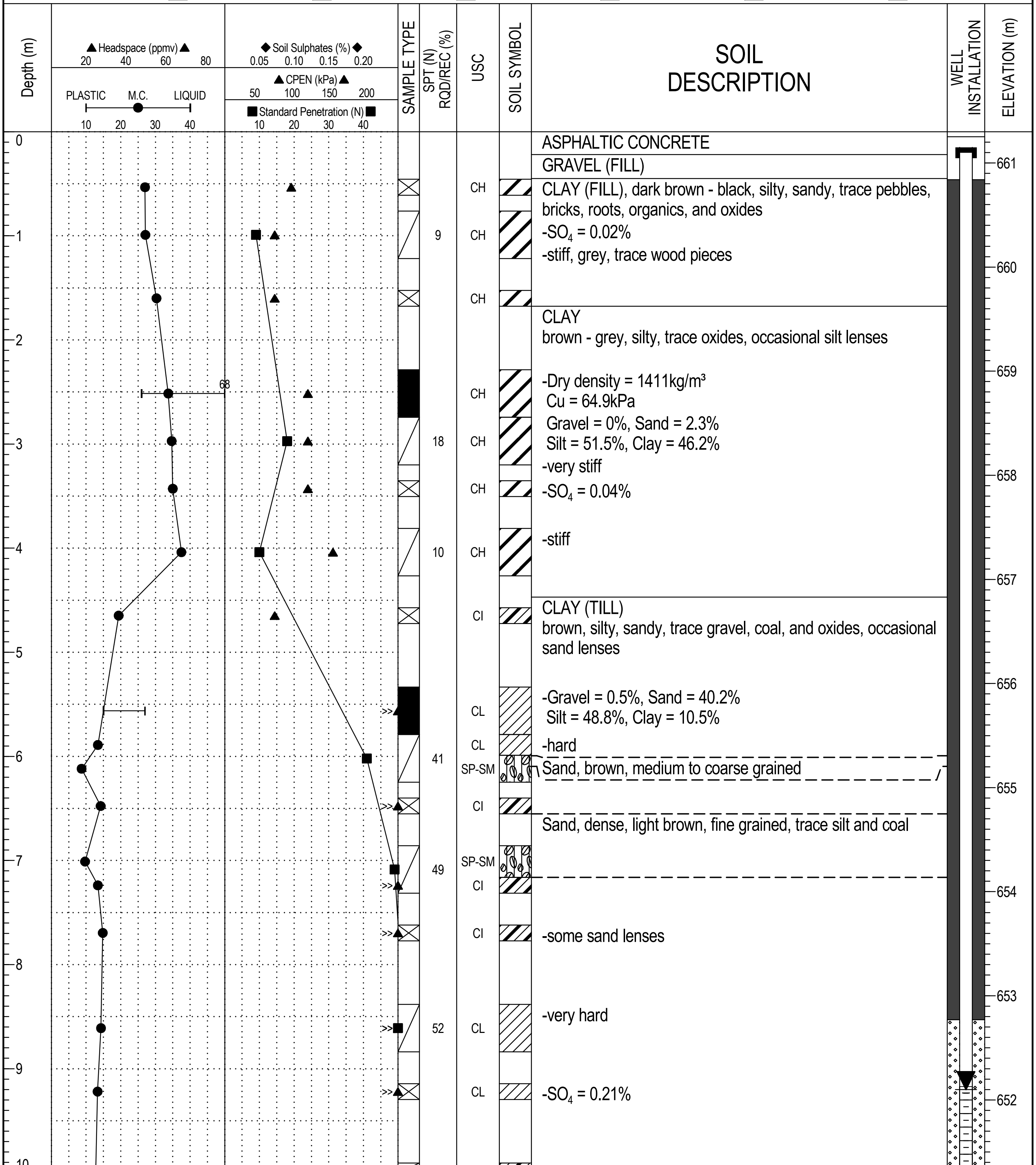
SAMPLE TYPE	SPT (N) RQD/REC (%)	USC	SOIL SYMBOL	SOIL DESCRIPTION	ELEVATION (m)
	61/93			CLAY SHALE, extremely weak, fresh, dark brown, trace cola stringers / inclusions -dark grey, trace sandstone lenses -some sandstone lenses / laminations interbedded at 90° TCA from 21.22 - 21.38m -dark brown, silty, trace coal	629 628
	73/96			-dark grey, trace light grey fine grained sandstone lenses / laminations at 90° TCA	627
				SANDSTONE extremely weak, fresh, grey, silty, fine grained, some clay shale lenses up to 20mm thick	
	46/97			CLAY SHALE, extremely weak, fresh, grey, silty, trace sandstone lenses -dark brown, trace siltstone lenses and coal	626 625
	67/89			BENTONITE, extremely weak, fresh, grey, trace clay shale lenses up to 30mm thick	
	0/57			COAL, very weak, fresh, black -fractured	624
	87/87			CLAY SHALE, very weak, fresh, dark brown, silty, some siltstone, trace coal -greenish grey, bentonitic, trace sandstone inclusions -dark brown	623
				SANDSTONE, extremely weak, fresh, grey, silty, fine grained, trace clay shale lenses and coal inclusions	
	90/95			CLAY SHALE, very weak, fresh, dark grey, silty, trace sandstone lenses -Dry density = 1883kg/m³, Cu = 1537.3kPa -some sandstone lenses from 28.29 - 28.50m	622
				SANDSTONE, very weak, fresh, grey, silty, fine grained, trace clay shale lenses	621
				CLAY SHALE very weak, fresh, dark grey, silty, trace sandstone lenses	
				END OF TEST HOLE AT 29.0m UPON COMPLETION: Backfilled with grout and bentonite chips at surface	620

PHASE 2 DRILLING (SEPTEMBER 2020)
TEST HOLES TH20-4 TO TH20-6

PROJECT: Latta Bridge Geotechnical Investigation	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-4**
CLIENT: BPTEC	DRILLING METHOD: Truck / Solid Stem Augers - Coring	PROJECT NO: 29077
START DATE: 2020-10-10	UTM ZONE: N5936380, E336110	ELEVATION: 661.3 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND



SOIL DESCRIPTION

ASPHALTIC CONCRETE

GRAVEL (FILL)

CLAY (FILL), dark brown - black, silty, sandy, trace pebbles, bricks, roots, organics, and oxides

-SO_4 = 0.02%

-stiff, grey, trace wood pieces

CLAY
brown - grey, silty, trace oxides, occasional silt lenses

-Dry density = 1411kg/m³
Cu = 64.9kPa
Gravel = 0%, Sand = 2.3%
Silt = 51.5%, Clay = 46.2%

-very stiff

-SO_4 = 0.04%

-stiff

CLAY (TILL)
brown, silty, sandy, trace gravel, coal, and oxides, occasional sand lenses

-Gravel = 0.5%, Sand = 40.2%
Silt = 48.8%, Clay = 10.5%

-hard

Sand, brown, medium to coarse grained

Sand, dense, light brown, fine grained, trace silt and coal

-some sand lenses

-very hard

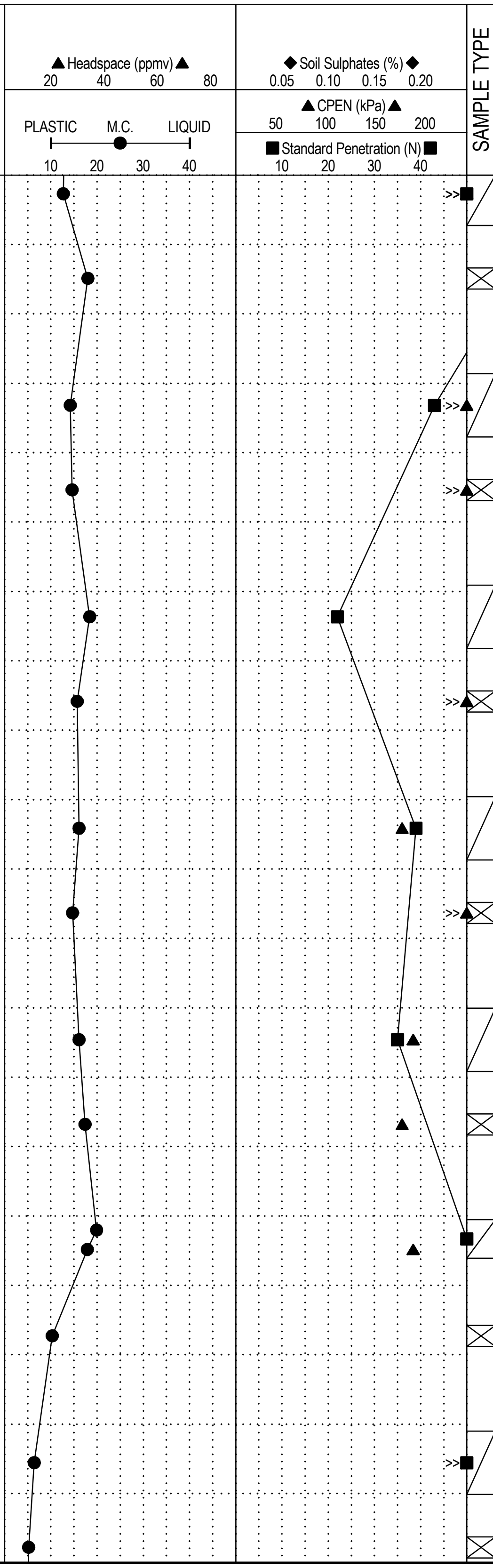
-SO_4 = 0.21%

THE CITY OF Edmonton	Transportation Engineeering Services Section	THURBER ENGINEERING LTD.	COMPLETION DEPTH: 40.8 m
			COMPLETION DATE: 20-10-10
		LOGGED BY: MW / REVIEWED BY: RWT	Page 1 of 5

PROJECT: Latta Bridge Geotechnical Investigation	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-4**
CLIENT: BPTEC	DRILLING METHOD: Truck / Solid Stem Augers - Coring	PROJECT NO: 29077
START DATE: 2020-10-10	UTM ZONE: N5936380, E336110	ELEVATION: 661.3 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

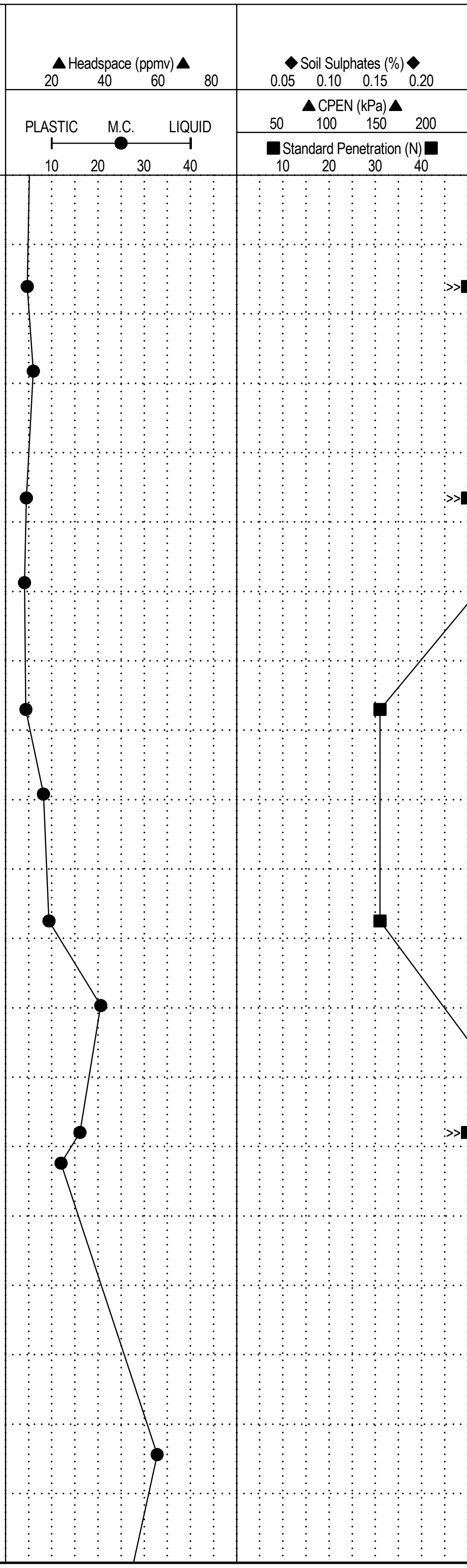


Depth (m)	SPT (N) RQD/REC (%)	USC	SOIL DESCRIPTION	ELEVATION (m)
10	71	CI	CLAY (TILL) - CONTINUED -grey	651
		SM		
11				650
	43	CI	-hard, sand seam at 11.6m	
12		CI		649
13	22	SM	Sand, compact, brown, fine grained, trace silt	648
		CI		
14				647
	39	CI	-hard	
15		CI		646
16	35	CI		645
		CI	-occasional wet sand lenses	
17				644
	50/125	SM CI	Sand, very dense -very hard	
18		SM	SAND AND GRAVEL very dense, brown, silty, fine grained, trace coal	643
19	77	SP-SM	-SO_4 = 0.02%	642
20		SP-SM		

PROJECT: Latta Bridge Geotechnical Investigation	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-4**
CLIENT: BPTEC	DRILLING METHOD: Truck / Solid Stem Augers - Coring	PROJECT NO: 29077
START DATE: 2020-10-10	UTM ZONE: N5936380, E336110	ELEVATION: 661.3 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND



Depth (m)	SPT (N) RQD/REC (%)	USC	SOIL DESCRIPTION	ELEVATION (m)
20			SAND AND GRAVEL - CONTINUED	641
20.8	56	SP-SM		
21			-clay lenses	640
21.4		SM	-oxidation staining, trace rounded gravel from 21.2 - 21.6m	
22.3	69	SP-SM		639
22.9		SP-SM		638
23.8	31	SP-SM	-dense	637
24.5		SM		
25.4	31	SP-SM	-SO_4 = 0.04%	636
26		SS	SANDSTONE extremely weak, bluish grey, highly weathered, trace oxidation staining and coal	635
26.9	65	SS		
27.1–28.6	0/4		NO RECOVERY	634, 633
28.6–29.5	0/64		CLAY SHALE, extremely weak, moderately weathered, dark brown, silty, reworked, some iron stained siltstone pieces -sandstone lenses from 29.06 - 29.16m -brown, trace coal fragments	632
29.5–30			SANDSTONE, extremely weak, fresh, light grey, fine grained, bentonitic	

STANDPIP 29077-CITY OF ED-ROCK.GPJ CITY OF EDMONTON.GDT 20-11-13

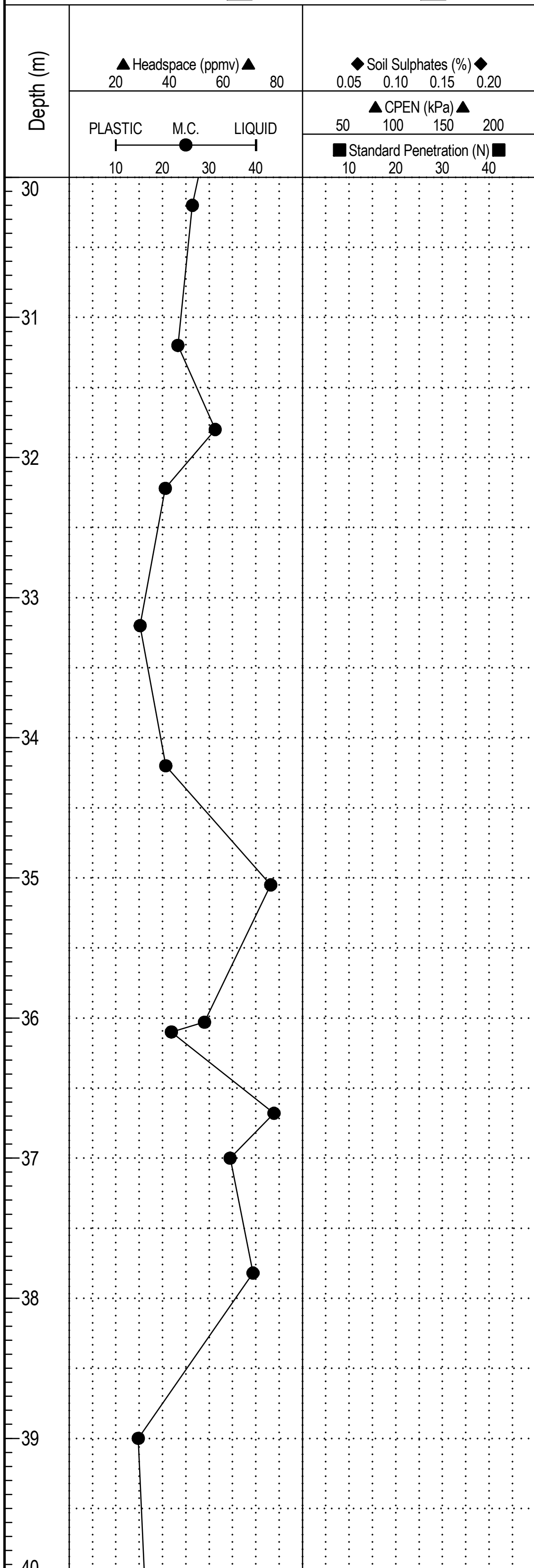
THE CITY OF Edmonton — Transportation Engineeering Services Section — THURBER ENGINEERING LTD.

LOGGED BY: MW	REVIEWED BY: RWT	COMPLETION DEPTH: 40.8 m
		COMPLETION DATE: 20-10-10

PROJECT: Latta Bridge Geotechnical Investigation	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-4**
CLIENT: BPTEC	DRILLING METHOD: Truck / Solid Stem Augers - Coring	PROJECT NO: 29077
START DATE: 2020-10-10	UTM ZONE: N5936380, E336110	ELEVATION: 661.3 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND



SPT (N) RQD/REC (%)	SOIL DESCRIPTION
78/95	CLAY SHALE, extremely weak, fresh, dark grey, silty, trace coal stringers
	-light grey - dark brown, thinly interbedded
	-dark brown - black, silty, trace coal fragments from 31.70 - 31.90m
	-dark grey, dark grey thin laminations
82/99	SANDSTONE extremely weak, fresh, dark grey, silty, trace light brown siltstone nodules
	CLAY SHALE extremely weak, fresh, light grey - black, fine grained, massive
86/99	
89/93	BENTONITE, extremely weak, fresh, green
	CLAY SHALE, extremely weak, fresh, dark brown
	COAL, extremely weak, fresh, black, fractured
	BENTONITE, extremely weak, fresh, light brown
	CLAY SHALE, extremely weak, fresh, dark brown
	BENTONITE, extremely weak, fresh, light green
33/53	CLAY SHALE, extremely weak, fresh, dark brown
	COAL, extremely weak, fresh, black, fractured
	CLAY SHALE, extremely weak, fresh, grey
89/89	SANDSTONE, extremely weak, fresh, light grey
	CLAY SHALE, extremely weak, fresh, dark grey, silty
	-very weak, trace coal inclusions

ELEVATION (m): 631, 630, 629, 628, 627, 626, 625, 624, 623, 622

PROJECT: Latta Bridge Geotechnical Investigation	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-4**
CLIENT: BPTEC	DRILLING METHOD: Truck / Solid Stem Augers - Coring	PROJECT NO: 29077
START DATE: 2020-10-10	UTM ZONE: N5936380, E336110	ELEVATION: 661.3 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

Depth (m)	▲Headspace (ppmv)▲ 20 40 60 80 / PLASTIC M.C. LIQUID 10 20 30 40	◆Soil Sulphates (%)◆ 0.05 0.10 0.15 0.20 / ▲CPEN (kPa)▲ 50 100 150 200 / ■Standard Penetration (N)■ 10 20 30 40	SAMPLE TYPE	SPT (N) RQD/REC (%)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL INSTALLATION	ELEVATION (m)
40				70/97			CLAY SHALE - CONTINUED		621
41							END OF TEST HOLE AT 40.8m UPON COMPLETION: (Below ground surface) -Slough at 24.8m -Water at 18.9m Backfilled with drill cuttings, bentonite chips, and cold mix at surface Monitoring well installed in adjacent hole WATER LEVEL BELOW GROUND SURFACE: -October 24, 2020 = 9.2m		620
42									619
43									618
44									617
45									616
46									615
47									614
48									613
49									612
50									

STANDPIP 29077-CITY OF ED-ROCK.GPJ CITY OF EDMONTON.GDT 20-11-13

THE CITY OF Edmonton

Transportation
Engineeering Services Section

THURBER ENGINEERING LTD.

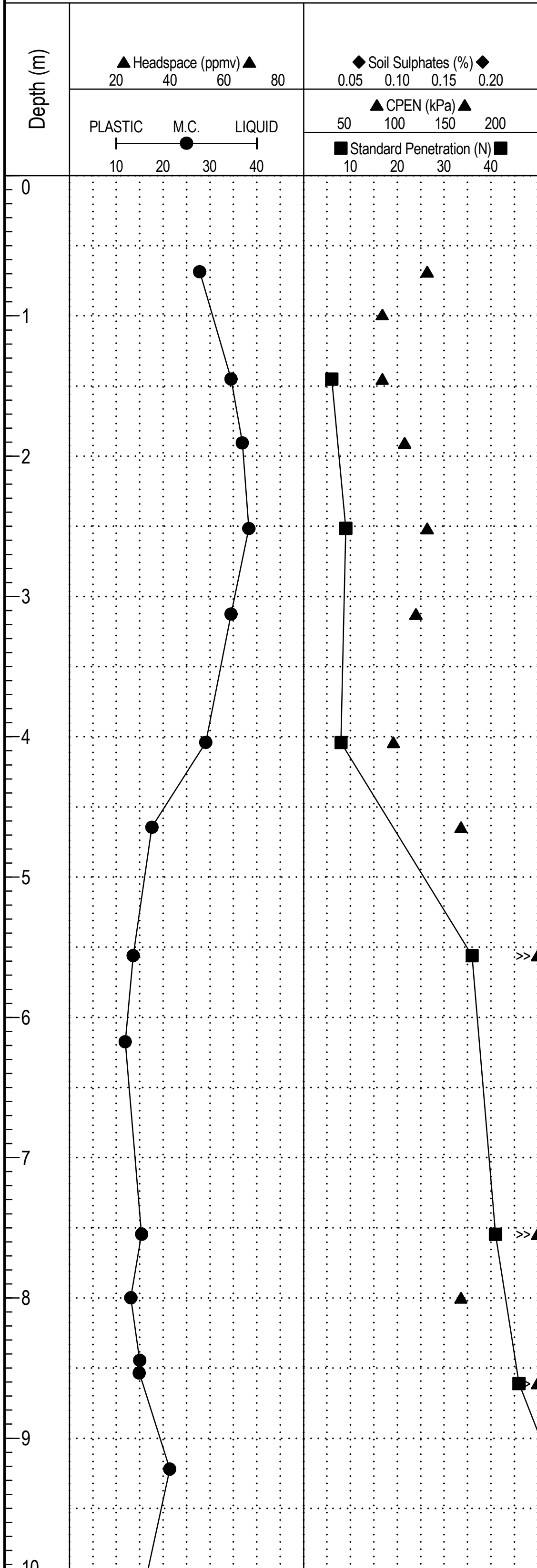
LOGGED BY: MW | REVIEWED BY: RWT

COMPLETION DEPTH: 40.8 m
COMPLETION DATE: 20-10-10

PROJECT: Latta Bridge Geotechnical Investigation	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-5**
CLIENT: BPTEC	DRILLING METHOD: Truck / Solid Stem Augers - Coring	PROJECT NO: 29077
START DATE: 2020-10-11	UTM ZONE: N5936317, E336084	ELEVATION: 661.0 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND



SAMPLE TYPE	SPT (N) RQD/REC (%)	USC	SOIL DESCRIPTION	ELEVATION (m)
			ASPHALTIC CONCRETE	
			GRAVEL (FILL), 20mm size	
Auger		CH	CLAY (FILL) brown, silty, sandy, trace organics, pebbles, and bricks	
Shelby Tube				660
Drive	6	CH	-firm, trace oxides and silt lenses	
Auger		CH	CLAY stiff, brown, silty, trace oxides, occasional silt lenses	659
Drive	9	CH	-trace calcareous deposits	
Auger		CH		658
Drive	8	CI	CLAY (TILL) brown, silty, sandy, trace gravel, coal, and oxides, occasional sand lenses	657
Auger		CI		656
Drive	36	CI	-hard	
Auger		SP-SM	Sand brown, silty, fine grained, trace oxides, occasional clay lenses	655
Shelby Tube				654
Drive	41	CI	-trace sand pockets	
Auger		CI		653
Drive	46	CI SM	Sand brown, silty, fine grained, trace oxides, occasional clay lenses	
Auger		SP-SM		652

WELL INSTALLATION

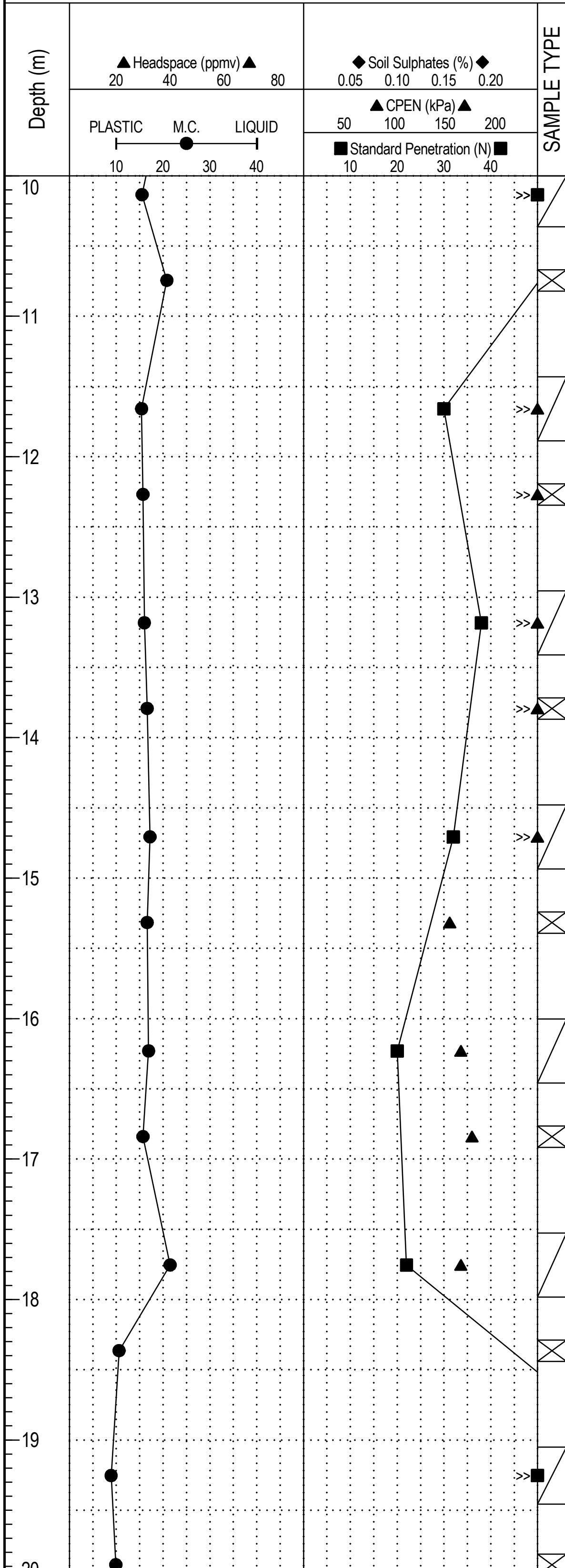
THE CITY OF Edmonton
Transportation
Engineeering Services Section
THURBER ENGINEERING LTD.

LOGGED BY: MW	REVIEWED BY: RWT	COMPLETION DEPTH: 41.1 m COMPLETION DATE: 20-10-11

PROJECT: Latta Bridge Geotechnical Investigation	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-5**
CLIENT: BPTEC	DRILLING METHOD: Truck / Solid Stem Augers - Coring	PROJECT NO: 29077
START DATE: 2020-10-11	UTM ZONE: N5936317, E336084	ELEVATION: 661.0 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND



SPT (N) RQD/REC (%)	USC	SOIL DESCRIPTION	ELEVATION (m)
64	CI	CLAY (TILL) - CONTINUED -very hard	
	SP	Sand brown, medium grained, trace silt and oxides	650
30	CI	CLAY (TILL) hard, grey, silty, some sand, trace coal, oxides, and calcareous deposits, occasional clay shale nodules	649
	CI		
38	CI		648
	CI		647
32	CI		646
	CI		
20	CI	-very stiff	645
	CI		644
22	CH	-trace fine pebbles and oxides	643
	SM	SAND AND GRAVEL very dense, brown silty, fine grained, trace coal	642
77/250	SP		
	SP		

STANDPIP 29077-CITY OF ED-ROCK.GPJ CITY OF EDMONTON.GDT 20-11-13

THE CITY OF Edmonton

Transportation
Engineeering Services Section

THURBER ENGINEERING LTD.

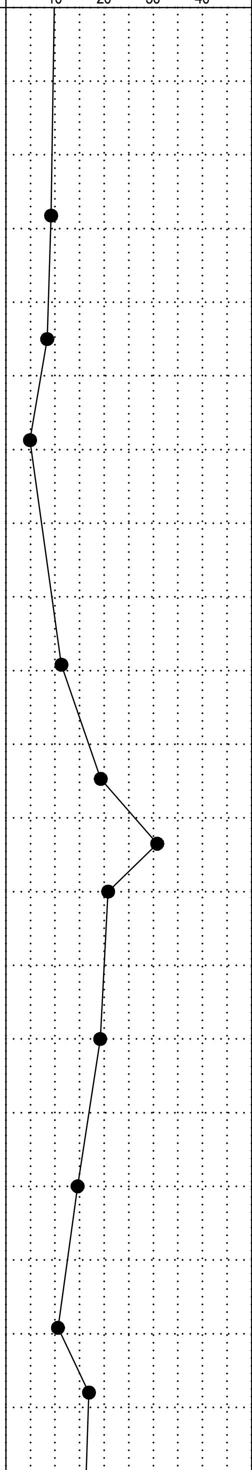
LOGGED BY: MW	REVIEWED BY: RWT	COMPLETION DEPTH: 41.1 m
		COMPLETION DATE: 20-10-11

PROJECT: Latta Bridge Geotechnical Investigation	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-5**
CLIENT: BPTEC	DRILLING METHOD: Truck / Solid Stem Augers - Coring	PROJECT NO: 29077
START DATE: 2020-10-11	UTM ZONE: N5936317, E336084	ELEVATION: 661.0 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

Chart headings: Depth (m) | ▲ Headspace (ppmv) ▲ 20 40 60 80; PLASTIC M.C. LIQUID 10 20 30 40 | ◆ Soil Sulphates (%) ◆ 0.05 0.10 0.15 0.20; ▲ CPEN (kPa) ▲ 50 100 150 200; ■ Standard Penetration (N) ■ 10 20 30 40 | SAMPLE TYPE | SPT (N) RQD/REC (%) | USC | SOIL SYMBOL | SOIL DESCRIPTION | WELL INSTALLATION | ELEVATION (m)



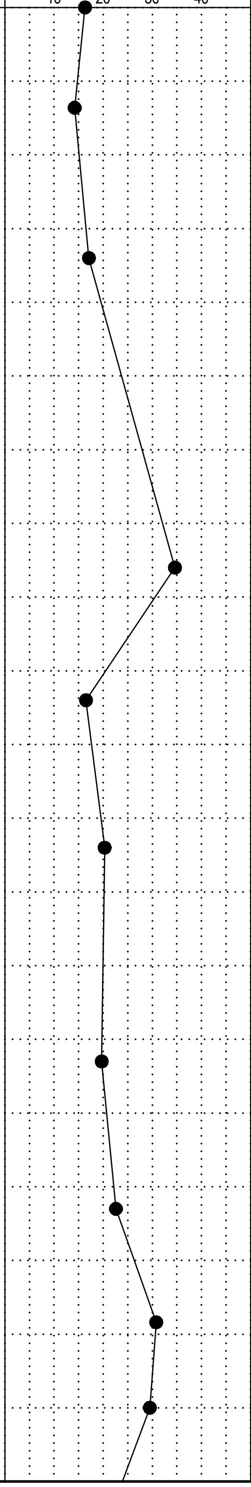
Depth (m)	SPT (N) RQD/REC (%)	USC	SOIL DESCRIPTION	Elevation (m)
20			SAND AND GRAVEL - CONTINUED	
21				640
		SP		
22	50	SP-SM		639
23		SP-SM		638
24		SP-SM		637
25	50/20	CS-CH	SANDSTONE very dense, bluish grey, trace oxides and coal	636
		COAL	COAL, black	
26			CLAY SHALE, extremely weak, fresh, dark brown, silty, carbonaceous, some coal inclusions	635
	45/86		-dark grey to grey, trace coal fragments	
27				634
28			SILTSTONE, extremely weak, fresh, dark brown	633
	79/100		SANDSTONE, extremely weak, fresh, dark grey, fine grained, trace thin dark grey clay shale laminations	
29				632
			CLAY SHALE, extremely weak, fresh, dark brown	
30	86/100		SANDSTONE, extremely weak, fresh, light grey, fine grained, trace light brown clay shale laminations	

PROJECT: Latta Bridge Geotechnical Investigation	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-5**
CLIENT: BPTEC	DRILLING METHOD: Truck / Solid Stem Augers - Coring	PROJECT NO: 29077
START DATE: 2020-10-11	UTM ZONE: N5936317, E336084	ELEVATION: 661.0 (m)

SAMPLE TYPE: Shelby Tube | Drive Sample | Auger Sample | No Recovery | A Casing | Cored Sample

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m) | ▲ Headspace (ppmv) ▲ 20 40 60 80 | PLASTIC M.C. LIQUID 10 20 30 40 | ◆ Soil Sulphates (%) ◆ 0.05 0.10 0.15 0.20 | ▲ CPEN (kPa) ▲ 50 100 150 200 | ■ Standard Penetration (N) ■ 10 20 30 40 | SAMPLE TYPE | SPT (N) RQD/REC (%) | USC | SOIL SYMBOL | SOIL DESCRIPTION | WELL INSTALLATION | ELEVATION (m)



Depth (m)	SPT (N) RQD/REC (%)	SOIL DESCRIPTION	Elevation (m)
30		CLAY SHALE, extremely weak, fresh, dark grey, silty	
		SANDSTONE, extremely weak, fresh, light grey	
		CLAY SHALE, extremely weak, fresh, dark brown	
31		SANDSTONE, extremely weak, fresh, light grey	630
	70/97	CLAY SHALE, extremely weak, fresh, dark grey, silty	
		SILTSTONE, weak, fresh, light grey, cemented	
		CLAY SHALE, extremely weak, fresh, dark brown	
32		COAL, extremely weak, fresh, black, fractured	629
		-brown, bentonitic clay shale lenses from 32.32 - 32.35m	
	0/57		
33			628
		CLAY SHALE, extremely weak, fresh, dark greenish grey, silty, trace dark grey laminations	
34		-dark grey	627
	80/100		
35			626
	66/80		
36		-dark brown, carbonaceous, trace coal fragments from 35.83 - 36.00m	625
37		-dark grey, trace light grey cemented siltstone inclusions	624
	68/100		
38			623
		BENTONITE, extremely weak, fresh, light grey	
		COAL extremely weak, fresh, black, fractured	
39	28/93		622
		CLAY SHALE, extremely weak, fresh, dark brown, silty, carbonaceous, trace coal inclusions	
		-occasional coal inclusions	
40			

PROJECT: Latta Bridge Geotechnical Investigation	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-5**
CLIENT: BPTEC	DRILLING METHOD: Truck / Solid Stem Augers - Coring	PROJECT NO: 29077
START DATE: 2020-10-11	UTM ZONE: N5936317, E336084	ELEVATION: 661.0 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

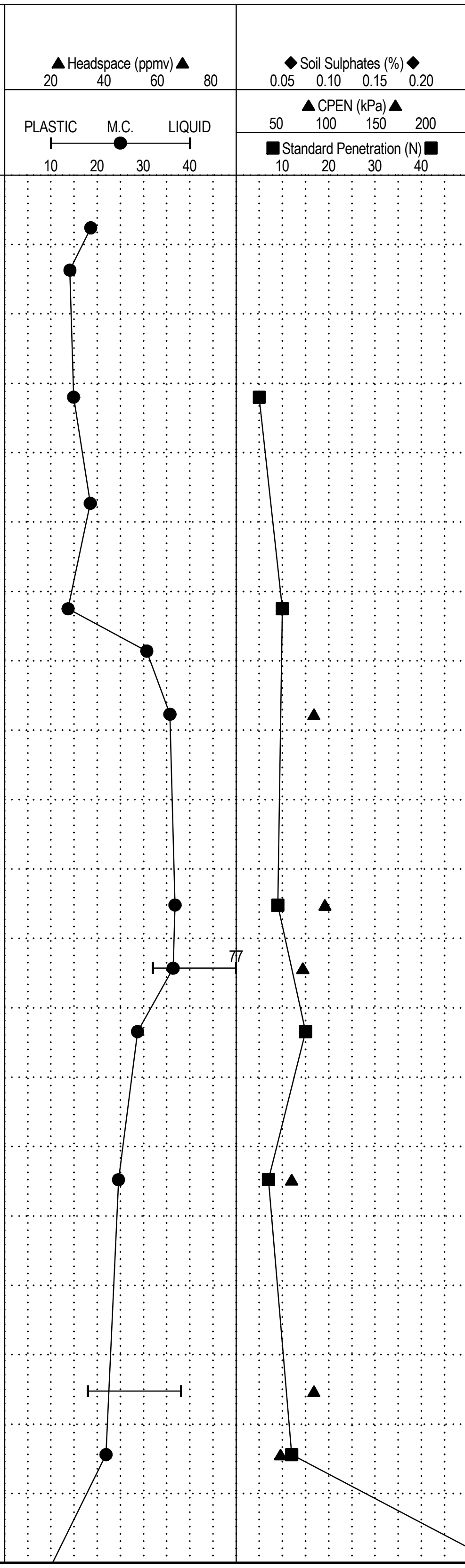
Depth (m) | ▲Headspace (ppmv)▲ 20 40 60 80 | PLASTIC M.C. LIQUID 10 20 30 40 | ◆Soil Sulphates (%)◆ 0.05 0.10 0.15 0.20 | ▲CPEN (kPa)▲ 50 100 150 200 | ■Standard Penetration (N)■ 10 20 30 40 | SAMPLE TYPE | SPT (N) RQD/REC (%) | USC | SOIL SYMBOL | SOIL DESCRIPTION | WELL INSTALLATION | ELEVATION (m)

Depth (m)	SPT (N) RQD/REC (%)	SOIL DESCRIPTION	ELEVATION (m)
40	61/87	CLAY SHALE - CONTINUED -dark grey	
41		END OF TEST HOLE AT 41.1m UPON COMPLETION: Backfilled with drill cuttings, bentonite chips, and concrete mix at surface Monitoring well installed in adjacent hole WATER LEVEL BELOW GROUND SURFACE: -October 24, 2020 = 9.2m	620
42			619
43			618
44			617
45			616
46			615
47			614
48			613
49			612
50			

PROJECT: Latta Bridge Geotechnical Investigation	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-6**
CLIENT: BPTEC	DRILLING METHOD: Track / Solid Stem Augers - Coring	PROJECT NO: 29077
START DATE: 2020-10-10	UTM ZONE: N5935410.9718, E34848.8444	ELEVATION: 651.2 (m)

SAMPLE TYPE: Shelby Tube; Drive Sample; Auger Sample; No Recovery; A Casing; Cored Sample

BACKFILL TYPE: BENTONITE; PEA GRAVEL; SLOUGH; GROUT; DRILL CUTTINGS; SAND



Depth (m)	SPT (N) RQD/REC (%)	USC	SOIL DESCRIPTION	ELEVATION (m)
0		CI	CLAY (FILL), black, sandy, silty, trace glass, construction debris, and pebbles	651
		SP	GRAVEL (FILL) loose, beige, sandy, rounded, trace silt, bricks, glass, and debris	
1				650
	5	SP		
2		SP		649
3	10	CI	CLAY (FILL) stiff, brown - grey, silty, trace oxides and oxide staining, occasional silt lenses and bricks	648
		CH		
4		CH		647
5	9	CH	-stiff, trace decaying wood pieces	646
		CH	-Dry density = 1359kg/m³ Cu = 60.2kPa Gravel = 0%, Sand = 1.6% Silt = 32%, Clay = 66.4%	
6	15	CI	-very stiff, trace organics	645
7	7	CI	CLAY (TILL) firm, brown, silty, sandy, trace gravel, coal, and oxides, occasional sand lenses	644
8				643
		CI	-Gravel = 0.7%, Sand = 32.9% Silt = 43.5%, Clay = 22.9%	
9	12	CI	-stiff	642
10				

THE CITY OF Edmonton

Transportation Engineeering Services Section

THURBER ENGINEERING LTD.

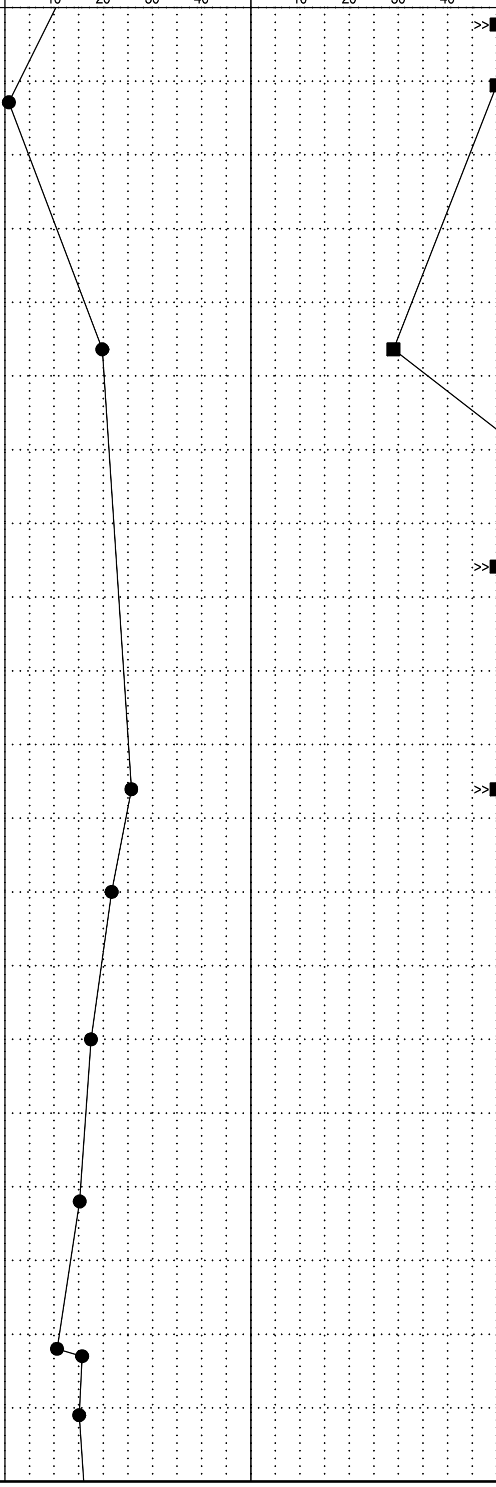
LOGGED BY: MW | REVIEWED BY: RWT

COMPLETION DEPTH: 29.2 m
COMPLETION DATE: 20-10-10

PROJECT: Latta Bridge Geotechnical Investigation	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-6**
CLIENT: BPTEC	DRILLING METHOD: Track / Solid Stem Augers - Coring	PROJECT NO: 29077
START DATE: 2020-10-10	UTM ZONE: N5935410.9718, E34848.8444	ELEVATION: 651.2 (m)

SAMPLE TYPE	Shelby Tube	Drive Sample	Auger Sample	No Recovery	A Casing	Cored Sample
BACKFILL TYPE	BENTONITE	PEA GRAVEL	SLOUGH	GROUT	DRILL CUTTINGS	SAND

Depth (m) | ▲ Headspace (ppmv) ▲ 20 40 60 80 | PLASTIC M.C. LIQUID 10 20 30 40 | ◆ Soil Sulphates (%) ◆ 0.05 0.10 0.15 0.20 | ▲ CPEN (kPa) ▲ 50 100 150 200 | ■ Standard Penetration (N) ■ 10 20 30 40 | SAMPLE TYPE | SPT (N) RQD/REC (%) | USC | SOIL SYMBOL | SOIL DESCRIPTION | WELL INSTALLATION | ELEVATION (m)



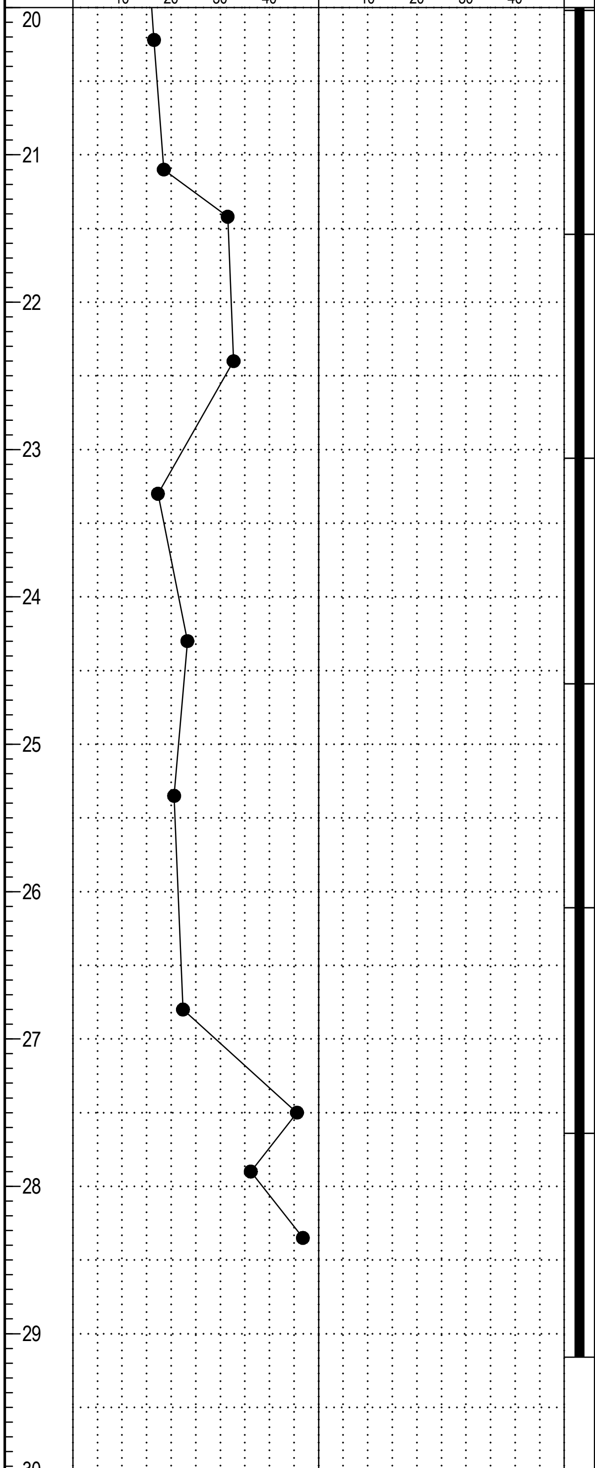
Depth (m)	SPT (N) RQD/REC (%)	USC	SOIL DESCRIPTION	ELEVATION (m)
10	63/114		SAND AND GRAVEL brown, fine to medium grained, trace silt, occasional pebbles	641
	50/75	GP		
11				640
12	29	SP	-compact	639
13				638
	86			
14				637
15			COAL	
	98/280	CS-CH	CLAY SHALE, extremely weak, fresh, dark brown, silty, carbonaceous, trace coal inclusions -dark brown - greenish grey, thinly bedded -dark greenish grey - grey	636
16	35/64			635
17			-dark grey	634
	97/97		SANDSTONE extremely weak, fresh, light grey, fine grained, bentonitic, some dark grey clay shale laminations	
18				633
19	85/93			632
			CLAY SHALE, extremely weak, fresh, dark grey, silty	
20			SANDSTONE, extremely weak, fresh, dark grey, fine grained, trace coal stringers	

PROJECT: Latta Bridge Geotechnical Investigation	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-6**
CLIENT: BPTEC	DRILLING METHOD: Track / Solid Stem Augers - Coring	PROJECT NO: 29077
START DATE: 2020-10-10	UTM ZONE: N5935410.9718, E34848.8444	ELEVATION: 651.2 (m)

SAMPLE TYPE: Shelby Tube | Drive Sample | Auger Sample | No Recovery | A Casing | Cored Sample

BACKFILL TYPE: BENTONITE | PEA GRAVEL | SLOUGH | GROUT | DRILL CUTTINGS | SAND

Depth (m) | ▲ Headspace (ppmv) ▲ 20 40 60 80 | PLASTIC M.C. LIQUID 10 20 30 40 | ◆ Soil Sulphates (%) ◆ 0.05 0.10 0.15 0.20 | ▲ CPEN (kPa) ▲ 50 100 150 200 | ■ Standard Penetration (N) ■ 10 20 30 40 | SAMPLE TYPE | SPT (N) RQD/REC (%) | USC | SOIL SYMBOL | SOIL DESCRIPTION | WELL INSTALLATION | ELEVATION (m)



SPT (N) RQD/REC (%)
68/97
0/70
93/99
100/100
85/94

SOIL DESCRIPTION

- CLAY SHALE, extremely weak, fresh, grey
- SILTSTONE, weak, fresh, light grey, cemented
- SANDSTONE, extremely weak, fresh, light grey
- CLAY SHALE, extremely weak, fresh, dark grey, silty
- SILTSTONE, weak, fresh, light grey, cemented
- CLAY SHALE, extremely weak, fresh, grey, silty, fractured
- COAL
  extremely weak, fresh, black, fractured
- CLAY SHALE, extremely weak, fresh, dark brown, silty, carbonaceous, trace coal chips
  -dark grey
  -light grey - dark grey, thin bedding at 90° TCA from 23.60 - 23.80m
  -light grey, bentonitic, thin bedding at 90° TCA
  -dark grey, thin bedding at 90° TCA
  -trace light brown cemented siltstone inclusions
- SILTSTONE, weak, fresh, light grey, cemented
- CLAY SHALE
  very weak, fresh, dark grey, silty, occasional light brown cemented siltstone inclusions
  -bentonitic, massive
- BENTONITE, extremely weak, fresh, light greenish grey - dark brown
- COAL, extremely weak, fresh, black, fractured
- CLAY SHALE, extremely weak, fresh, dark brown
- BENTONITE, extremely weak, fresh, dark grey
- CLAY SHALE, extremely weak, fresh, dark grey, silty

END OF TEST HOLE AT 29.2m
UPON COMPLETION: (Below ground surface)
-Slough at 11.6m
-Water at 9.8m

ELEVATION (m): 631, 630, 629, 628, 627, 626, 625, 624, 623, 622

PROJECT: Latta Bridge Geotechnical Investigation	DRILLING COMPANY: ALL SERVICE DRILLING INC	BOREHOLE NO: **TH20-6**
CLIENT: BPTEC	DRILLING METHOD: Track / Solid Stem Augers - Coring	PROJECT NO: 29077
START DATE: 2020-10-10	UTM ZONE: N5935410.9718, E34848.8444	ELEVATION: 651.2 (m)

SAMPLE TYPE: Shelby Tube, Drive Sample, Auger Sample, No Recovery, A Casing, Cored Sample

BACKFILL TYPE: BENTONITE, PEA GRAVEL, SLOUGH, GROUT, DRILL CUTTINGS, SAND

Depth (m)	▲Headspace (ppmv)▲ 20 40 60 80 / PLASTIC M.C. LIQUID 10 20 30 40	◆Soil Sulphates (%)◆ 0.05 0.10 0.15 0.20 / ▲CPEN (kPa)▲ 50 100 150 200 / ■Standard Penetration (N)■ 10 20 30 40	SAMPLE TYPE	SPT (N) RQD/REC (%)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL INSTALLATION	ELEVATION (m)
30							Backfilled with drill cuttings, sand, and bentonite chips at surface Monitoring well installed in adjacent hole WATER LEVEL BELOW GROUND SURFACE: -October 24, 2020 = Dry		621
31									620
32									619
33									618
34									617
35									616
36									615
37									614
38									613
39									612
40									

THE CITY OF Edmonton

Transportation
Engineeering Services Section

THURBER ENGINEERING LTD.

LOGGED BY: MW | REVIEWED BY: RWT

COMPLETION DEPTH: 29.2 m
COMPLETION DATE: 20-10-10

THURBER

APPENDIX C

Geotechnical Laboratory Testing

THURBER ENGINEERING LTD.

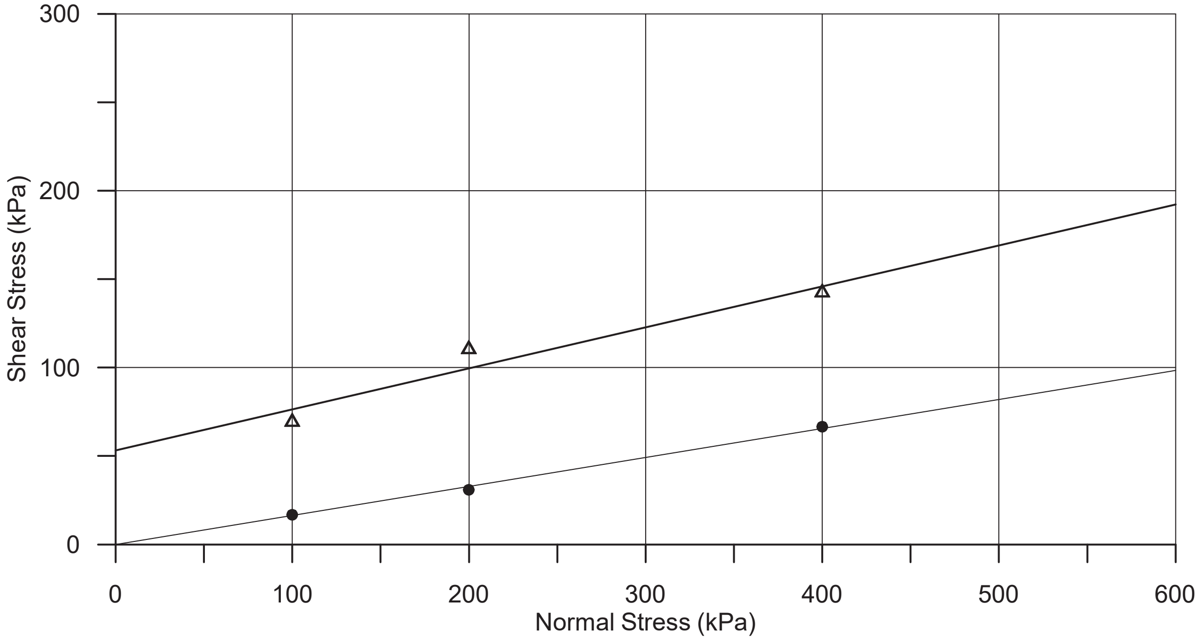
Direct Shear Test Results

Client: City of Edmonton
Project: Latta Bridge
Job No.: 28330

Test Hole: TH20-2
Sample: Clay (CH), silty, brown and grey.
Depth: 4.57 - 5.18 m
Date: April 10/20

Peak Strength Parameters:
c' = 53kPa Φ' = 13°
Residual Strength Parameters:
c' = 0 kPa Φ' =9°

Atterberg Limits: LL= 80% PL= 31% PI= 49%
Particle Size: Sand= 1.2% Silt= 47.3% Clay= 51.5%



Remarks:

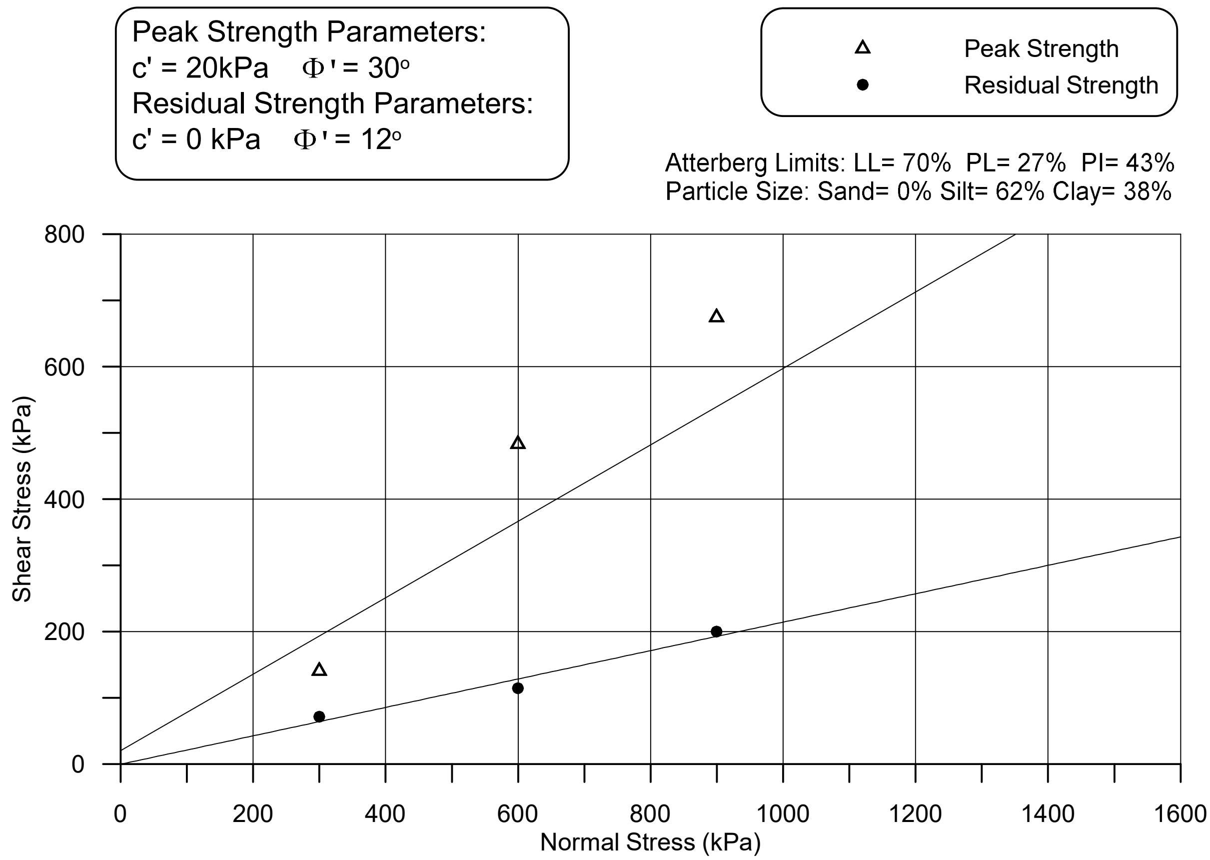
THURBER ENGINEERING LTD.

Direct Shear Test Results

Client: City of Edmonton
Project: Latta Bridge
Job No.: 28330

Test Hole: TH20-1
Sample: Clay Shale (CH), silty, blue grey.
Depth: 34.10 - 34.20 m
Date: April 13/20

Peak Strength Parameters:
c' = 20kPa   Φ' = 30°
Residual Strength Parameters:
c' = 0 kPa   Φ' = 12°



Remarks:

THURBER ENGINEERING LTD.

Direct Shear Test Results

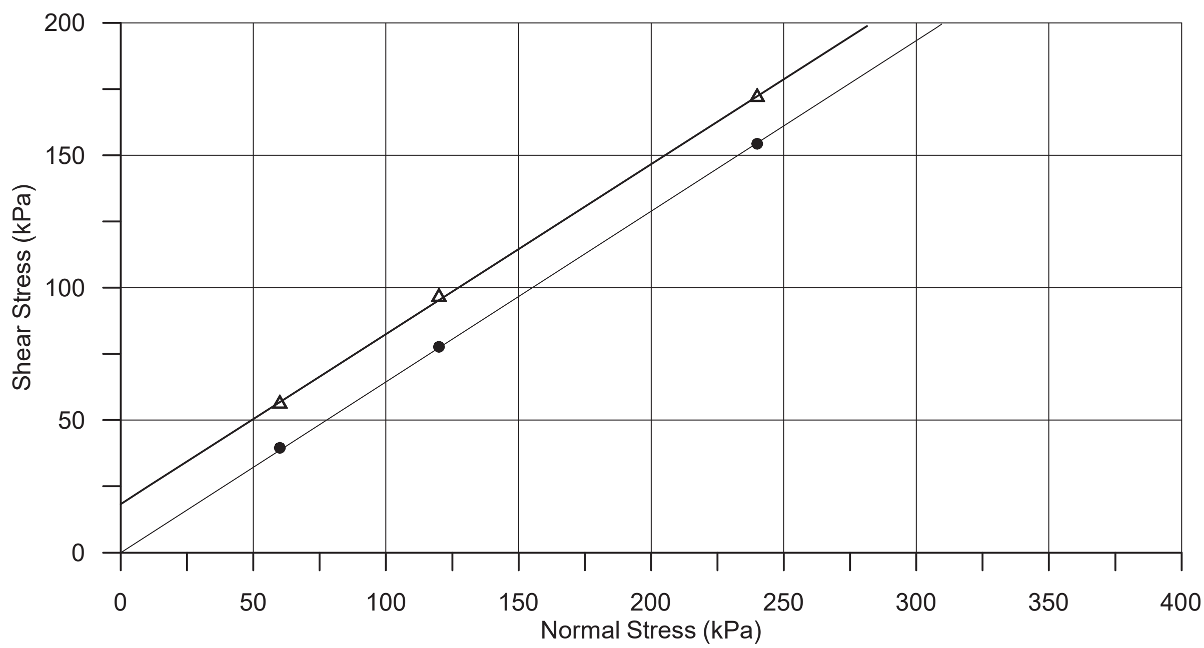
Client: BPTECH
Project: Latta Bridge
Job No.: 29077

Test Hole: TH20-4
Sample: Clay till (CI), sandy, some silt, brown.
Depth: 5.33 - 5.79 m
Date: Nov 5/20

Peak Strength Parameters:
c' = 18kPa   Φ' = 33°
Residual Strength Parameters:
c' = 0 kPa   Φ' =33°

△ Peak Strength
● Residual Strength

Atterberg Limits: LL= 27% PL= 15% PI= 12%
Particle Size: Sand= 40.7% Silt= 48.8% Clay= 10.5%



Remarks:

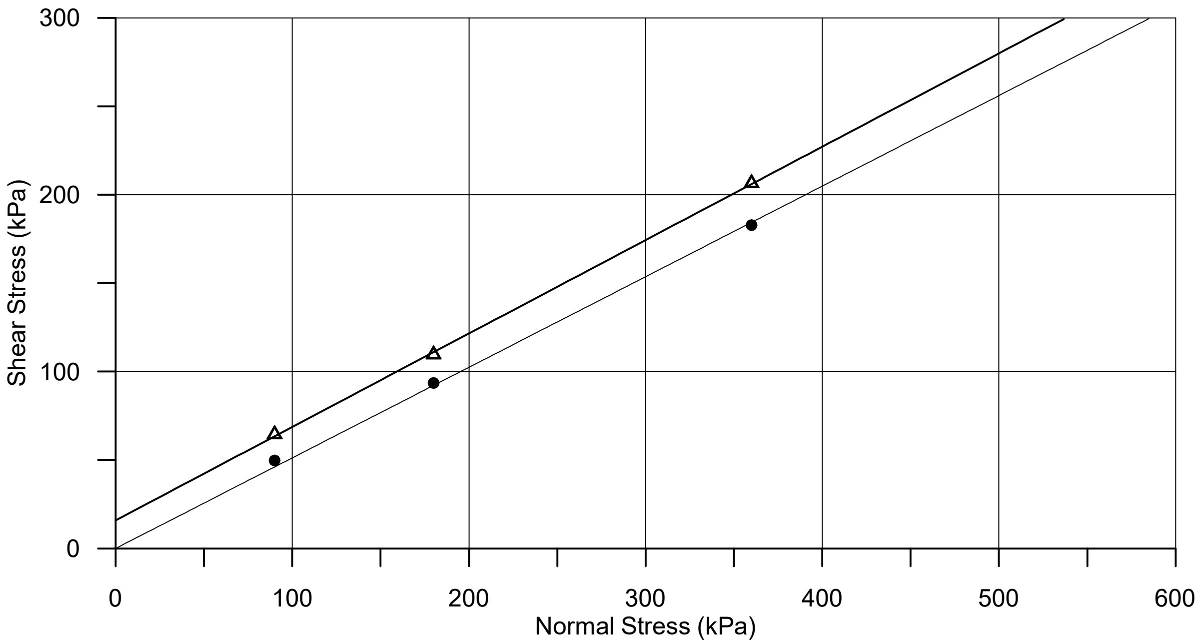
THURBER ENGINEERING LTD.

Direct Shear Test Results

Client: BPTECH
Project: Latta Bridge
Job No.: 29077

Test Hole: TH20-6
Sample: Clay till (CI), silty, some sand, brown.
Depth: 8.56 - 8.99 m
Date: Nov 20/20

Peak Strength Parameters:
c' = 16kPa Φ' = 28°
Residual Strength Parameters:
c' = 0kPa Φ' = 27°



Remarks:

THURBER ENGINEERING LTD.
UNCONFINED COMPRESSION TEST REPORT

City of Edmonton
FILE NUMBER : 28330

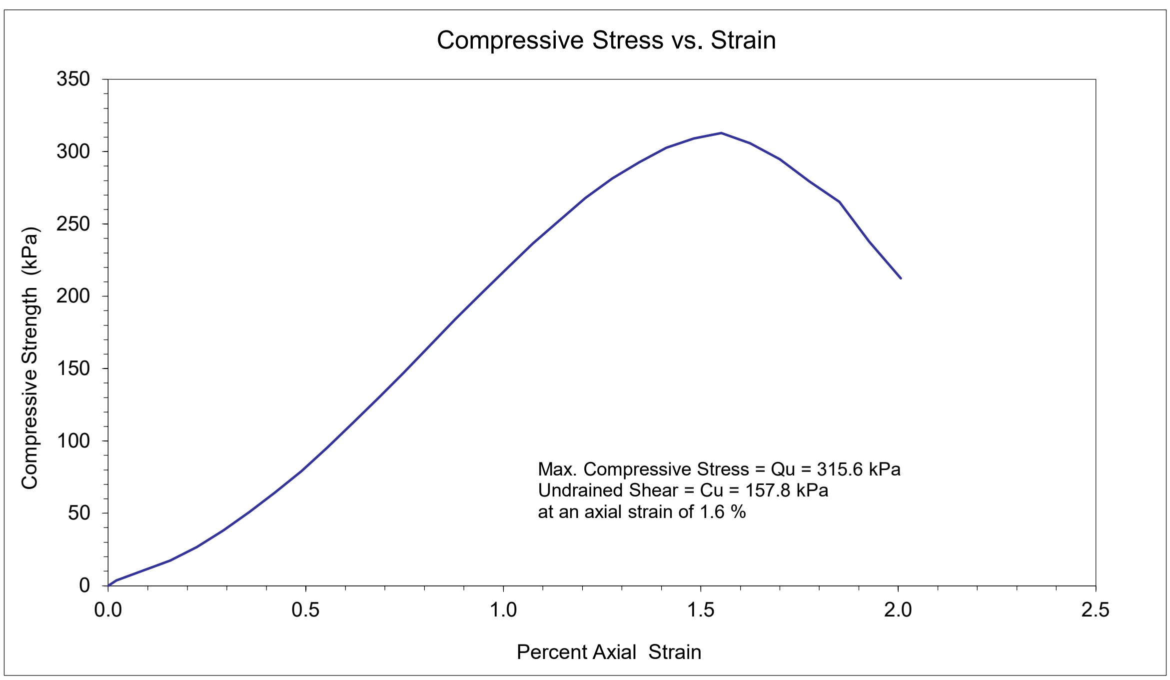
REPORT DATE: April 9/20
REPORT NUMBER: UC20-1

Latta Bridge

TEST DATE: April 8/20
SAMPLE: TH20-1 @ 35.43 - 35.57 m
DESCRIPTION: Clay Shale (CH), silty, trace siltstone laminations and inclusions, grey.

SPECIMEN DETAILS:

Wet Density (kg/m^3):	2091
Dry Density (kg/m^3):	1775
Moisture Content (%):	17.8
Liquid Limit (%):	-
Plastic Limit (%):	-
Plasticity Index (%):	-
Gravel (%):	-
Sand (%):	-
Silt (%):	-
Clay (%):	



THURBER ENGINEERING LTD.
UNCONFINED COMPRESSION TEST REPORT

City of Edmonton
FILE NUMBER : 28330

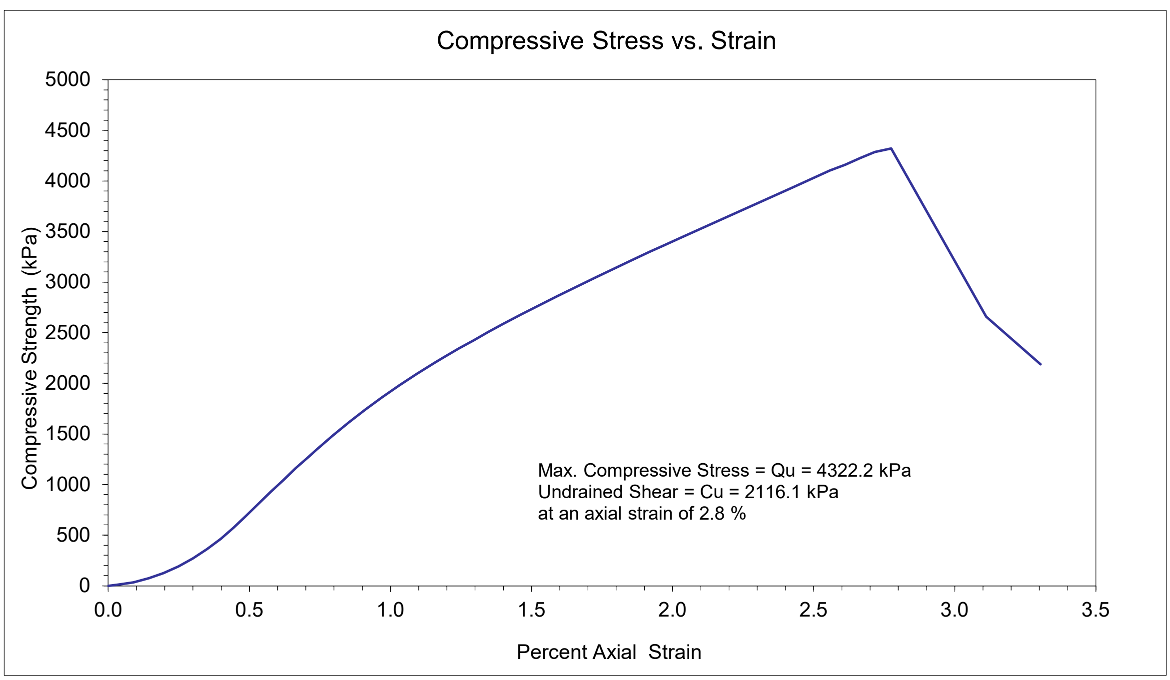
REPORT DATE: April 9/20
REPORT NUMBER: UC20-2

Latta Bridge

TEST DATE: April 8/20
SAMPLE: TH20-1 @ 41.10 - 41.30 m
DESCRIPTION: Clay Shale (CH), silty, trace siltstone inclusions, coal stringers, grey.

SPECIMEN DETAILS:

Wet Density (kg/m^3):	2194
Dry Density (kg/m^3):	1911
Moisture Content (%):	14.8
Liquid Limit (%):	-
Plastic Limit (%):	-
Plasticity Index (%):	-
Gravel (%):	-
Sand (%):	-
Silt (%):	-
Clay (%):	



THURBER ENGINEERING LTD.
UNCONFINED COMPRESSION TEST REPORT

City of Edmonton
FILE NUMBER : 28330

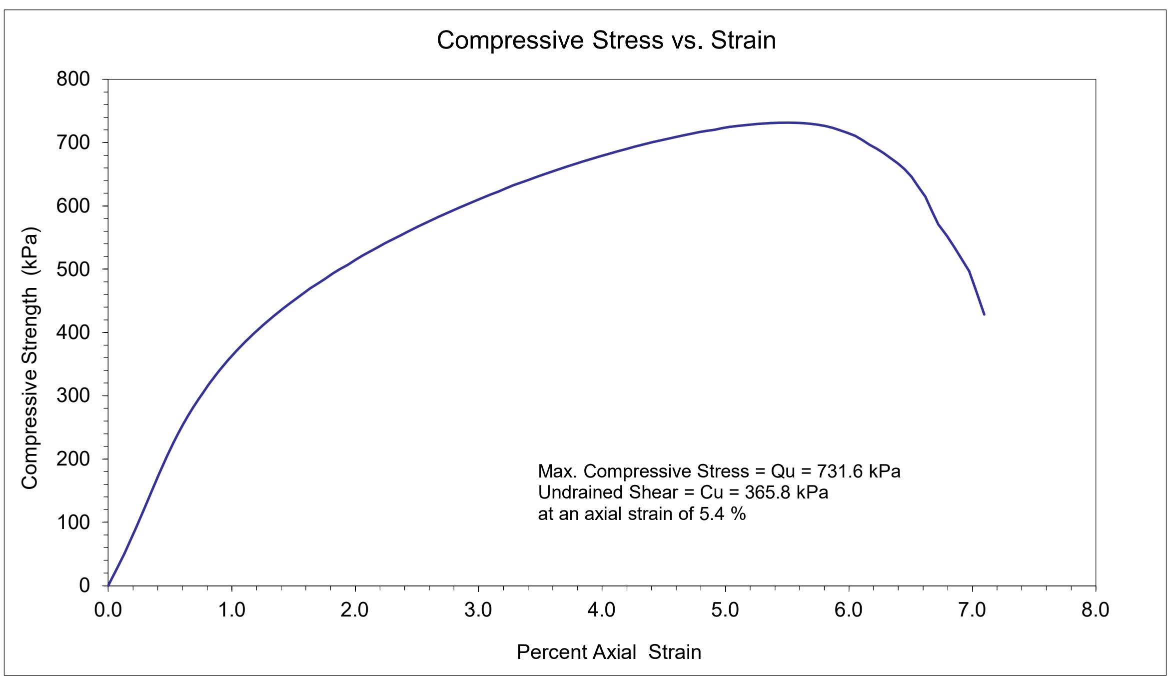
REPORT DATE: April 9/20
REPORT NUMBER: UC20-3

Latta Bridge

TEST DATE: April 8/20
SAMPLE: TH20-2 @ 29.73 - 29.96 m
DESCRIPTION: Clay Shale (CH), bentonitic, silty, trace siltstone inclusions, blue and light grey.

SPECIMEN DETAILS:

Wet Density (kg/m^3):	2004
Dry Density (kg/m^3):	1663
Moisture Content (%):	20.5
Liquid Limit (%):	-
Plastic Limit (%):	-
Plasticity Index (%):	-
Gravel (%):	-
Sand (%):	-
Silt (%):	-
Clay (%):	



THURBER ENGINEERING LTD.

THURBER ENGINEERING LTD.
UNCONFINED COMPRESSION TEST REPORT

City of Edmonton
FILE NUMBER : 28330

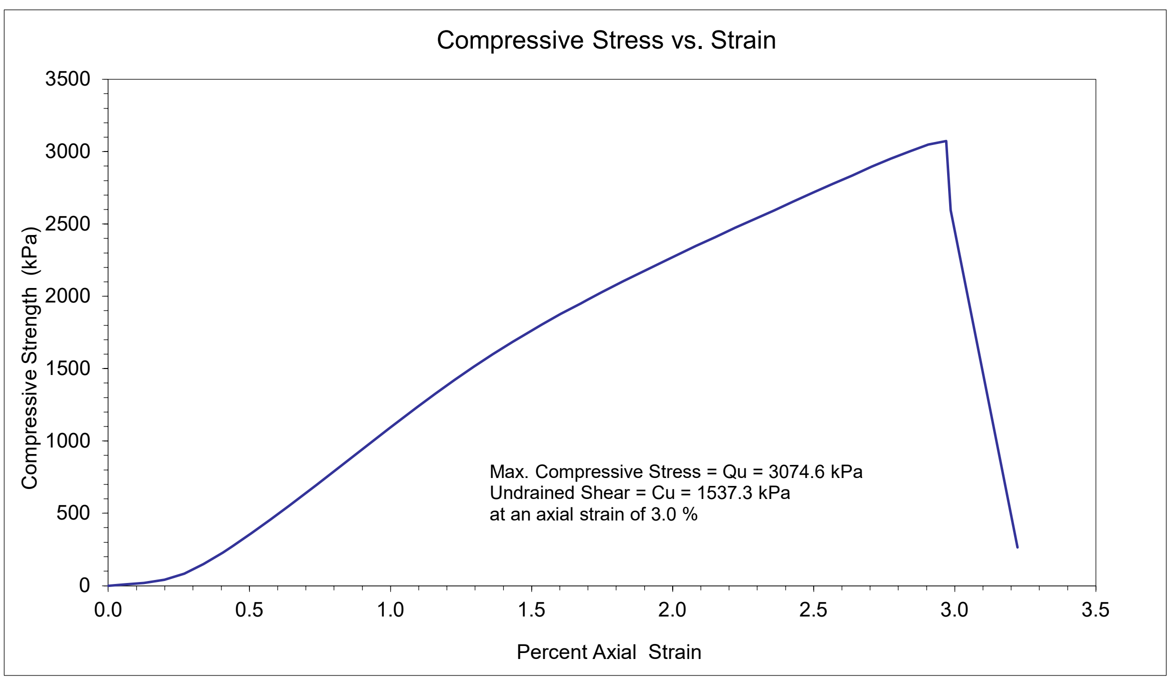
REPORT DATE: April 9/20
REPORT NUMBER: UC20-4

Latta Bridge

TEST DATE: April 8/20
SAMPLE: TH20-3 @ 27.82 - 28.02 m
DESCRIPTION: Clay Shale (CH), silty, trace siltstone inclusions, coal stringers, grey.

SPECIMEN DETAILS:

Wet Density (kg/m^3):	2177
Dry Density (kg/m^3):	1883
Moisture Content (%):	15.6
Liquid Limit (%):	-
Plastic Limit (%):	-
Plasticity Index (%):	-
Gravel (%):	-
Sand (%):	-
Silt (%):	-
Clay (%):	



THURBER ENGINEERING LTD.
UNCONFINED COMPRESSION TEST REPORT

BPTEC
FILE NUMBER : 29077

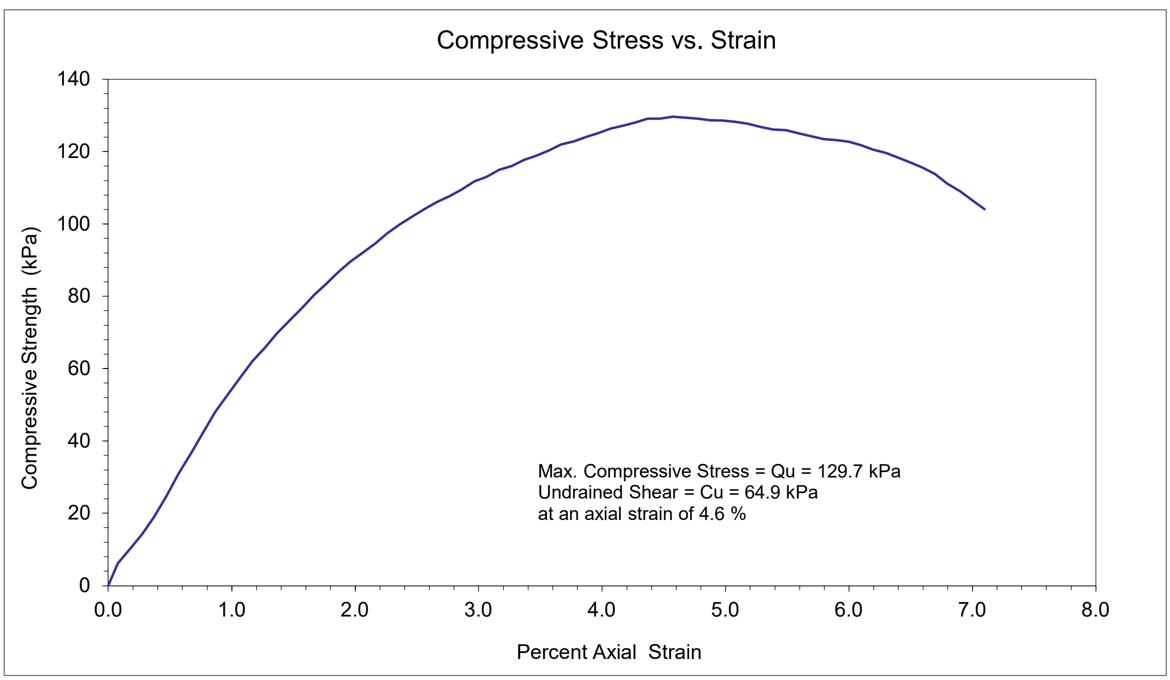
REPORT DATE: Oct 29/20
REPORT NUMBER: UC20-1

Latta Bridge

TEST DATE: Oct 28/20
SAMPLE: TH20-4 @ 2.29 - 2.74 m
DESCRIPTION: Clay (CH), silty, trace silt lenses, coal, oxides, brown and grey.

SPECIMEN DETAILS:

Wet Density (kg/m^3):	1887
Dry Density (kg/m^3):	1411
Moisture Content (%):	33.7
Liquid Limit (%):	-
Plastic Limit (%):	-
Plasticity Index (%):	-
Gravel (%):	-
Sand (%):	-
Silt (%):	-
Clay (%):	



THURBER ENGINEERING LTD.

THURBER ENGINEERING LTD.
UNCONFINED COMPRESSION TEST REPORT

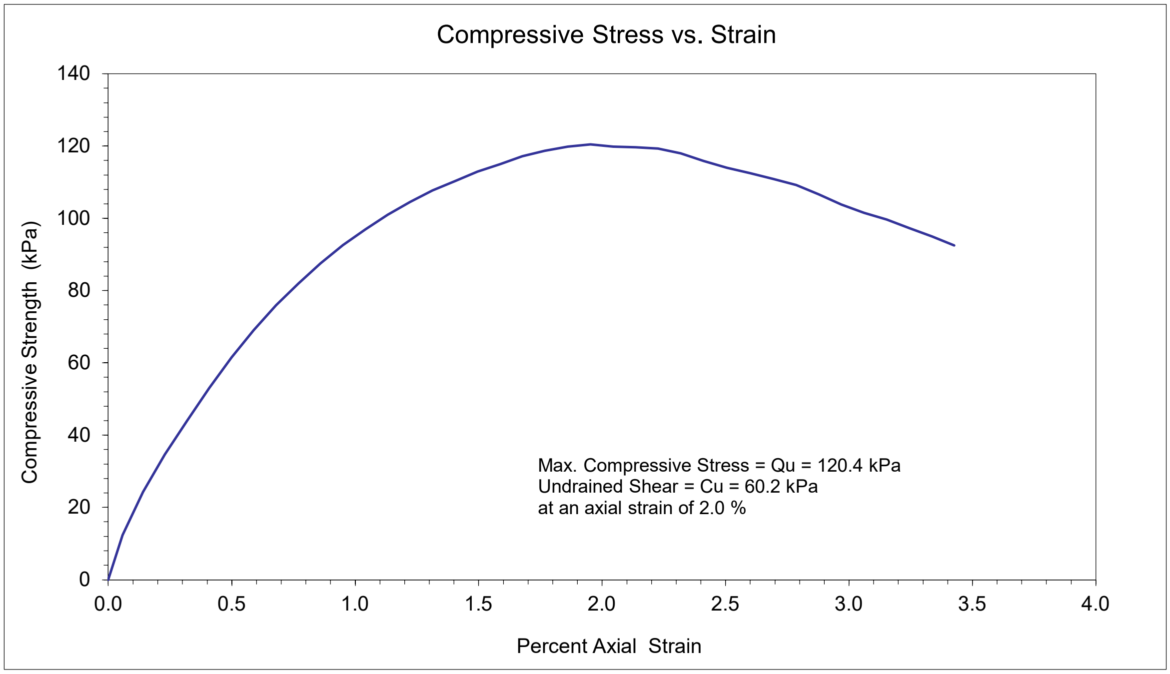
BPTEC		REPORT DATE:	Oct 29/20
FILE NUMBER :	29077	REPORT NUMBER:	UC20-2

Latta Bridge

TEST DATE:	Oct 28/20
SAMPLE:	TH20-6 @ 5.49 - 5.94 m
DESCRIPTION:	Clay (CH), silty, trace silt lenses, coal, oxides, bentonitic clay pockets, organic pockets, grey.

SPECIMEN DETAILS:

Wet Density (kg/m^3):	1854
Dry Density (kg/m^3):	1359
Moisture Content (%):	36.4
Liquid Limit (%):	-
Plastic Limit (%):	-
Plasticity Index (%):	-
Gravel (%):	-
Sand (%):	-
Silt (%):	-
Clay (%):	



THURBER

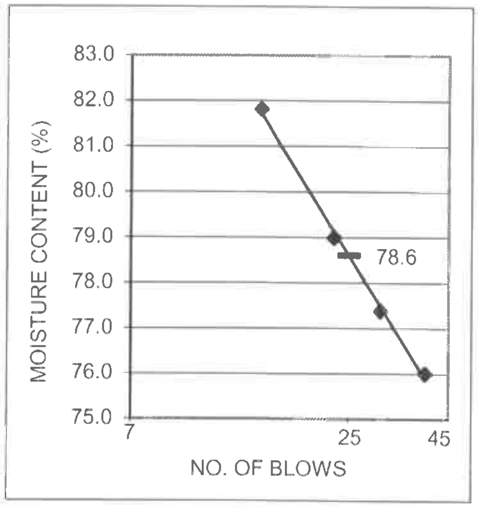
ATTERBERG LIMITS
ASTM D4318

Client: City of Edmonton
Project: Latta Bridge
Project No: 28330
Test Hole: TH20-1
Sample No: G4
Depth: 2.3 m

Date Tested: 02-Apr-20
Tested By: LLK
Checked By:

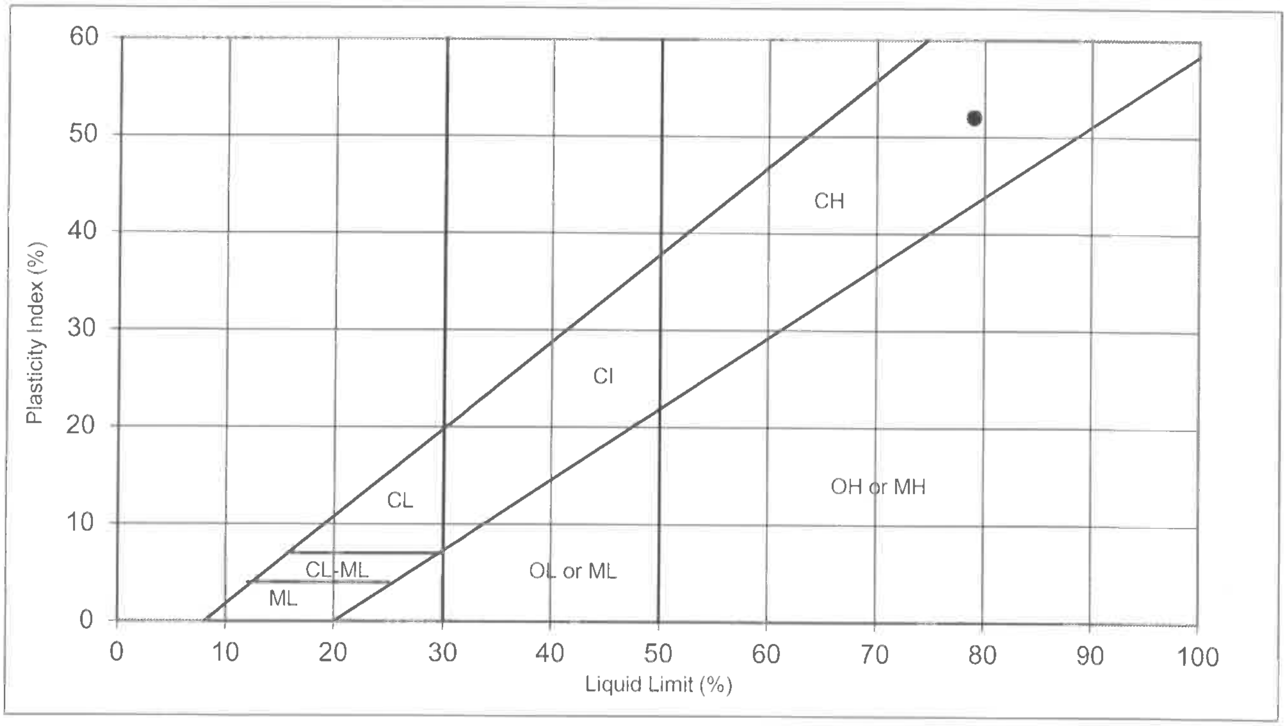
LIQUID LIMIT

Trial No:	1	2	3	4
No of Blows:	39	30	23	15
Container No.	1	2	3	4
Wet Soil + Container	18.55	17.72	17.63	18.69
Dry Soil + Container	10.54	9.99	9.85	10.28
Wt. Of Container	0	0	0	0
Moisture Content	76.0	77.4	79.0	81.8



PLASTIC LIMIT

	1	2		AVERAGE
Container No.	5	6		
Wet Soil + Container	28.94	29.08		
Dry Soil + Container	26.75	26.89		
Wt. Of Container	18.82	18.78		
Moisture Content	27.6	27.0		**27.3**



REMARKS

Liquid Limit:	**79**
Plastic Limit:	**27**
Plasticity Index:	**52**
USC Classification:	**CH**

THURBER

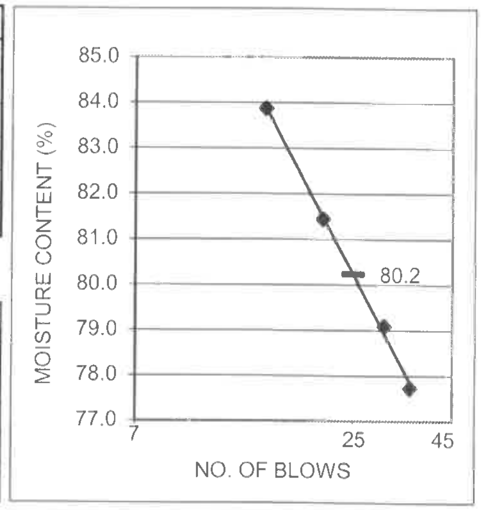
ATTERBERG LIMITS
ASTM D4318

Client: City of Edmonton
Project: Latta Bridge
Project No: 28330
Test Hole: TH20-2
Sample No: ST7
Depth: 4.57 - 5.18 m

Date Tested: 02-Apr-20
Tested By: JAP
Checked By:

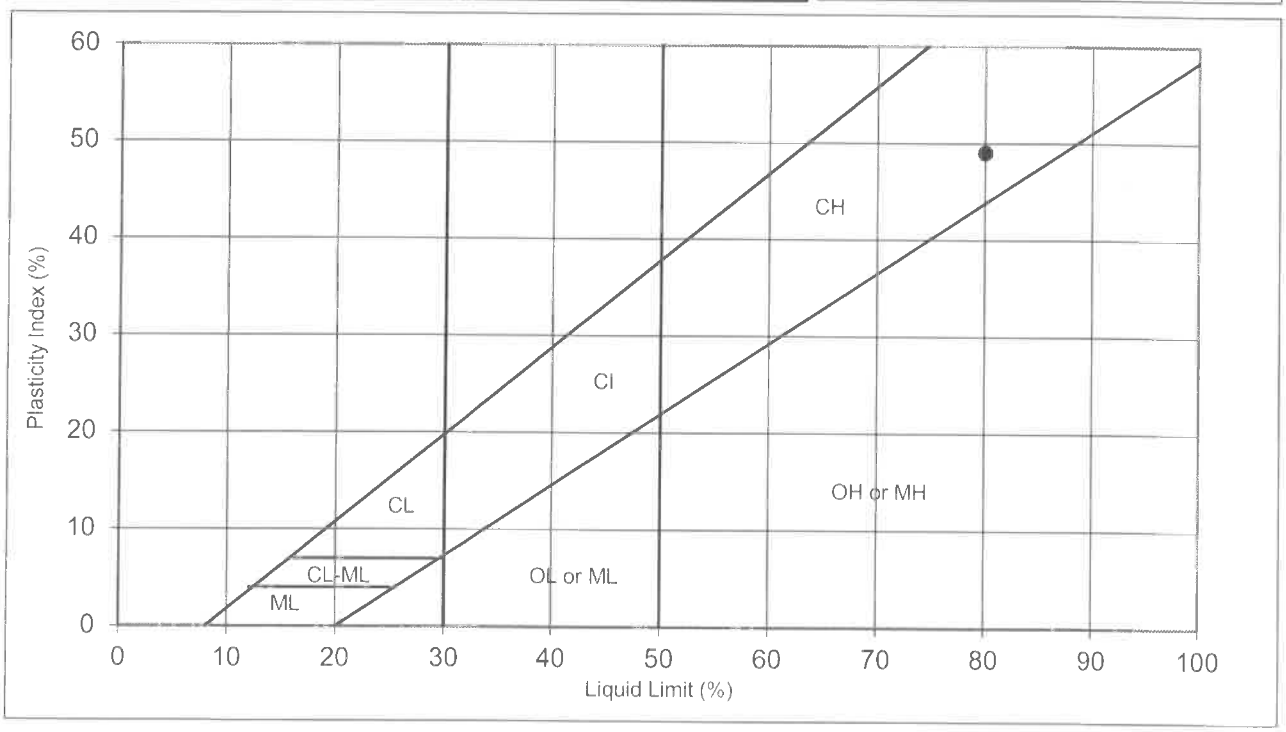
LIQUID LIMIT

Trial No:	1	2	3	4
No of Blows:	35	30	21	15
Container No.	1	2	3	4
Wet Soil + Container	16.35	13.70	13.59	12.65
Dry Soil + Container	9.2	7.65	7.49	6.88
Wt. Of Container	0	0	0	0
Moisture Content	77.7	79.1	81.4	83.9



PLASTIC LIMIT

	1	2		AVERAGE
Container No.	5	6		
Wet Soil + Container	28.48	28.65		
Dry Soil + Container	26.15	26.33		
Wt. Of Container	18.65	18.93		
Moisture Content	31.1	31.4		**31.2**



REMARKS

Liquid Limit:	**80**
Plastic Limit:	**31**
Plasticity Index:	**49**
USC Classification:	**CH**

ATTERBERG LIMITS
ASTM D4318

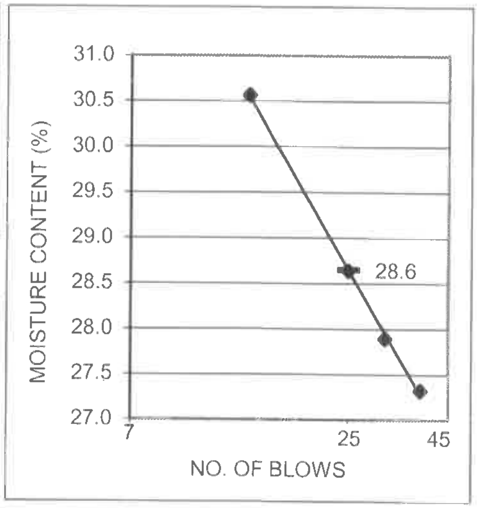
THURBER

Client: City of Edmonton
Project: Latta Bridge
Project No: 28330
Test Hole: TH20-2
Sample No: G9
Depth: 5.7 m

Date Tested: 02-Apr-20
Tested By: LLK
Checked By:

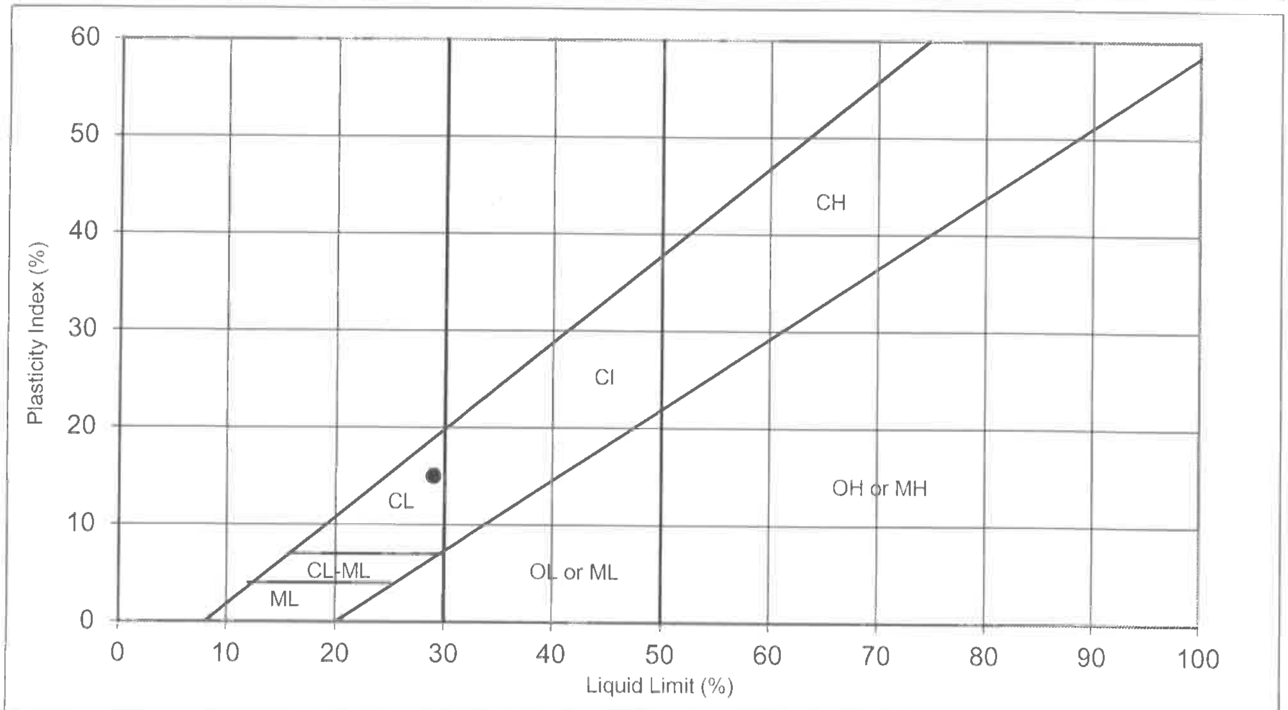
LIQUID LIMIT

Trial No:	1	2	3	4
No of Blows:	38	31	25	14
Container No.	1	2	3	4
Wet Soil + Container	23.3	25.86	22.37	24.01
Dry Soil + Container	18.3	20.22	17.39	18.39
Wt. Of Container	0	0	0	0
Moisture Content	27.3	27.9	28.6	30.6



PLASTIC LIMIT

	1	2		**AVERAGE**
Container No.	5	6		
Wet Soil + Container	30.66	30.8		
Dry Soil + Container	29.16	29.30		
Wt. Of Container	18.75	18.7		
Moisture Content	14.4	14.2		**14.3**



REMARKS

Liquid Limit:	**29**
Plastic Limit:	**14**
Plasticity Index:	**15**
USC Classification:	**CL**

THURBER

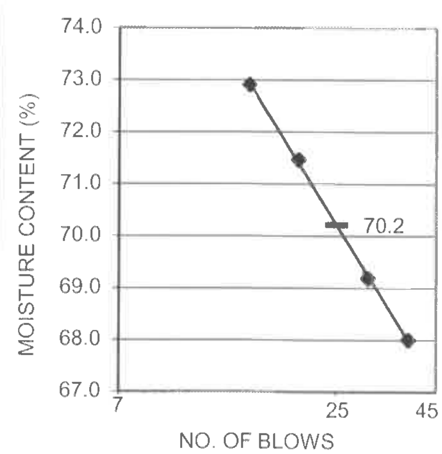
ATTERBERG LIMITS
ASTM D4318

Client: City of Edmonton
Project: Latta Bridge
Project No: 28330
Test Hole: TH20-1
Sample No: Run 5
Depth: 34.10 - 34.20 m

Date Tested: 09-Apr-20
Tested By: NM
Checked By:

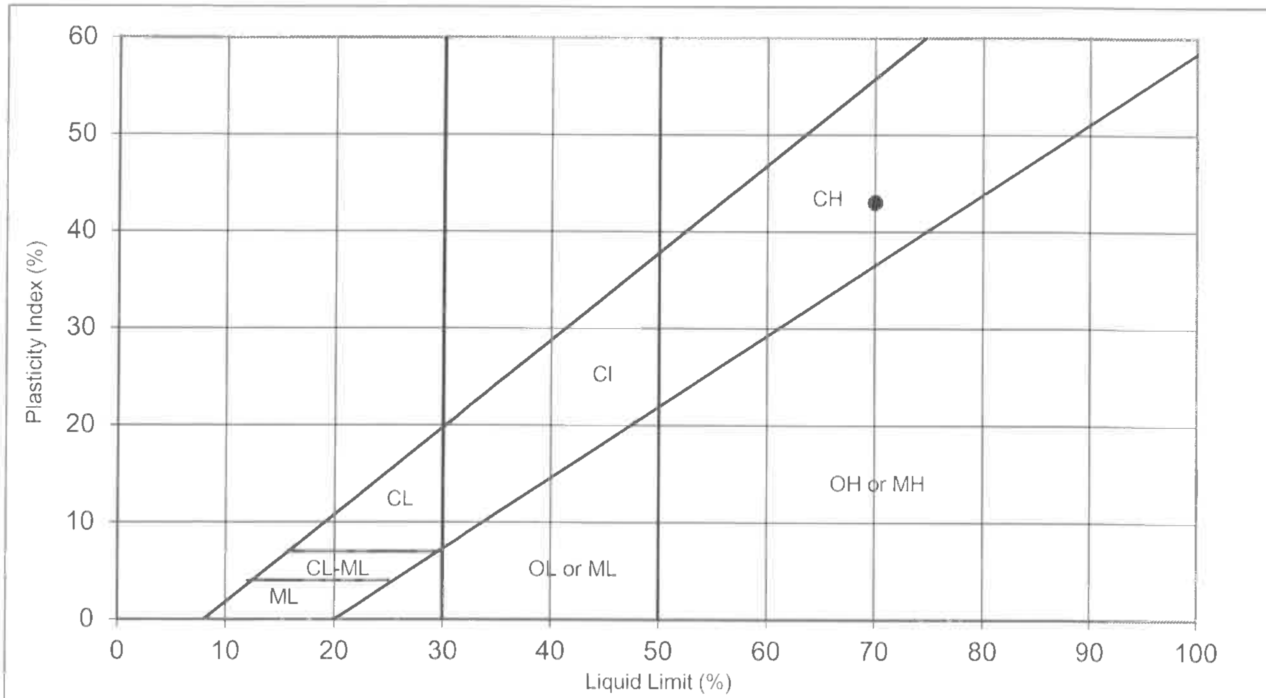
LIQUID LIMIT

Trial No:	1	2	3	4
No of Blows:	38	30	20	15
Container No.	1	2	3	4
Wet Soil + Container	13.49	14.11	13.82	13.4
Dry Soil + Container	8.03	8.34	8.06	7.75
Wt. Of Container	0	0	0	0
Moisture Content	68.0	69.2	71.5	72.9



PLASTIC LIMIT

	1	2		AVERAGE
Container No.	5	6		
Wet Soil + Container	28.64	28.43		
Dry Soil + Container	26.52	26.37		
Wt. Of Container	18.72	18.82		
Moisture Content	27.2	27.3		27.2



REMARKS
Blenderized Limit

Liquid Limit:	**70**
Plastic Limit:	**27**
Plasticity Index:	**43**
USC Classification:	**CH**

ATTERBERG LIMITS
ASTM D4318

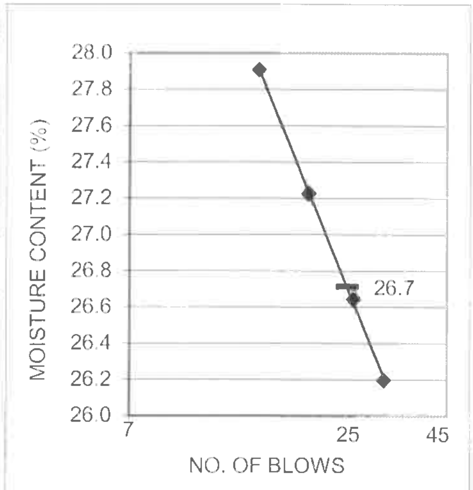
THURBER

Client: BPTEC
Project: Latta Bridge
Project No: 29077
Test Hole: TH20-4
Sample No: Sa.9
Depth: 5.33 - 5.79 m

Date Tested: 04-Nov-20
Tested By: NM
Checked By:

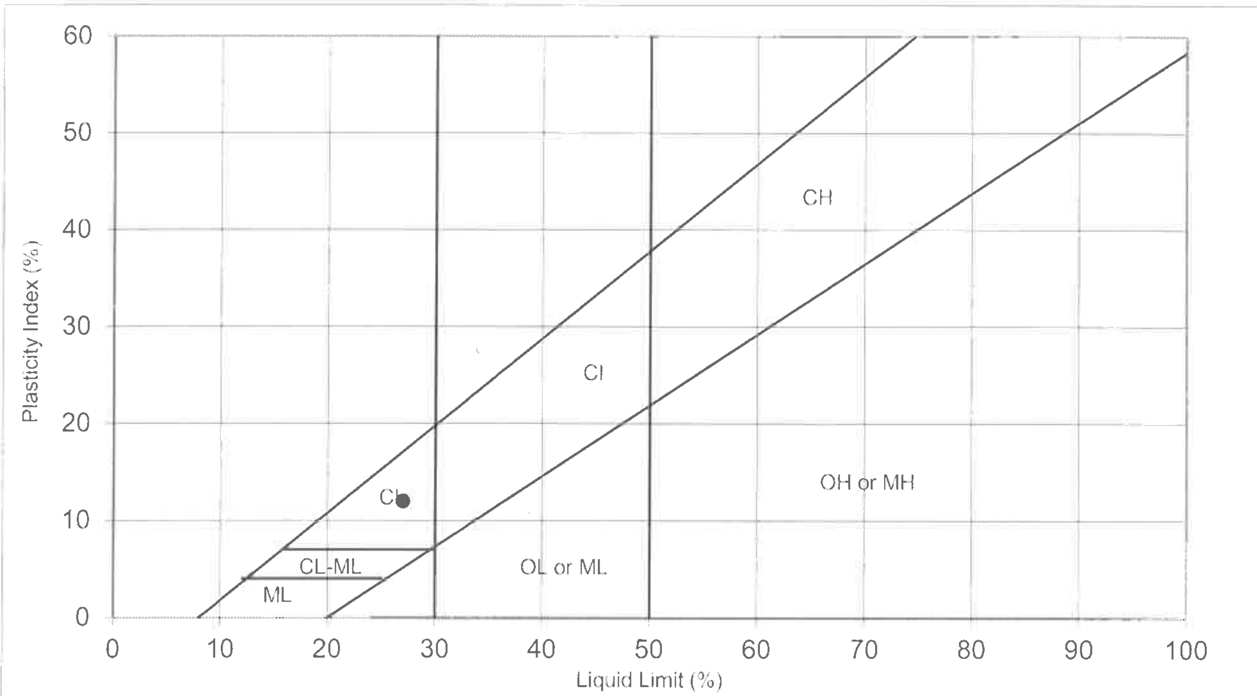
LIQUID LIMIT

Trial No:	1	2	3	4
No of Blows:	31	26	20	15
Container No.	1	2	3	4
Wet Soil + Container	12.14	14.45	14.86	14.3
Dry Soil + Container	9.62	11.41	11.68	11.18
Wt. Of Container	0	0	0	0
Moisture Content	26.2	26.6	27.2	27.9



PLASTIC LIMIT

	1	2		AVERAGE
Container No.	5	6		
Wet Soil + Container	28.38	28.26		
Dry Soil + Container	27.17	27.03		
Wt. Of Container	18.8	18.66		
Moisture Content	14.5	14.7		**14.6**



REMARKS

Liquid Limit:	**27**
Plastic Limit:	**15**
Plasticity Index:	**12**
USC Classification:	**CL**

ATTERBERG LIMITS
ASTM D4318

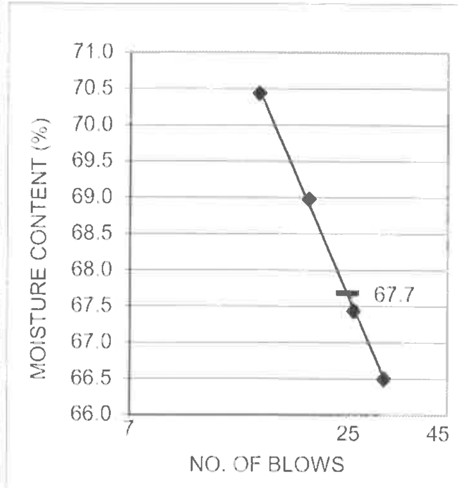
THURBER

Client: BPTEC
Project: Latta Bridge
Project No: 29077
Test Hole: TH20-4
Sample No: Sa.4
Depth: 2.29 - 2.74 m

Date Tested: 04-Nov-20
Tested By: NM
Checked By:

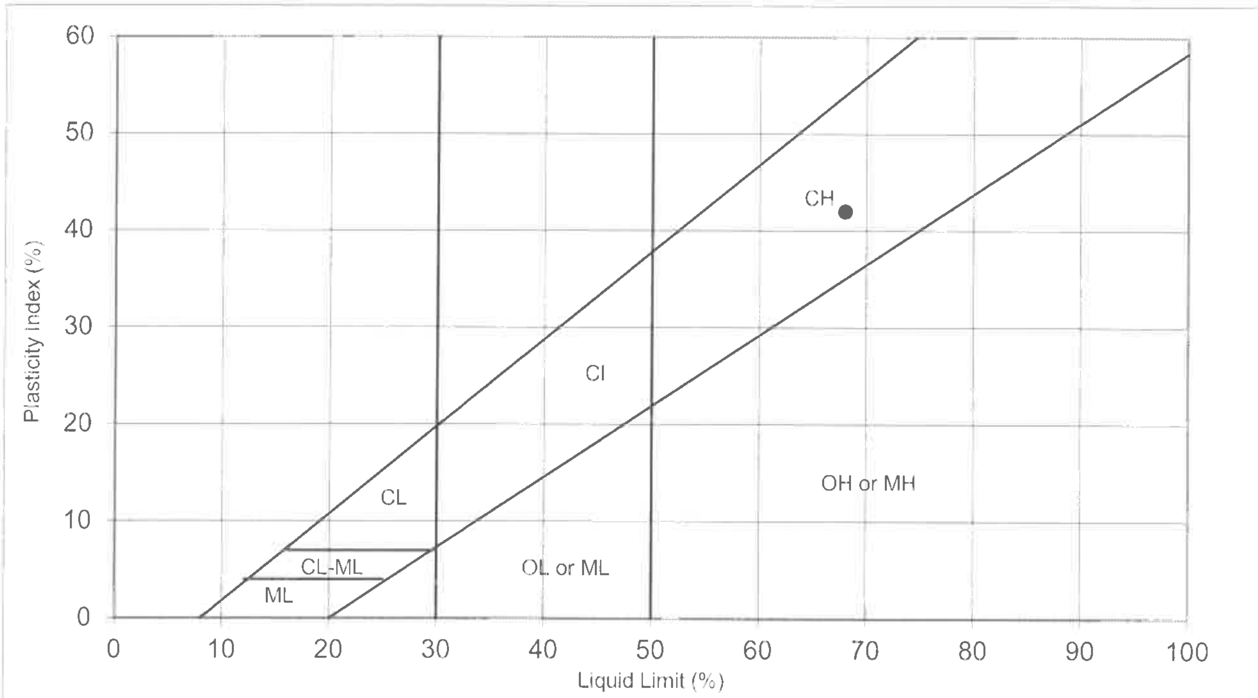
LIQUID LIMIT

Trial No:	1	2	3	4
No of Blows:	31	26	20	15
Container No.	1	2	3	4
Wet Soil + Container	13.02	14.50	12.2	12.22
Dry Soil + Container	7.82	8.66	7.22	7.17
Wt. Of Container	0	0	0	0
Moisture Content	66.5	67.4	69.0	70.4



PLASTIC LIMIT

	1	2		AVERAGE
Container No.	5	6		
Wet Soil + Container	28.85	28.72		
Dry Soil + Container	26.77	26.64		
Wt. Of Container	18.9	18.76		
Moisture Content	26.4	26.4		**26.4**



REMARKS

Liquid Limit:	**68**
Plastic Limit:	**26**
Plasticity Index:	**42**
USC Classification:	**CH**

ATTERBERG LIMITS
ASTM D4318

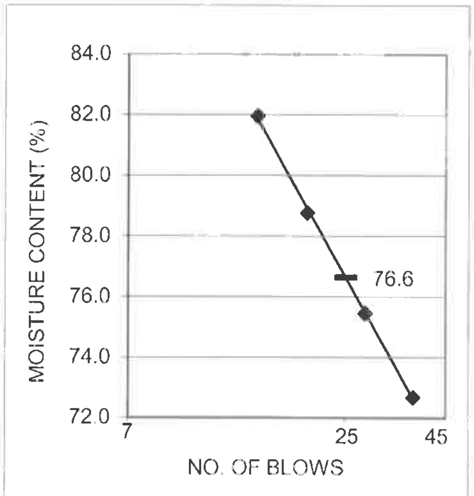
THURBER

Client: BPTEC
Project: Latta Bridge
Project No: 29077
Test Hole: TH20-6
Sample No: Sa.10
Depth: 5.49 - 5.94 m

Date Tested: 03-Nov-20
Tested By: JAP
Checked By:

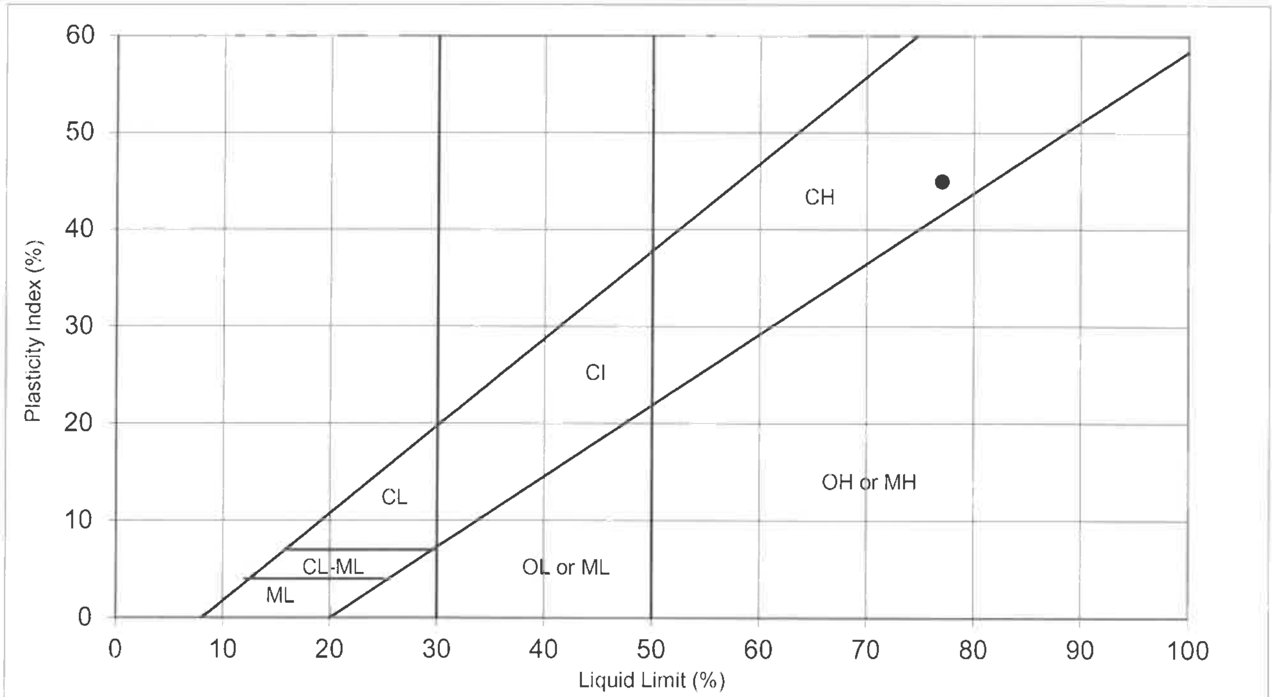
LIQUID LIMIT

Trial No:	1	2	3	4
No of Blows:	37	28	20	15
Container No.	1	2	3	4
Wet Soil + Container	16.3	16.58	15.82	15.32
Dry Soil + Container	9.44	9.45	8.85	8.42
Wt. Of Container	0	0	0	0
Moisture Content	72.7	75.4	78.8	81.9



PLASTIC LIMIT

	1	2		**AVERAGE**
Container No.	5	6		
Wet Soil + Container	30.43	29.38		
Dry Soil + Container	27.65	26.84		
Wt. Of Container	18.94	18.9		
Moisture Content	31.9	32.0		**32.0**



REMARKS

Liquid Limit:	**77**
Plastic Limit:	**32**
Plasticity Index:	**45**
USC Classification:	**CH**

ATTERBERG LIMITS
ASTM D4318

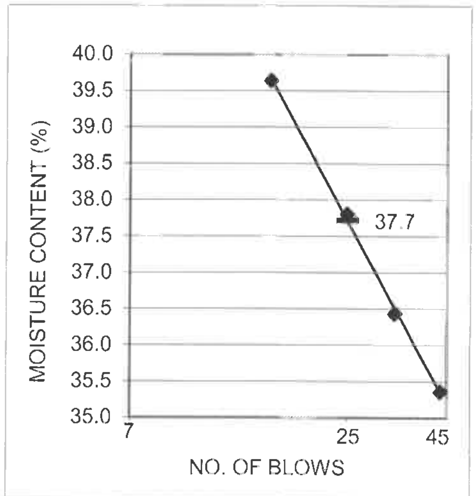
THURBER

Client: BPTEC
Project: Latta Bridge
Project No: 29077
Test Hole: TH20-6
Sample No: Sa.12
Depth: 8.53 - 8.99 m

Date Tested: 04-Nov-20
Tested By: JAP
Checked By:

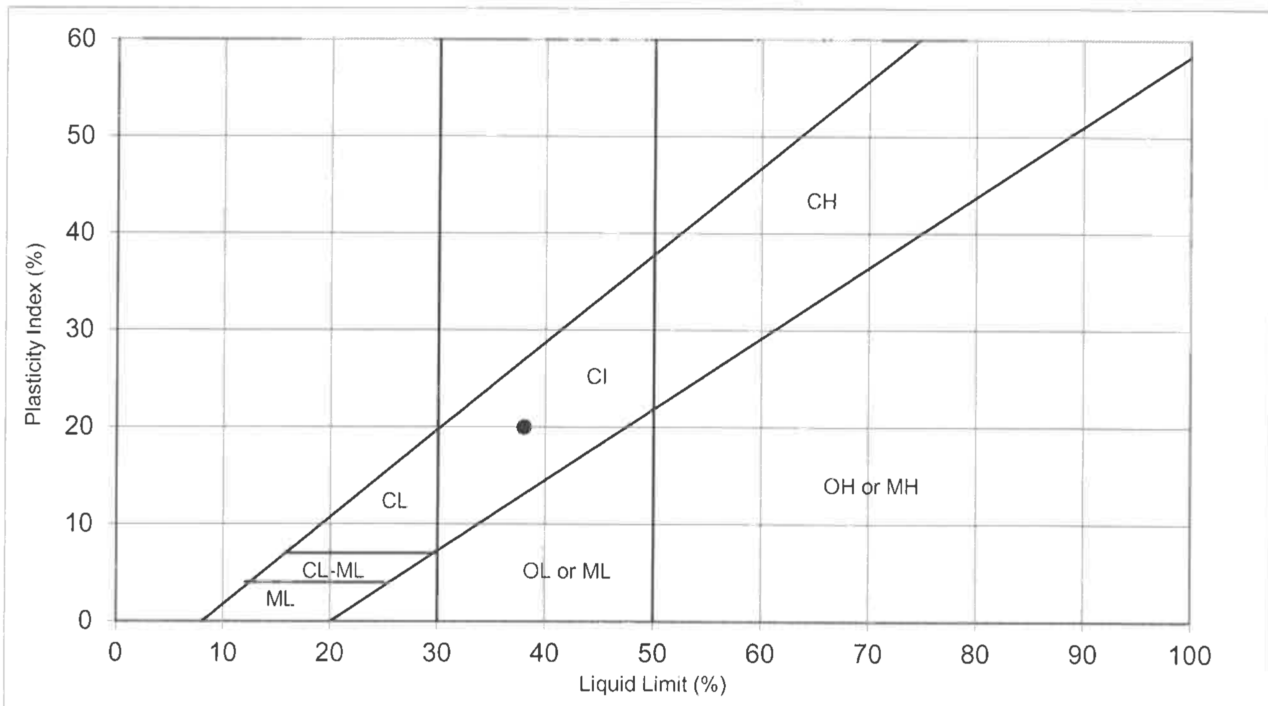
LIQUID LIMIT

Trial No:	1	2	3	4
No of Blows:	43	33	25	16
Container No.	1	2	3	4
Wet Soil + Container	17.15	18.91	16.95	16.17
Dry Soil + Container	12.67	13.86	12.3	11.58
Wt. Of Container	0	0	0	0
Moisture Content	35.4	36.4	37.8	39.6



PLASTIC LIMIT

	1	2		AVERAGE
Container No.	5	6		
Wet Soil + Container	29.91	30.31		
Dry Soil + Container	28.2	28.54		
Wt. Of Container	18.86	18.8		
Moisture Content	18.3	18.2		**18.2**



REMARKS

Liquid Limit:	**38**
Plastic Limit:	**18**
Plasticity Index:	**20**
USC Classification:	**CI**

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GRAIN SIZE DISTRIBUTION REPORT

Client: BPTEC

Project: Latta Bridge

Project No: 29077

Date Tested: 02-Nov-20

Tested By: NM

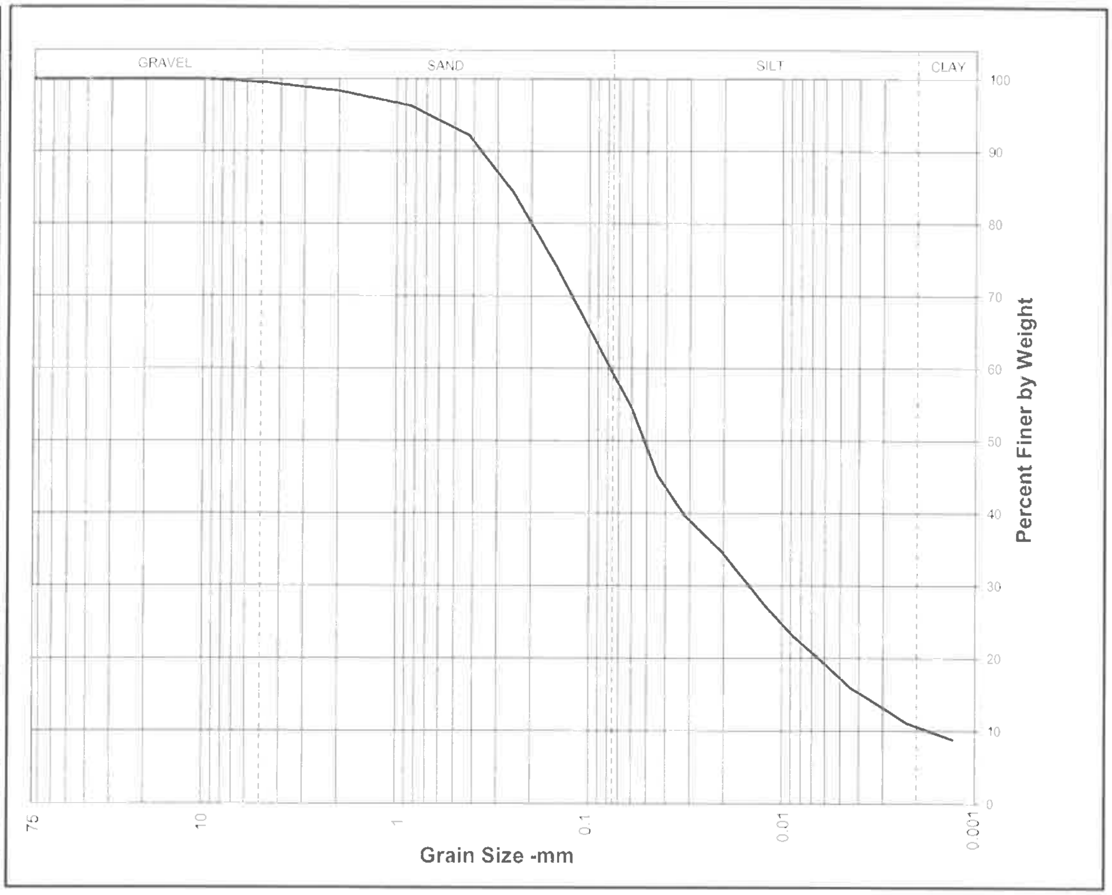
Test Hole: TH20-4

Depth: 5.33 - 5.79

Sample Description:

Sample No.: Sa. 9

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	99.5
2.00	98.3
0.850	96.3
0.425	92.2
0.250	84.4
0.150	74.3
0.075	59.2
0.060	54.6
0.044	45.2
0.032	39.7
0.020	34.7
0.012	27.2
0.009	23.0
0.006	19.6
0.004	16.0
0.003	13.6
0.002	11.1



Distribution	
Cobbles	0%
Gravel	0.5%
Sand	40.2%
Silt	48.8%
Clay	10.5%

Remarks:

Checked By:

Tested in Accordance with ASTM D422, C136 and C117 unless otherwise indicated

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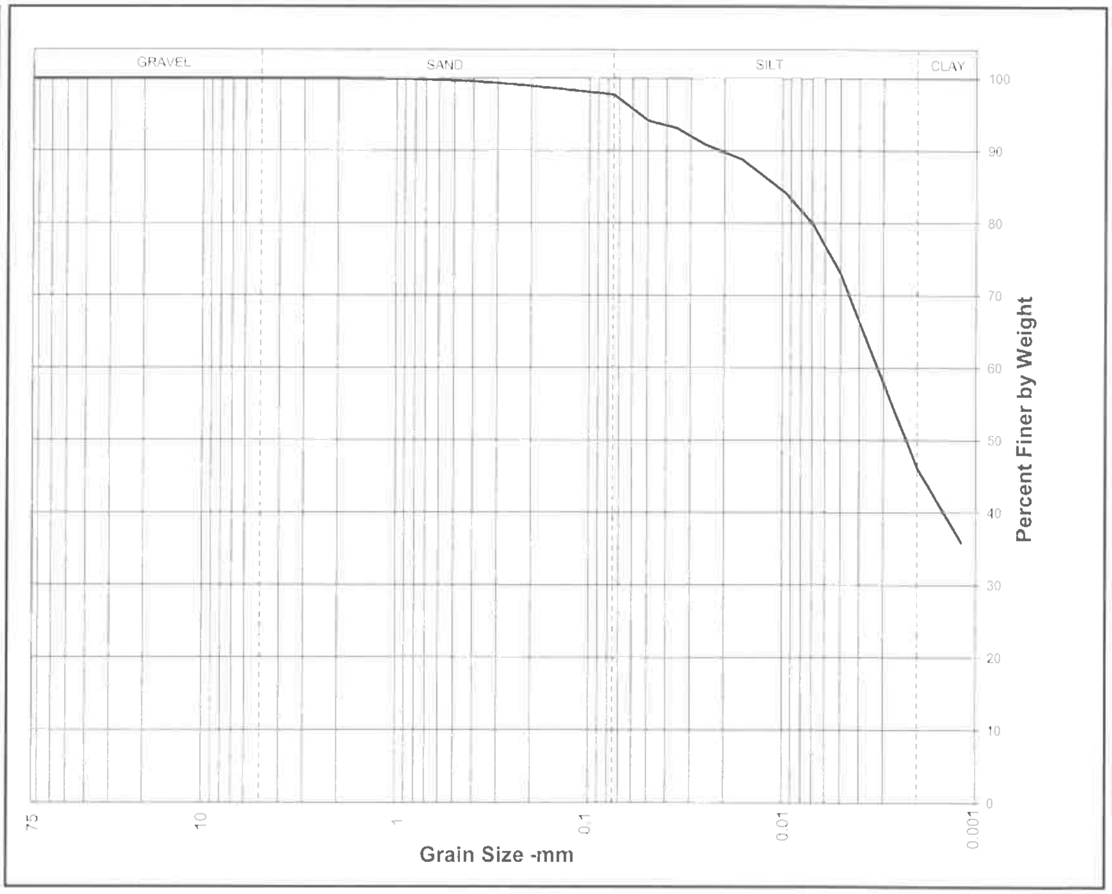
GRAIN SIZE DISTRIBUTION REPORT

Client: BPTEC
Date Tested: 02-Nov-20
Project: Latta Bridge
Project No: 29077
Tested By: NM

Test Hole: TH20-4
Depth: 2.29 - 2.74 m
Sample Description:
Sample No.: Sa. 4

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	99.6
0.250	99.2
0.150	98.6
0.075	97.7
0.050	94.1
0.035	93.1
0.025	90.8
0.016	88.8
0.010	84.1
0.007	79.8
0.005	73.2
0.004	64.1
0.003	55.1
0.002	46.1



Distribution	
Cobbles	0%
Gravel	0%
Sand	2.3%
Silt	51.5%
Clay	46.2%

Remarks:

Checked By:

Tested in Accordance with ASTM D422, C136 and C117 unless otherwise indicated

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GRAIN SIZE DISTRIBUTION REPORT

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Client: BPTEC

Project: Latta Bridge

Project No: 29077

Date Tested: 03-Nov-20

Tested By: JAP

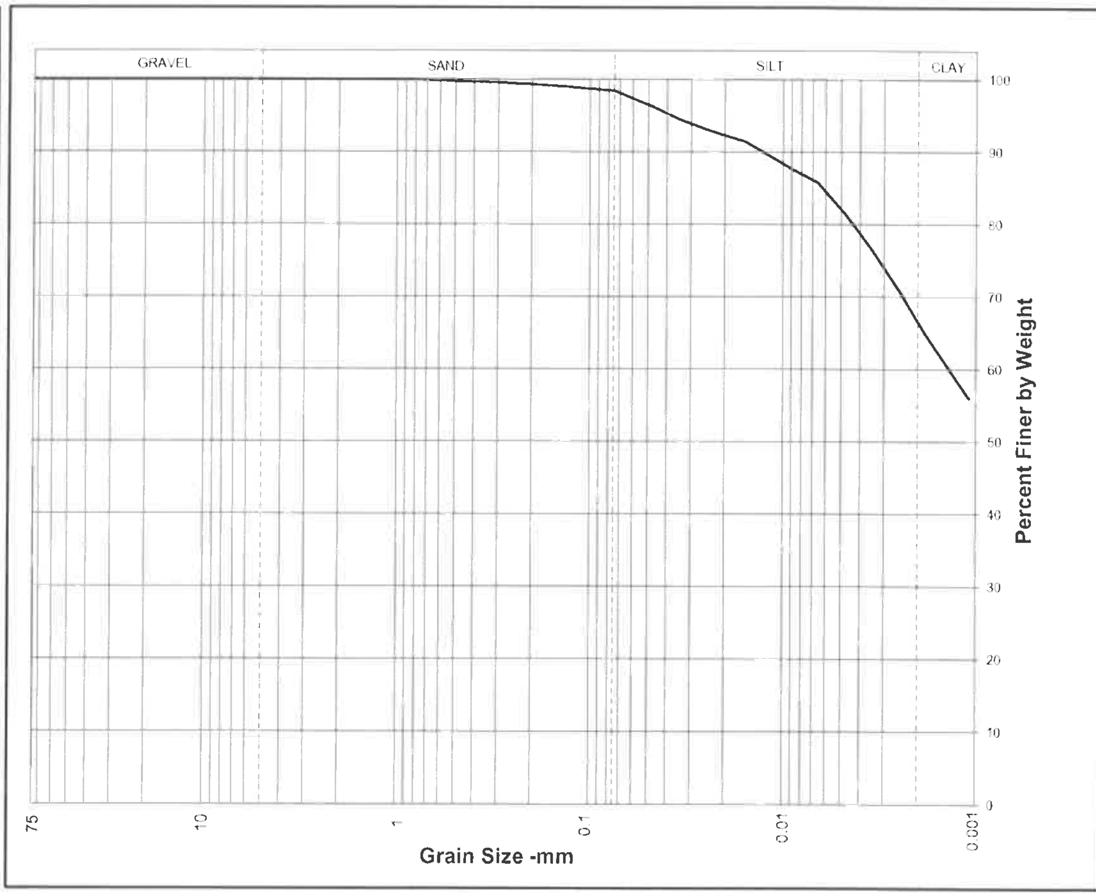
Test Hole: TH20-6

Sample Description:

Depth: 5.49 - 5.94 m

Sample No.: Sa. 10

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	99.7
0.250	99.4
0.150	99.1
0.075	98.4
0.048	96.3
0.034	94.4
0.024	93.0
0.016	91.4
0.009	87.8
0.007	85.8
0.005	81.4
0.003	76.5
0.003	70.9
0.002	64.8



Distribution	
Cobbles	0%
Gravel	0%
Sand	1.6%
Silt	32%
Clay	66.4%

Remarks:

Checked By:

Tested in Accordance with ASTM D422, C136 and C117 unless otherwise indicated

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GRAIN SIZE DISTRIBUTION REPORT

Client: BPTEC

Project: Latta Bridge

Project No: 29077

Date Tested: 03-Nov-20

Tested By: JAP

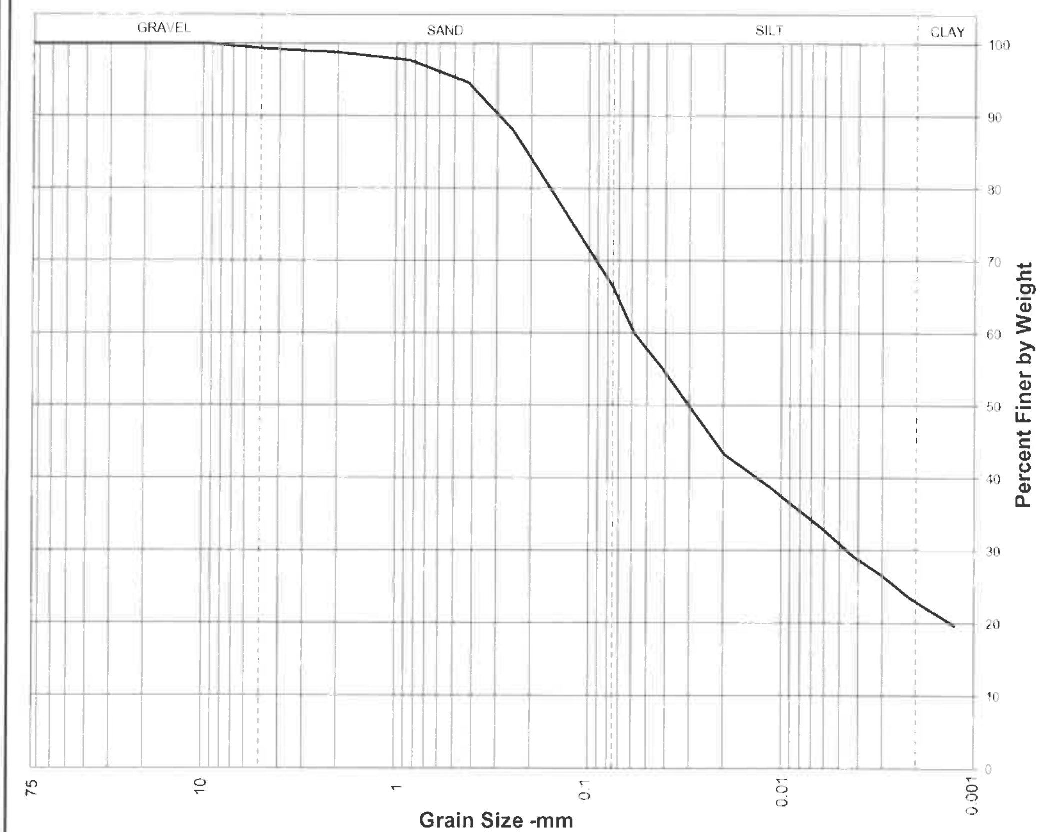
Test Hole: TH20-6

Sample Description:

Depth: 8.53 - 8.99 m

Sample No.: Sa. 12

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	99.3
2.00	98.8
0.850	97.7
0.425	94.6
0.250	88.1
0.150	78.9
0.075	66.3
0.058	60.0
0.042	55.3
0.030	50.1
0.020	43.3
0.012	38.9
0.008	35.8
0.006	32.7
0.004	29.3
0.003	26.7
0.002	23.6



Distribution	
Cobbles	0%
Gravel	0.7%
Sand	32.9%
Silt	43.5%
Clay	22.9%

Remarks:

Checked By:

Tested in Accordance with ASTM D422, C136 and C117 unless otherwise indicated

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GRAIN SIZE DISTRIBUTION REPORT

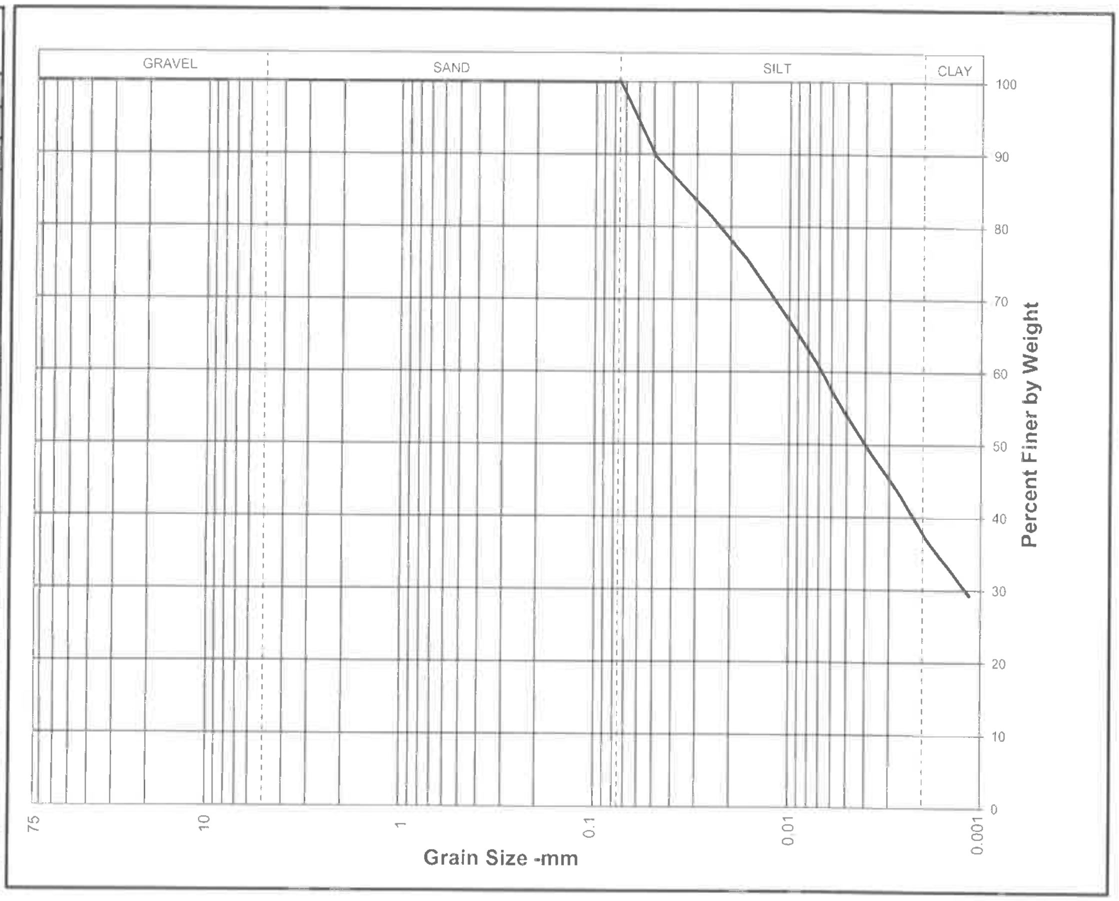
Client: City of Edmonton
Project: Latta Bridge
Project No: 28330

Date Tested: 09-Apr-20
Tested By: NM

Test Hole: TH20-1
Sample Description:

Depth: 34.10 - 34.20 m
Sample No.: Run 5

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	100.0
0.250	100.0
0.150	100.0
0.075	100.0
0.049	89.7
0.035	85.6
0.025	81.5
0.016	75.5
0.010	66.8
0.007	60.9
0.005	54.4
0.004	48.7
0.003	42.9
0.002	37.2



Distribution	
Cobbles	0.0%
Gravel	0.0%
Sand	0.0%
Silt	62.4%
Clay	37.6%

Remarks: Blenderized

Checked By:

Tested in Accordance with ASTM D422, C136 and C117 unless otherwise indicated

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GRAIN SIZE DISTRIBUTION REPORT

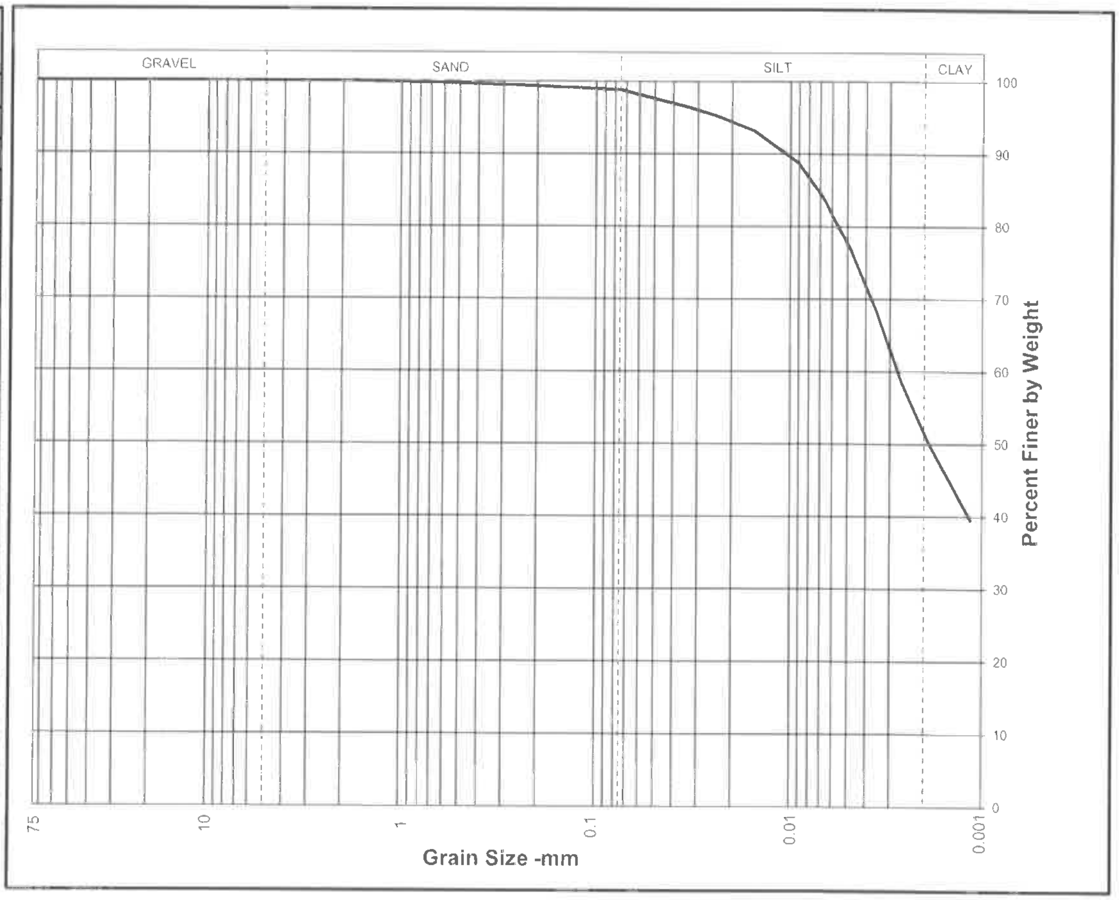
Client: City of Edmonton
Project: Latta Bridge
Project No: 28330

Date Tested: 02-Apr-20
Tested By: JAP

Test Hole: TH20-2
Sample Description:

Depth: 4.57 - 5.18 m
Sample No.: ST7

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	99.6
0.250	99.4
0.150	99.2
0.075	98.8
0.047	97.5
0.034	96.4
0.024	95.2
0.015	93.2
0.009	88.8
0.007	83.6
0.005	76.9
0.004	68.4
0.003	58.6
0.002	50.3



Distribution	
Cobbles	0%
Gravel	0%
Sand	1.2%
Silt	47.3%
Clay	51.5%

Remarks:

Checked By:

Tested in Accordance with ASTM D422, C136 and C117 unless otherwise indicated

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GRAIN SIZE DISTRIBUTION REPORT

Client: City of Edmonton

Project: Latta Bridge

Project No: 28330

Date Tested: 02-Apr-20

Tested By: LLK

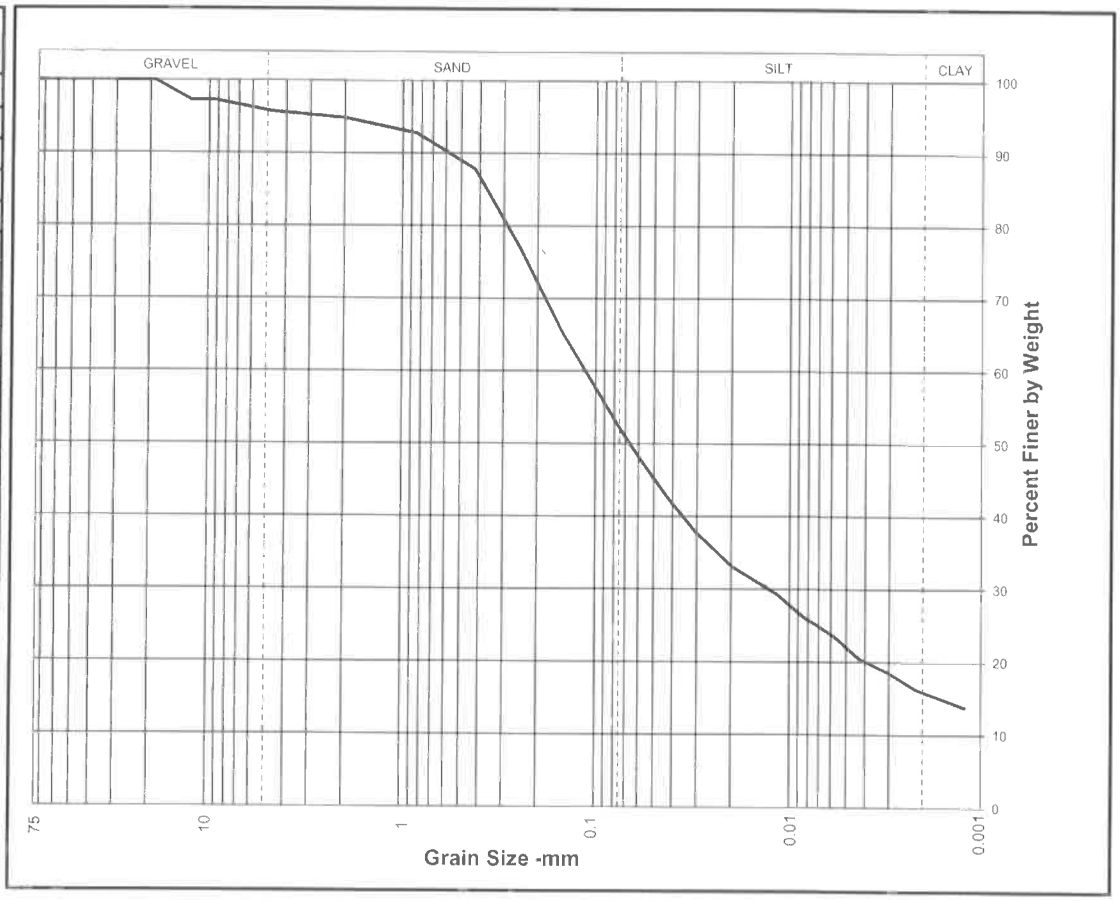
Test Hole: TH20-2

Sample Description:

Depth: 5.7 m

Sample No.: G9

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	97.3
9.5	97.3
4.75	95.7
2.00	94.8
0.850	92.7
0.425	87.8
0.250	77.1
0.150	65.4
0.075	52.1
0.059	47.9
0.043	42.7
0.031	38.0
0.020	33.1
0.012	29.4
0.008	26.1
0.006	23.8
0.004	20.4
0.003	18.6
0.002	16.2



Distribution	
Cobbles	0%
Gravel	4.3%
Sand	43.7%
Silt	36.2%
Clay	15.8%

Remarks:

Checked By:

Tested in Accordance with ASTM D422, C136 and C117 unless otherwise indicated

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Job No:	29077		
Client:	BPTEC		
Project:	Latta Bridge		
HOLE/PIT:	TH20-4	SAMPLE:	G1
DEPTH:	0.46 m	TECH:	NM
DATE:	29-Oct-20	CHECKED BY:	

SULPHATE TEST ON SOILS USING PFRA METHOD

BEAKER NO: 11-11 / 23 CRUCIBLE NO: M4

1- Add 100 g of oven dried soil, passing No. 40 sieve.
2- Add 500 mL of distilled water - or ratio of 20 g of soil to 100 g of water.
3- Add 3 drops of concentrated HCL acid.
4- Place mixture in oven (110C, 250F) for 1 hour or allow to sit overnight.
5- Draw off or filter 100 mL clear liquid from mixture into 250 mL beaker.
6- Add 100 mL distilled water on 5 mL concentrated HCL acid.
7- Heat in oven for 1 hour.
8- Add 10 mL of 10% BACL2 solution, mix thoroughly, observe reaction.

	Clear Solution No Reaction	X	Slightly Milky No Precipitate		Milky Solution With Precipitate

9- Filter mixture through crucible on vacuum setup, dry crucible thoroughly in oven

Wt of Crucible + BaSO4 (ppt) (oven dried)	25.53	g
WTt of Crucible Empty	25.52	g
Wt of BaSO4 (ppt)	0.01	g
Wt of Soil Used (passing No. 40 sieve)	100	g

CALCULATIONS

Gravimetric Factor

$$\text{Wt of Sulphate} = \frac{\text{Wt } BaSO_4 \text{ (ppt) gms}}{\text{Gravimetric Factor}} = \frac{0.01}{2.60} = 0.004 \text{ g}$$

$$\text{Percent Sulphate} = \frac{\text{Wt of } SO_4 \times 100\%}{\text{Wt of Soil Used (g)}} = \frac{0.38}{20} = 0.02 \text{ \%}$$

X	0-0.1%	Clear Solution, No reaction
	0.1-0.5%	Slightly Milky, No Precipitation Dangerous if Water Table is Too High
	>0.5%	Milky with Precipitate Dangerous, use HS Cement

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Job No:	29077		
Client:	BPTEC		
Project:	Latta Bridge		
HOLE/PIT:	TH20-4	SAMPLE:	G6
DEPTH:	3.35 m	TECH:	NM
DATE:	29-Oct-20	CHECKED BY:	

SULPHATE TEST ON SOILS USING PFRA METHOD

BEAKER NO: 11-13 / 17 CRUCIBLE NO: 17-8

1- Add 100 g of oven dried soil, passing No. 40 sieve.
2- Add 500 mL of distilled water - or ratio of 20 g of soil to 100 g of water.
3- Add 3 drops of concentrated HCL acid.
4- Place mixture in oven (110C, 250F) for 1 hour or allow to sit overnight.
5- Draw off or filter 100 mL clear liquid from mixture into 250 mL beaker.
6- Add 100 mL distilled water on 5 mL concentrated HCL acid.
7- Heat in oven for 1 hour.
8- Add 10 mL of 10% BACL2 solution, mix thoroughly, observe reaction.

	Clear Solution No Reaction	X	Slightly Milky No Precipitate		Milky Solution With Precipitate

9- Filter mixture through crucible on vacuum setup, dry crucible thoroughly in oven

Wt of Crucible + BaSO4 (ppt) (oven dried)	25.61	g
WTt of Crucible Empty	25.59	g
Wt of BaSO4 (ppt)	0.02	g
Wt of Soil Used (passing No. 40 sieve)	100	g

CALCULATIONS

Gravimetric Factor

$$\text{Wt of Sulphate} = \frac{\text{Wt } BaSO_4 \text{ (ppt) gms}}{\text{Gravimetric Factor}} = \frac{0.02}{2.60} = 0.008 \text{ g}$$

$$\text{Percent Sulphate} = \frac{\text{Wt of } SO_4 \times 100\%}{\text{Wt of Soil Used (g)}} = \frac{0.77}{20} = 0.04 \text{ \%}$$

X	0-0.1%	Clear Solution, No reaction
	0.1-0.5%	Slightly Milky, No Precipitation Dangerous if Water Table is Too High
	>0.5%	Milky with Precipitate Dangerous, use HS Cement

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Phone (780) 438-1460 | Fax (780) 437-7125

Job No:	29077		
Client:	BPTEC		
Project:	Latta Bridge		
HOLE/PIT:	TH20-4	SAMPLE:	G15
DEPTH:	9.14 m	TECH:	NM
DATE:	29-Oct-20	CHECKED BY:	

SULPHATE TEST ON SOILS USING PFRA METHOD

BEAKER NO: 11-10 / 11 CRUCIBLE NO: R27

1- Add 100 g of oven dried soil, passing No. 40 sieve.
2- Add 500 mL of distilled water - or ratio of 20 g of soil to 100 g of water.
3- Add 3 drops of concentrated HCL acid.
4- Place mixture in oven (110C, 250F) for 1 hour or allow to sit overnight.
5- Draw off or filter 100 mL clear liquid from mixture into 250 mL beaker.
6- Add 100 mL distilled water on 5 mL concentrated HCL acid.
7- Heat in oven for 1 hour.
8- Add 10 mL of 10% BACL2 solution, mix thoroughly, observe reaction.

	Clear Solution No Reaction	X	Slightly Milky No Precipitate		Milky Solution With Precipitate

9- Filter mixture through crucible on vacuum setup, dry crucible thoroughly in oven

Wt of Crucible + BaSO4 (ppt) (oven dried)	25.66	g
WTt of Crucible Empty	25.55	g
Wt of BaSO4 (ppt)	0.11	g
Wt of Soil Used (passing No. 40 sieve)	100	g

CALCULATIONS

Gravimetric Factor

$$\text{Wt of Sulphate} = \frac{\text{Wt } BaSO_4 \text{ (ppt) gms}}{\text{Gravimetric Factor}} = \frac{0.11}{2.60} = 0.042 \text{ g}$$

$$\text{Percent Sulphate} = \frac{\text{Wt of } SO_4 \times 100\%}{\text{Wt of Soil Used (g)}} = \frac{4.23}{20} = 0.21 \text{ \%}$$

	0-0.1%	Clear Solution, No reaction
X	0.1-0.5%	Slightly Milky, No Precipitation Dangerous if Water Table is Too High
	>0.5%	Milky with Precipitate Dangerous, use HS Cement

THURBER ENGINEERING LTD.

4127 Roper Road
Edmonton, Alberta T6B 3S5
Phone (780) 438-1460 | Fax (780) 437-7125

Job No:	29077		
Client:	BPTEC		
Project:	Latta Bridge		
HOLE/PIT:	TH20-4	SAMPLE:	P29
DEPTH:	19.05-19.50m	TECH:	JAP
DATE:	29-Oct-20	CHECKED BY:	

SULPHATE TEST ON SOILS USING PFRA METHOD

BEAKER NO: K1/24 CRUCIBLE NO: 8

1- Add 100 g of oven dried soil, passing No. 40 sieve.
2- Add 500 mL of distilled water - or ratio of 20 g of soil to 100 g of water.
3- Add 3 drops of concentrated HCL acid.
4- Place mixture in oven (110C, 250F) for 1 hour or allow to sit overnight.
5- Draw off or filter 100 mL clear liquid from mixture into 250 mL beaker.
6- Add 100 mL distilled water on 5 mL concentrated HCL acid.
7- Heat in oven for 1 hour.
8- Add 10 mL of 10% BACL2 solution, mix thoroughly, observe reaction.

[ ] Clear Solution No Reaction	[X] Slightly Milky No Precipitate	[ ] Milky Solution With Precipitate

9- Filter mixture through crucible on vacuum setup, dry crucible thoroughly in oven

Wt of Crucible + BaSO4 (ppt) (oven dried)	25.76	g
WTt of Crucible Empty	25.75	g
Wt of BaSO4 (ppt)	0.01	g
Wt of Soil Used (passing No. 40 sieve)	100	g

CALCULATIONS

Gravimetric Factor

$$\text{Wt of Sulphate} = \frac{\text{Wt } BaSO_4 \text{ (ppt) gms}}{\text{Gravimetric Factor}} = \frac{0.01}{2.60} = 0.004 \text{ g}$$

$$\text{Percent Sulphate} = \frac{\text{Wt of } SO_4 \times 100\%}{\text{Wt of Soil Used (g)}} = \frac{0.38}{20} = 0.02 \ \%$$

[X]	0-0.1%	Clear Solution, No reaction
[ ]	0.1-0.5%	Slightly Milky, No Precipitation Dangerous if Water Table is Too High
[ ]	>0.5%	Milky with Precipitate Dangerous, use HS Cement

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Edmonton, Alberta T6B 3S5
Phone (780) 438-1460 | Fax (780) 437-7125

Job No:	29077		
Client:	BPTEC		
Project:	Latta Bridge		
HOLE/PIT:	TH20-4	SAMPLE:	P37
DEPTH:	25.1-25.6 m	TECH:	JAP
DATE:	29-Oct-20	CHECKED BY:	

SULPHATE TEST ON SOILS USING PFRA METHOD

BEAKER NO: H11/6-3 CRUCIBLE NO: 7

1- Add 100 g of oven dried soil, passing No. 40 sieve.
2- Add 500 mL of distilled water - or ratio of 20 g of soil to 100 g of water.
3- Add 3 drops of concentrated HCL acid.
4- Place mixture in oven (110C, 250F) for 1 hour or allow to sit overnight.
5- Draw off or filter 100 mL clear liquid from mixture into 250 mL beaker.
6- Add 100 mL distilled water on 5 mL concentrated HCL acid.
7- Heat in oven for 1 hour.
8- Add 10 mL of 10% BACL2 solution, mix thoroughly, observe reaction.

	Clear Solution No Reaction	X	Slightly Milky No Precipitate		Milky Solution With Precipitate

9- Filter mixture through crucible on vacuum setup, dry crucible thoroughly in oven

Wt of Crucible + BaSO4 (ppt) (oven dried)	26.06	g
WTt of Crucible Empty	26.04	g
Wt of BaSO4 (ppt)	0.02	g
Wt of Soil Used (passing No. 40 sieve)	100.09	g

CALCULATIONS

Gravimetric Factor

$$\text{Wt of Sulphate} = \frac{\text{Wt } BaSO_4 \text{ (ppt) gms}}{\text{Gravimetric Factor}} = \frac{0.02}{2.60} = 0.008 \text{ g}$$

$$\text{Percent Sulphate} = \frac{\text{Wt of } SO_4 \times 100\%}{\text{Wt of Soil Used (g)}} = \frac{0.77}{20.018} = 0.04 \text{ \%}$$

X	0-0.1%	Clear Solution, No reaction
	0.1-0.5%	Slightly Milky, No Precipitation Dangerous if Water Table is Too High
	>0.5%	Milky with Precipitate Dangerous, use HS Cement

APPENDIX D

Summary of Piezometer Readings and Slope Inclinmeter

SUMMARY OF PIEZOMETER READINGS AND SLOPE INCLINOMETER PLOTS

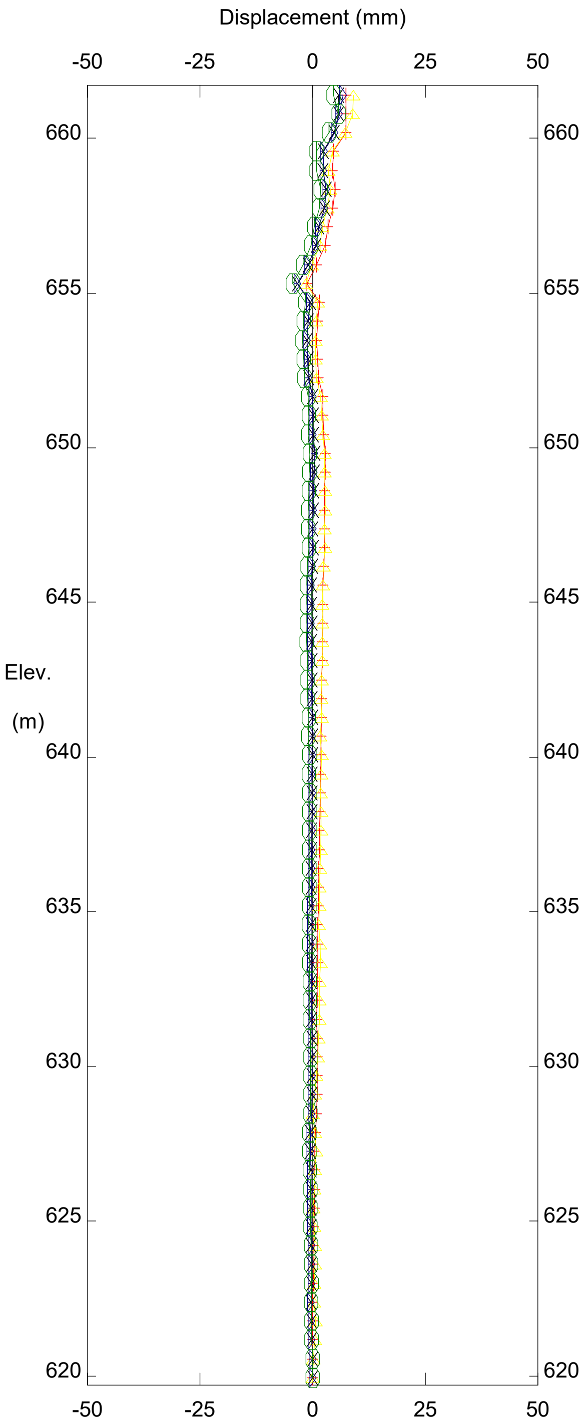
THURBER

TABLE 1
VIBRATING WIRE PIEZOMETER INSTRUMENTATION READING SUMMARY

Date Monitored: September 28, 2020

INSTRUMENT #	DATE INITIALIZED	TIP DEPTH (m)	GROUND ELEV. (m)	CURRENT STATUS	HIGHEST MEASURED GROUNDWATER LEVEL BGS (m)	MEASURED PORE PRESSURE (kPa)	CURRENT GROUNDWATER LEVEL BGS (m)	PREVIOUS GROUNDWATER LEVEL BGS (m)	CHANGE IN WATER LEVEL SINCE PREVIOUS READING (m)
VW20-1A	Mar 24, 2020	12.2	661.7	Operational	8.56	17.7	10.4	10.4	0
VW20-1B	Mar 24, 2020	33.5	661.7	Operational	33.53	0.01	33.53	33.53	0
VW20-2A	Mar 24, 2020	12.2	661.4	Operational	10.8	13.5	10.9	10.8	0.1
VW20-2B	Mar 24, 2020	33.53	661.4	Operational	33.53	0.01	33.53	33.53	0

City of Edmonton



Cumulative Displacement

Direction A

LEGEND

Initial 24 Mar 2020

17 Jul 2020

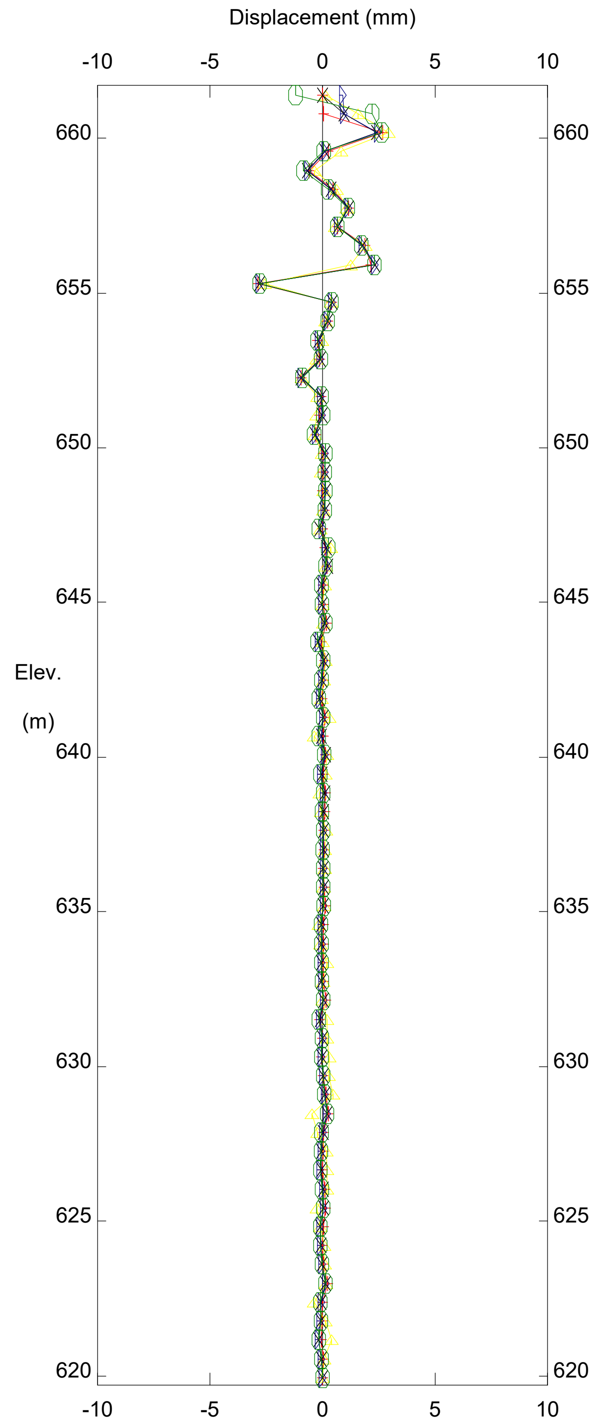
28 Sep 2020*

13 Oct 2020

13 Oct 2020

24 Nov 2020

Ref. Elevation 661.707 m



Incremental Displacement

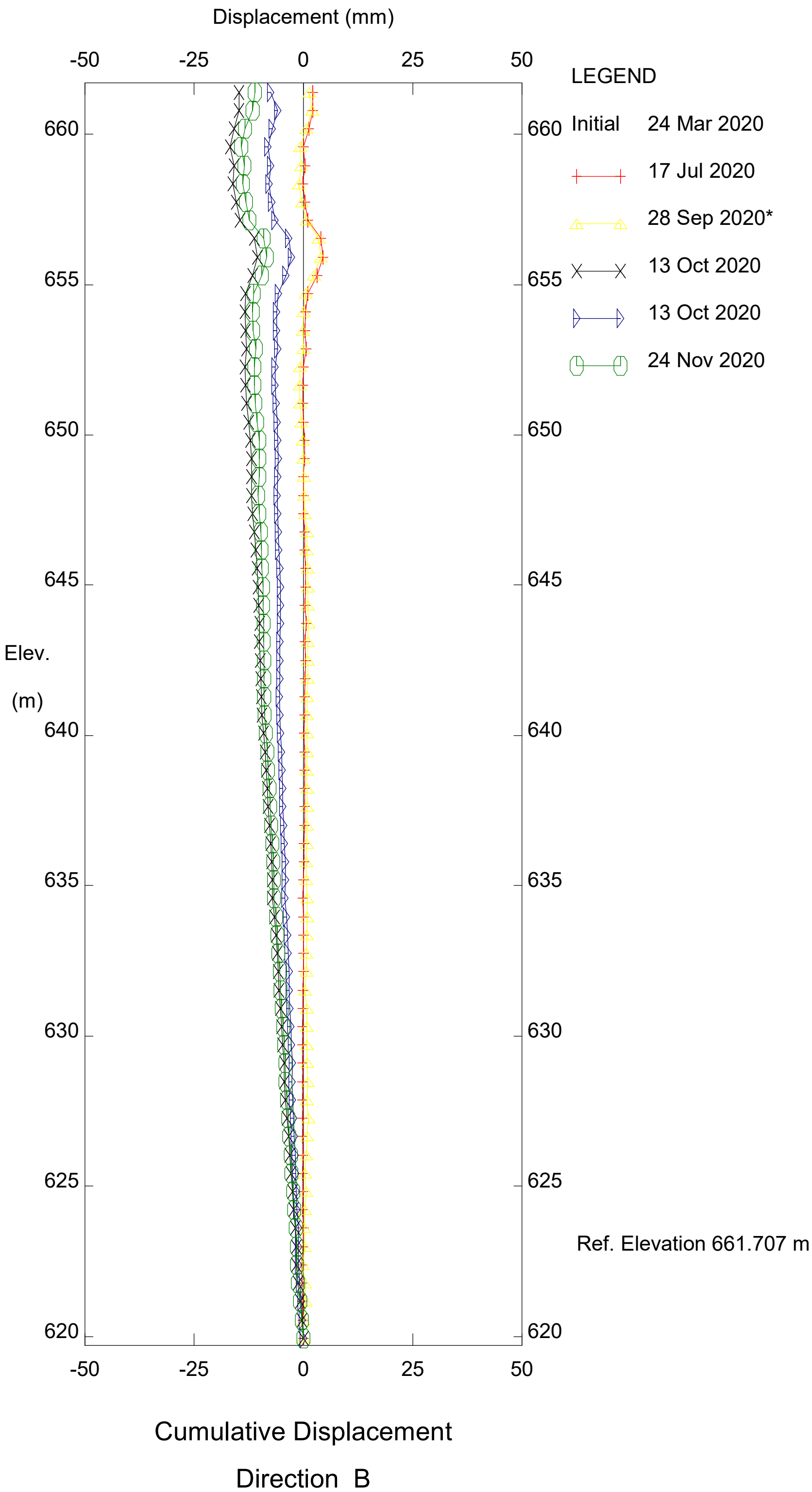
Direction A

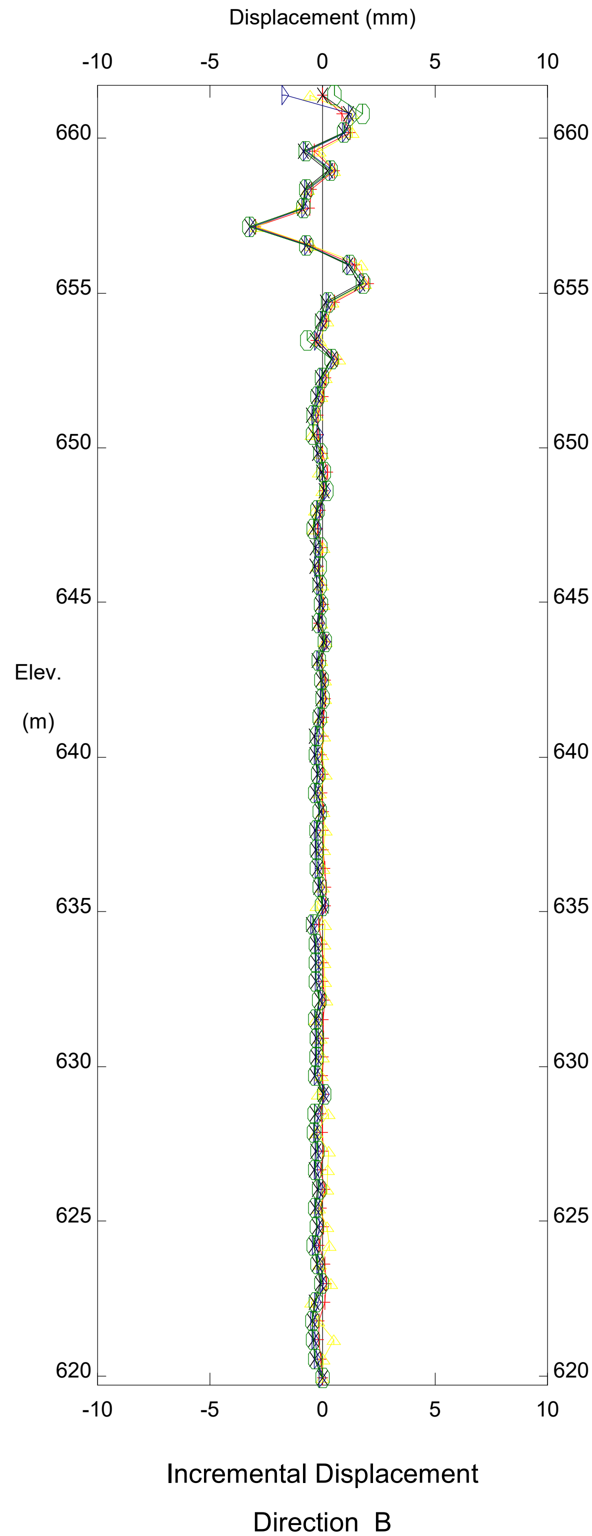
28330-Latta Bridge, Inclinometer TH20-1

Sets marked * include zero shift and/or rotation corrections.

G:\Engineering Services\Geotech\GEOTECHNICAL_LAB\SI_DATA\Latta Bridge\TH20-1.gtl

City of Edmonton



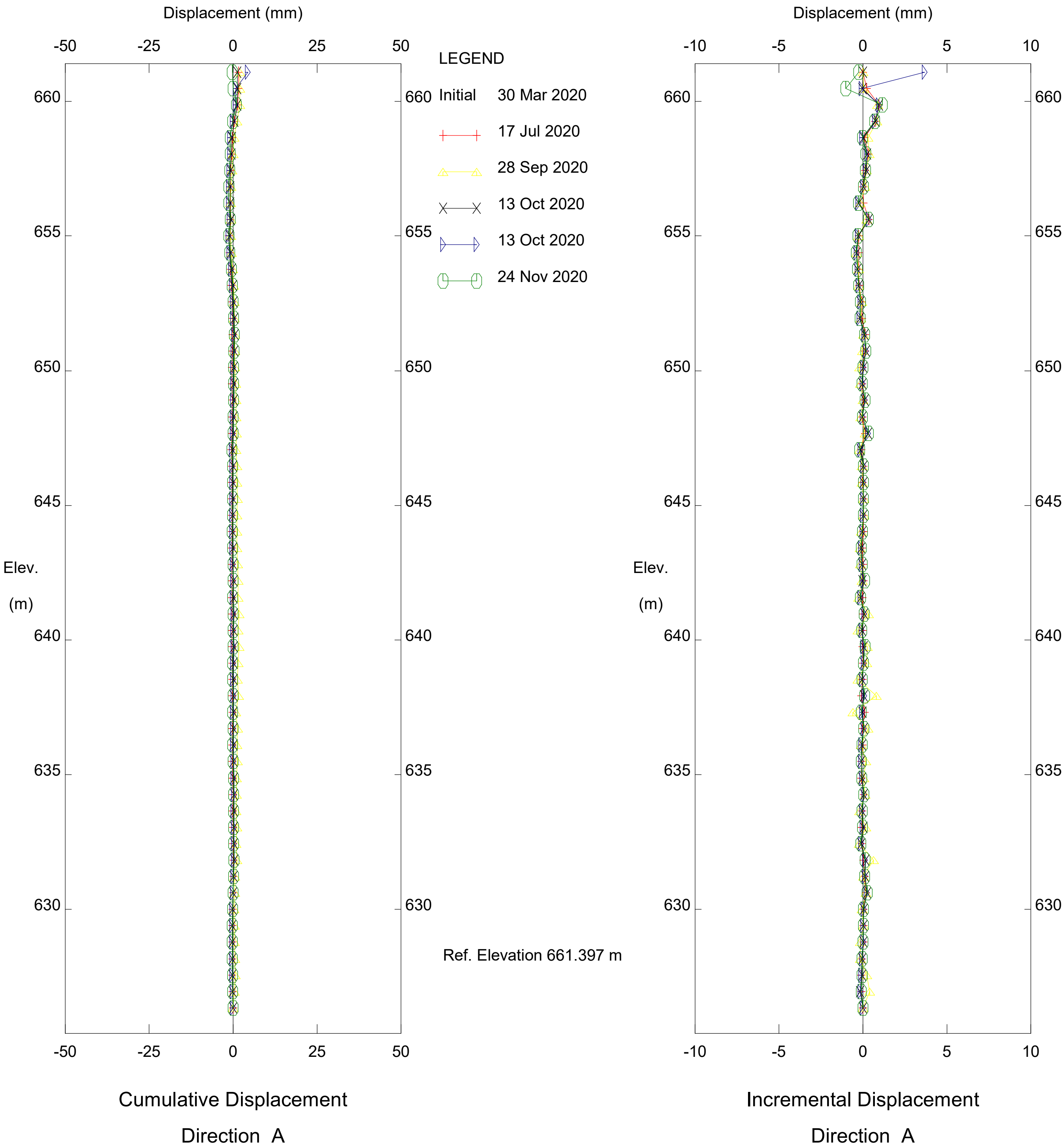


28330-Latta Bridge, Inclinometer TH20-1

Sets marked * include zero shift and/or rotation corrections.

G:\Engineering Services\Geotech\GEOTECHNICAL_LAB\SI_DATA\Latta Bridge\TH20-1.gtl

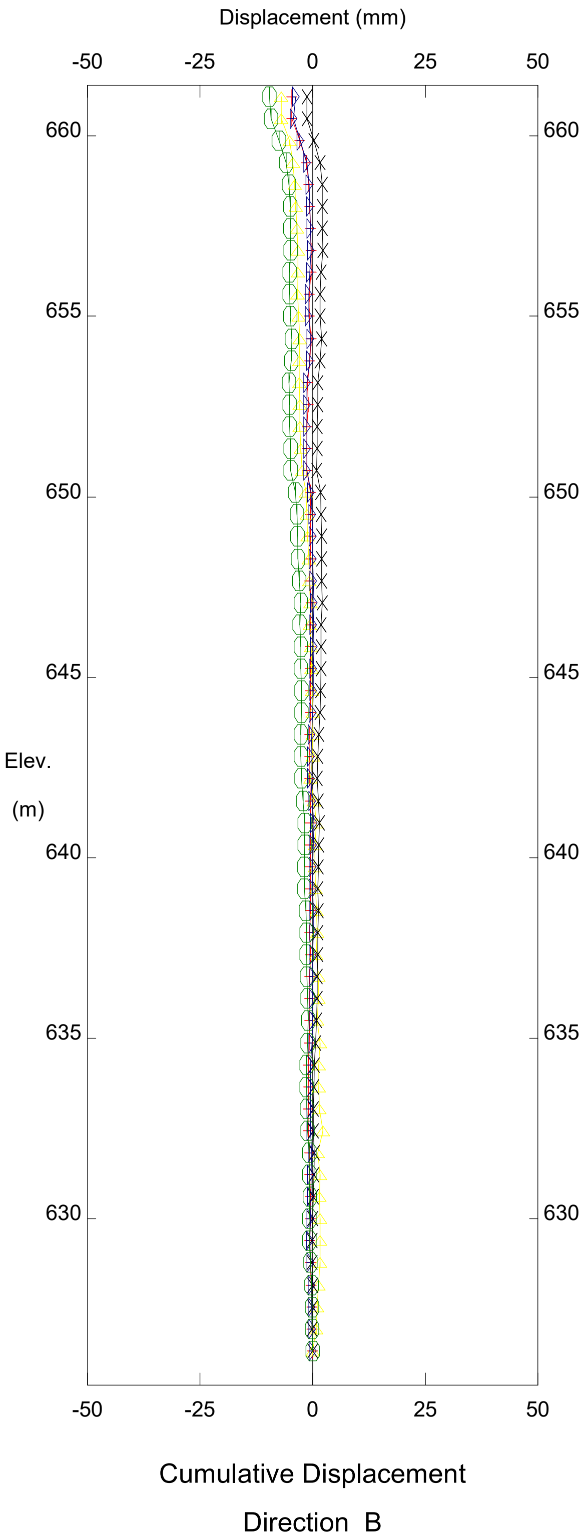
City of Edmonton



28330-Latta Bridge, Inclinometer TH20-2

G:\Engineering Services\Geotech\GEOTECHNICAL_LAB\SI_DATA\Latta Bridge\TH20-2.gtl

City of Edmonton



LEGEND

Initial 30 Mar 2020

17 Jul 2020

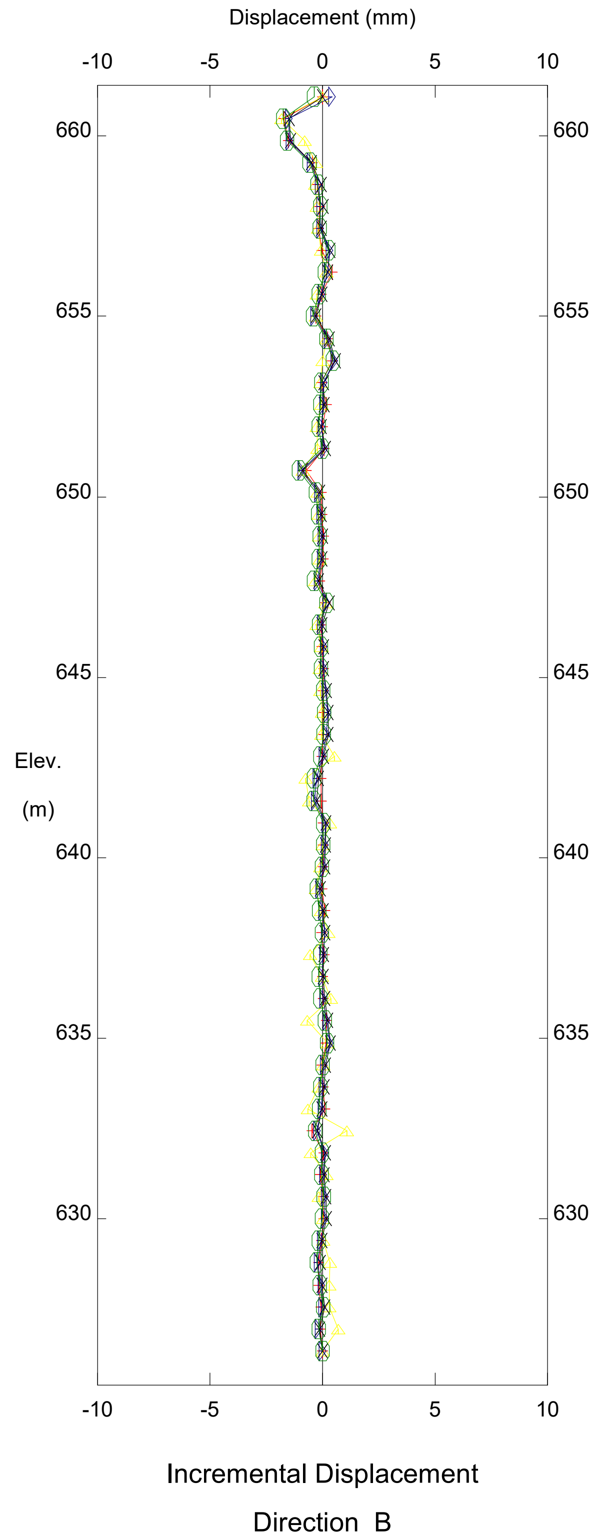
28 Sep 2020

13 Oct 2020

13 Oct 2020

24 Nov 2020

Ref. Elevation 661.397 m



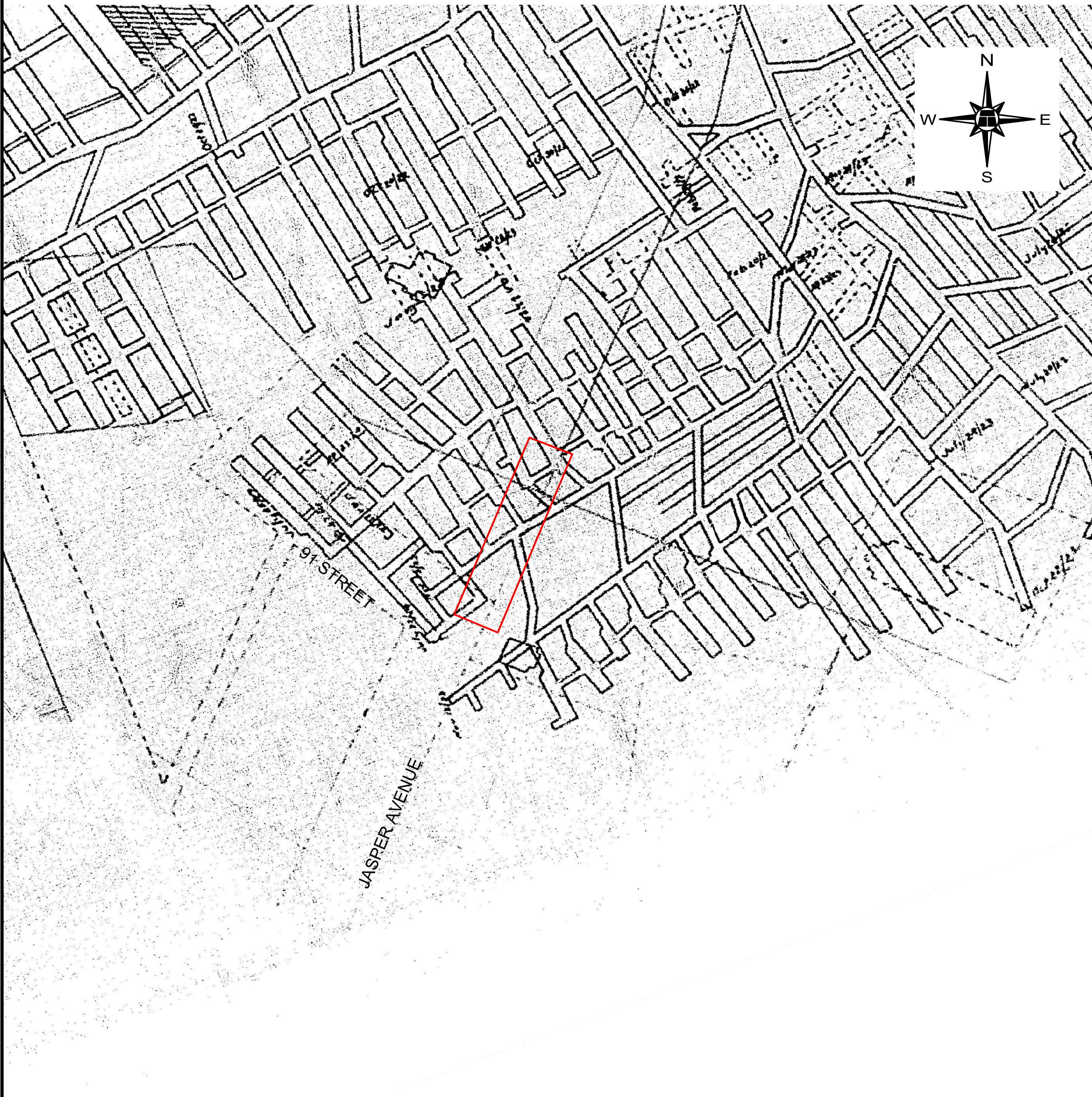
28330-Latta Bridge, Inclinometer TH20-2

G:\Engineering Services\Geotech\GEOTECHNICAL_LAB\SI_DATA\Latta Bridge\TH20-2.gtl

APPENDIX E

Coal Mine Drawings

H:\25000\25233 Latta Bridge - Condition Assessment\Drafting\25233-G1~G2.dwg - G2 - Jul. 12, 2019



LEGEND

BRIDGE LOCATION

0 20 40 60 80 100 120m

SCALE 1:2000

BASE PLAN PROVIDED BY

LATTA BRIDGE AT JASPER AVENUE AND 91 STREET, EDMONTON, ALBERTA
PRELIMINARY GEOTECHNICAL ASSESSMENT

SITE PLAN SHOWING COAL MINES

DWG No. 25223-G2

COWI NORTH AMERICA LTD.

DRAWN BY	KLW
DESIGNED BY	KEF
APPROVED BY	XW
SCALE	1:2000
DATE	JULY 2019
FILE No.	25233

THURBER ENGINEERING LTD.

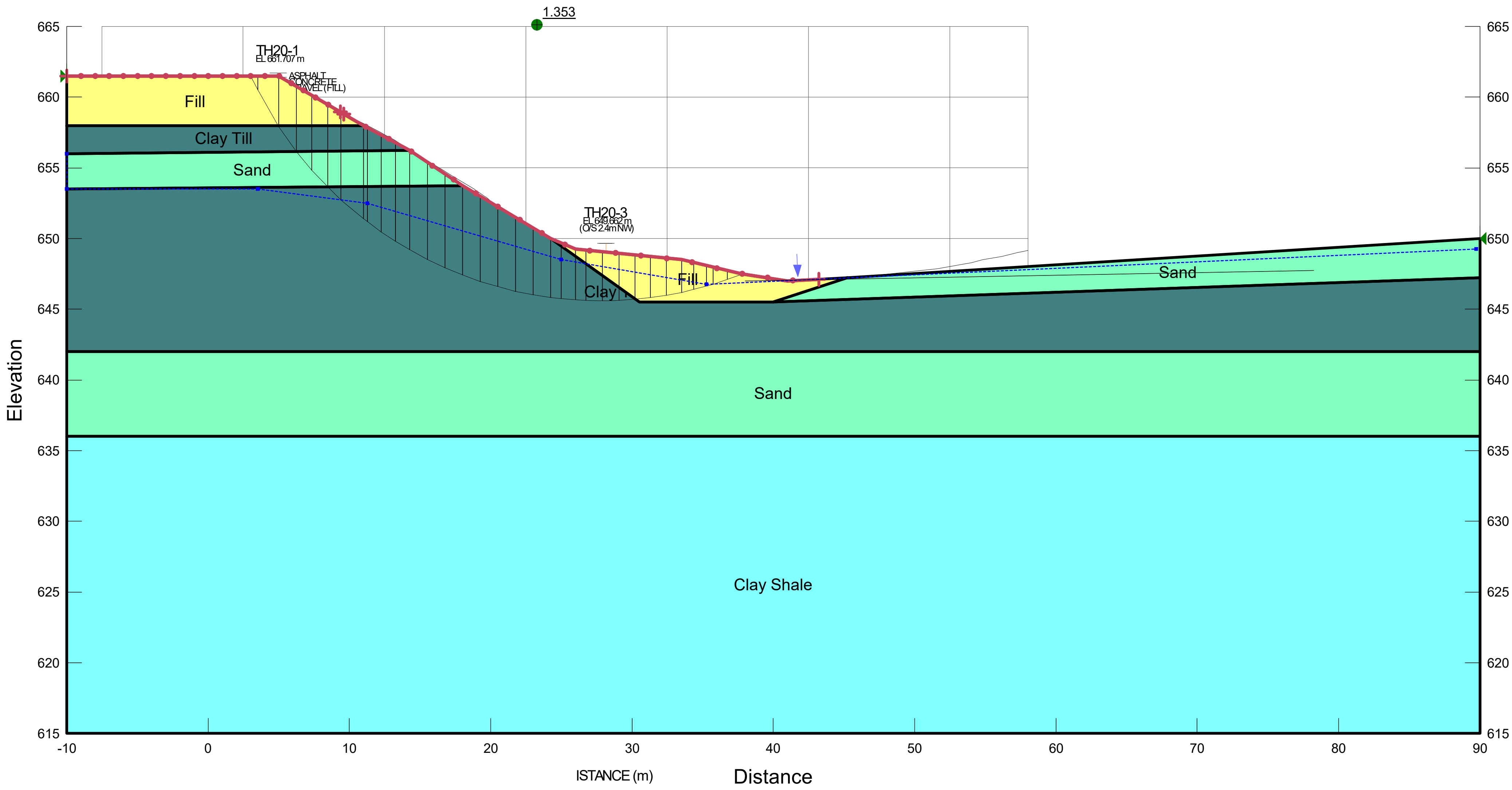

109TH AVE.
108A AVE.
108TH AVE.
107TH AVE.
106A AVE.
106TH AVE.
95TH STREET
STREET
Line between River Lots 14 & 16
Canadian National Railway
SURVEY EXTENDED
REFERENCE
MINE No 632
LOCATION
OPERATED BY PENN COAL CO
STRATA
THICKNESS OF SEAM
SCALE:- 100 FEET - 1 INCH
Consulting Mining Engineer
Mine Surveyor
CERT No
APPROX. LATTA
BRIDGE LOCATION

THURBER

APPENDIX F

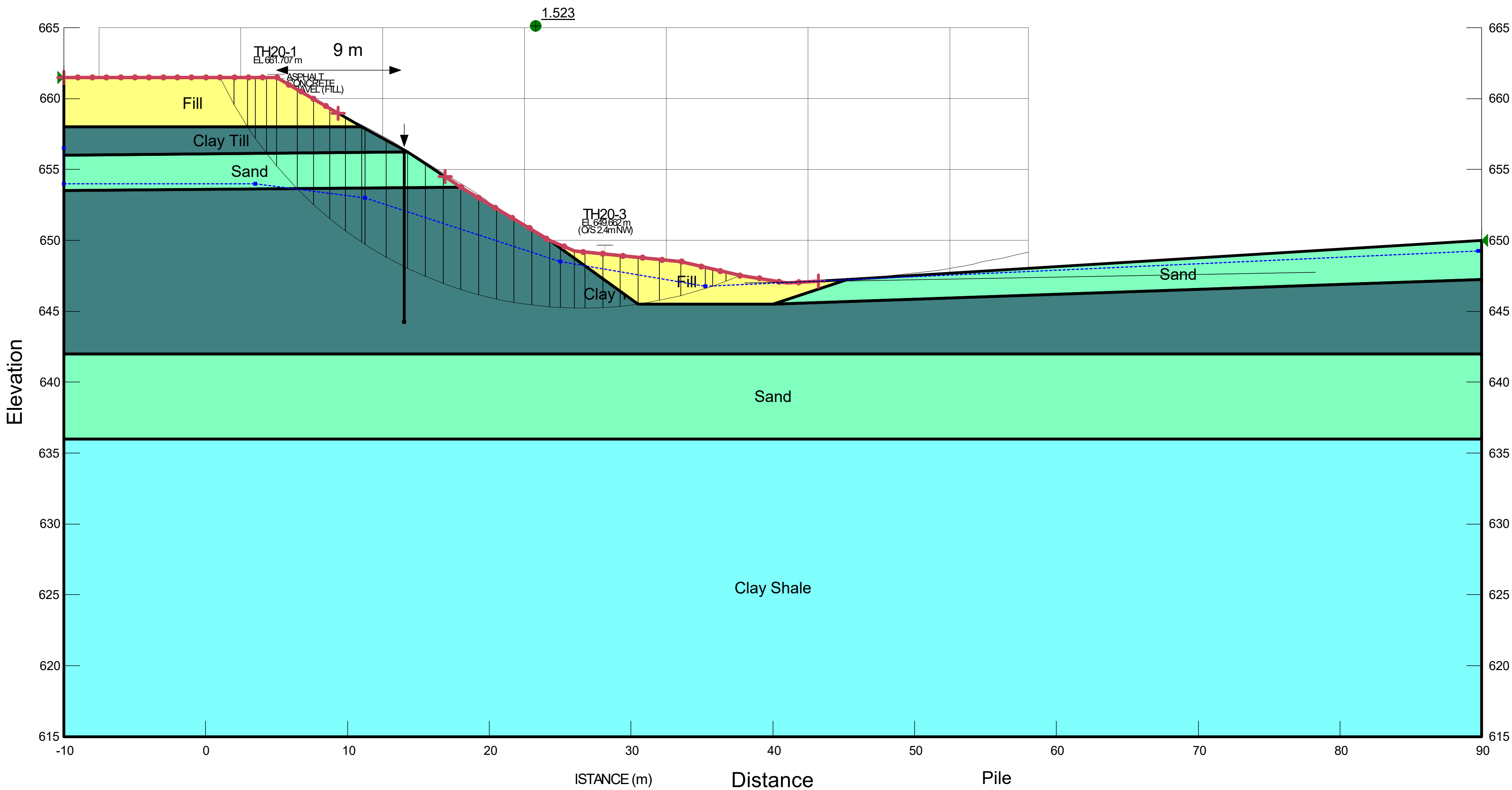
Slope Stability Results

Case 1- Section B - South Bank - Back Analysis.gsz



Fill	Mohr-Coulomb	19 kN/m³	10 kPa	13 °	1
Clay Till	Mohr-Coulomb	21 kN/m³	5 kPa	30 °	1
Sand	Mohr-Coulomb	20 kN/m³	0 kPa	34 °	1
Clay Shale	Mohr-Coulomb	19 kN/m³	10 kPa	26 °	1

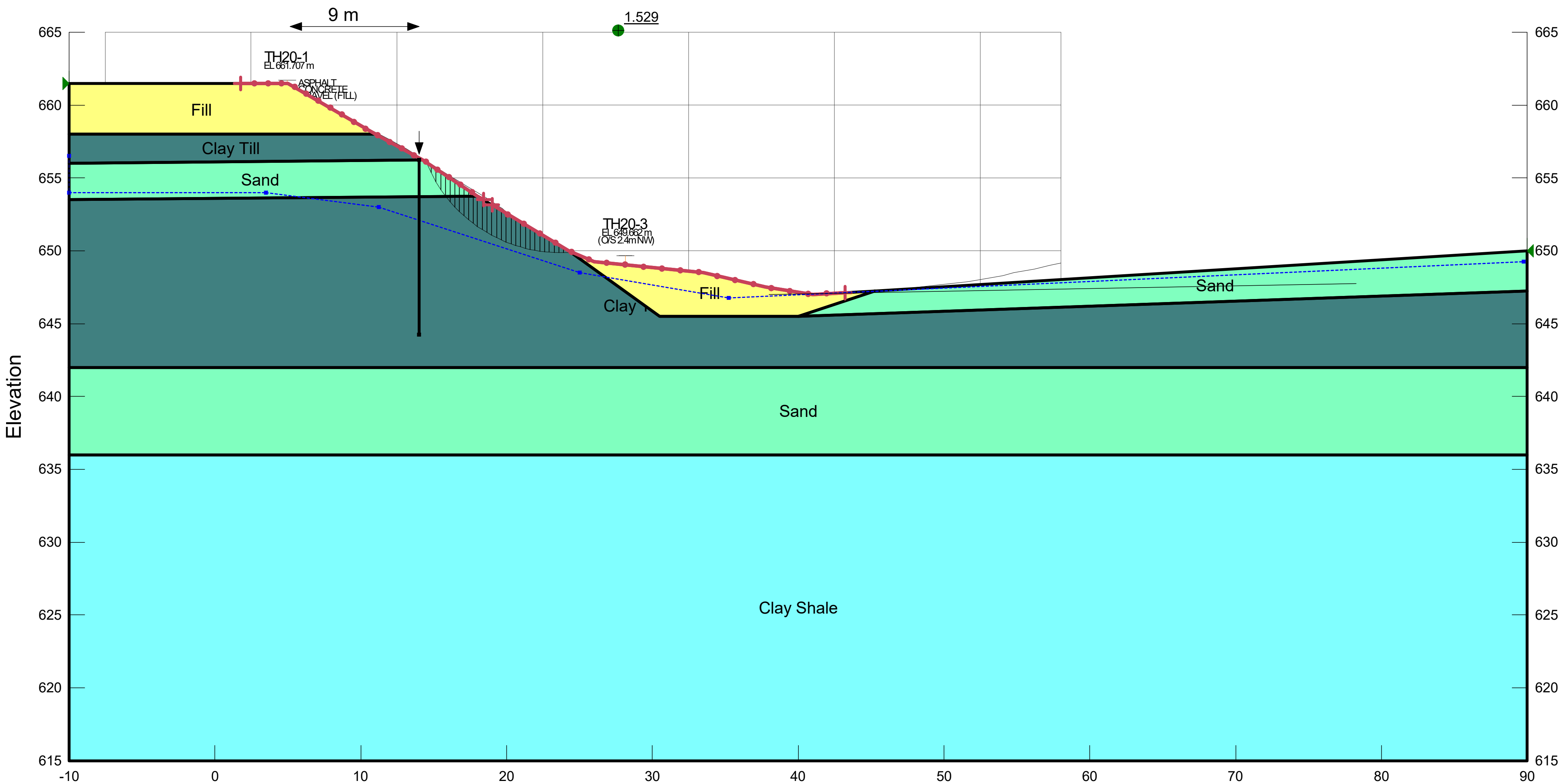
Case 2- Section B - South Bank - Pile Wall.gsz



Pile
Total Length: 12 m
Shear Capacity: 175 kN

Fill	Mohr-Coulomb	19 kN/m³	10 kPa	13 °	1
Clay Till	Mohr-Coulomb	21 kN/m³	5 kPa	30 °	1
Sand	Mohr-Coulomb	20 kN/m³	0 kPa	34 °	1
Clay Shale	Mohr-Coulomb	19 kN/m³	10 kPa	26 °	1

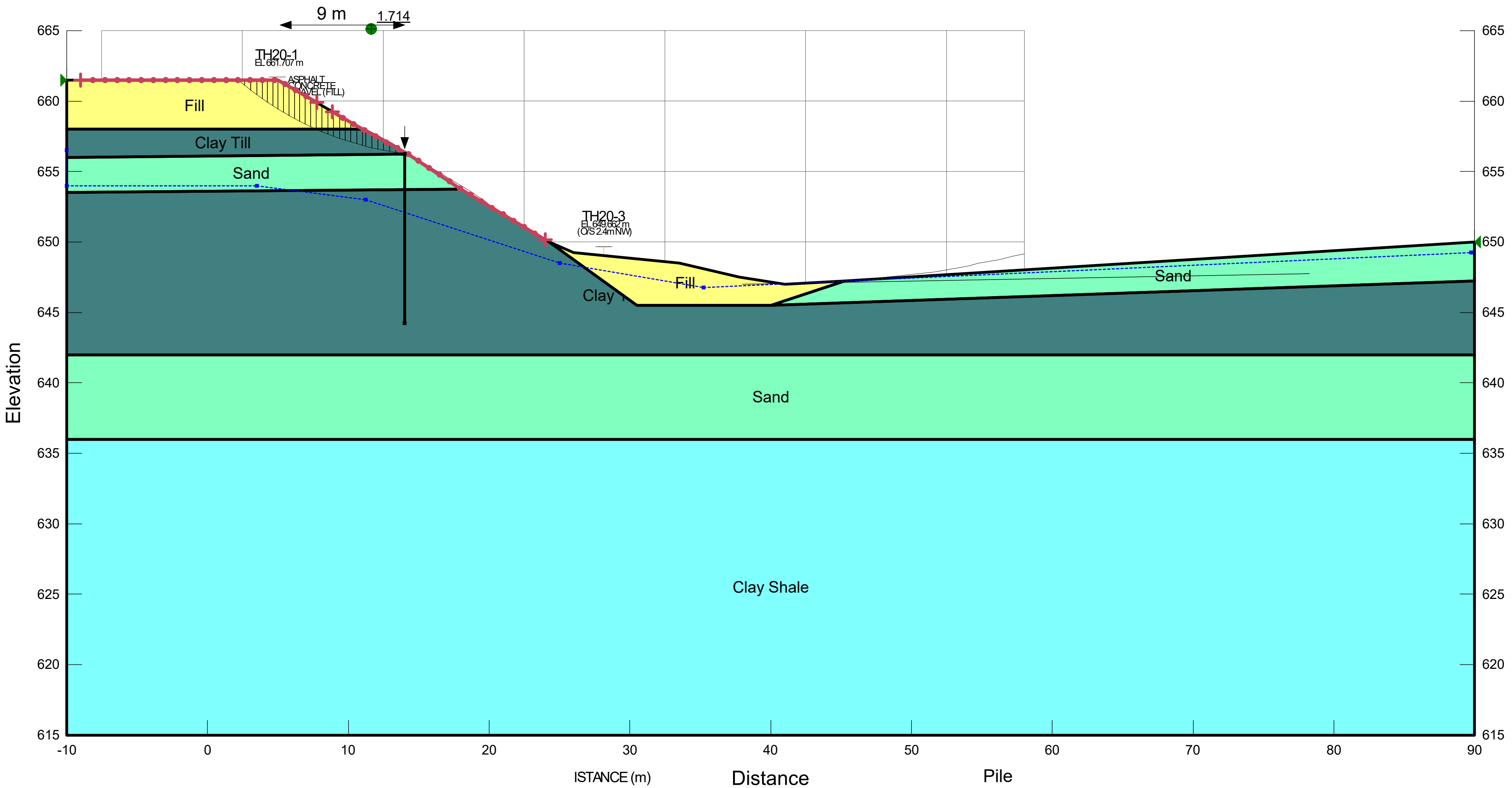
Case 3 - Section B - South Bank - Front of Pile Wall.gsz



Pile
Total Length: 12 m
Shear Capacity: 175 kN

Fill	Mohr-Coulomb	19 kN/m³	10 kPa	13 °	1
Clay Till	Mohr-Coulomb	21 kN/m³	5 kPa	30 °	1
Sand	Mohr-Coulomb	20 kN/m³	0 kPa	34 °	1
Clay Shale	Mohr-Coulomb	19 kN/m³	10 kPa	26 °	1

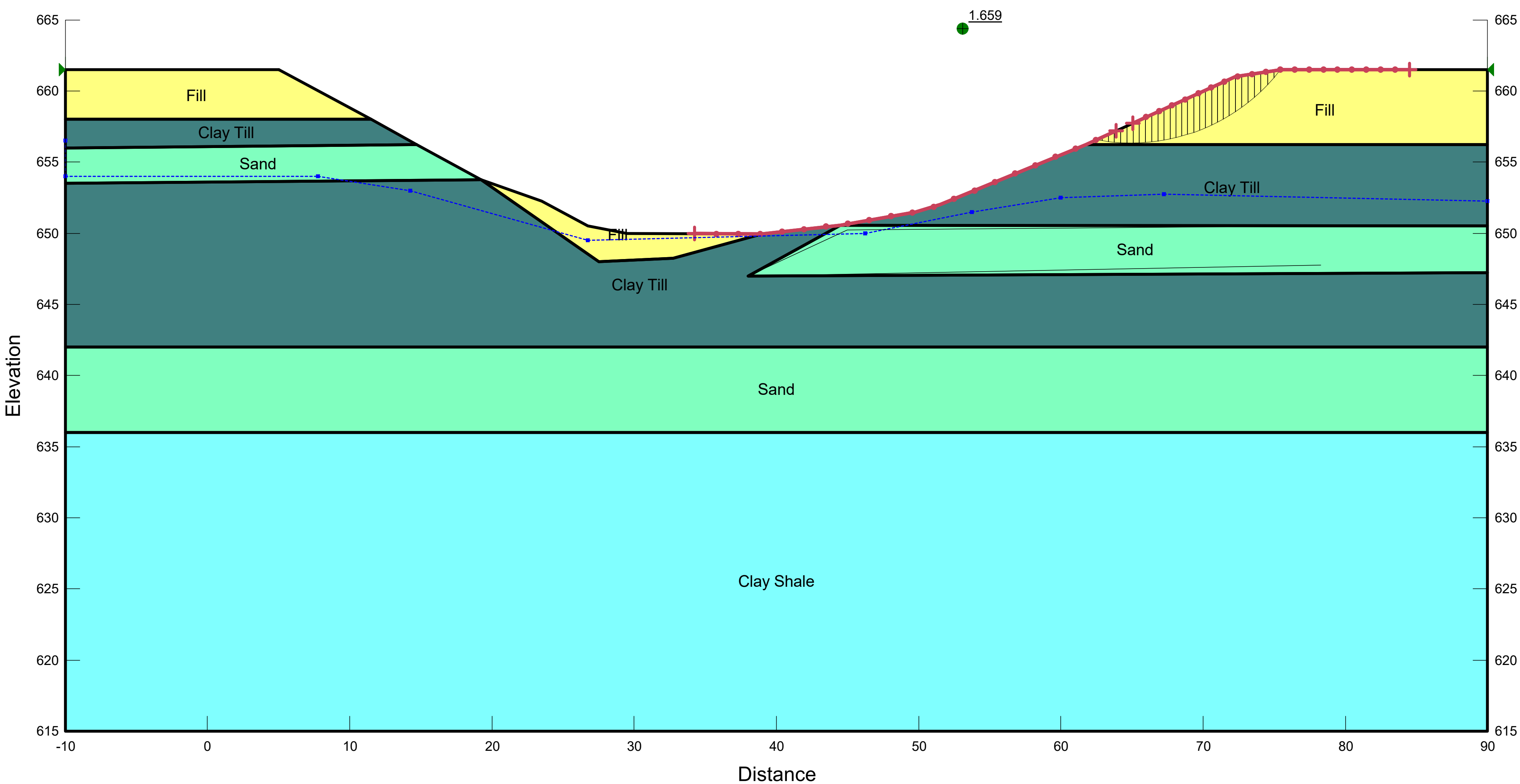
Case 4 - Section B - South Bank - Behind of Pile Wall.gsz



Pile
Total Length: 12 m
Shear Capacity: 175 kN

Fill	Mohr-Coulomb	19 kN/m³	10 kPa	13 °	1
Clay Till	Mohr-Coulomb	21 kN/m³	5 kPa	30 °	1
Sand	Mohr-Coulomb	20 kN/m³	0 kPa	34 °	1
Clay Shale	Mohr-Coulomb	19 kN/m³	10 kPa	26 °	1

Case 5- Section A - North Bank.gsz

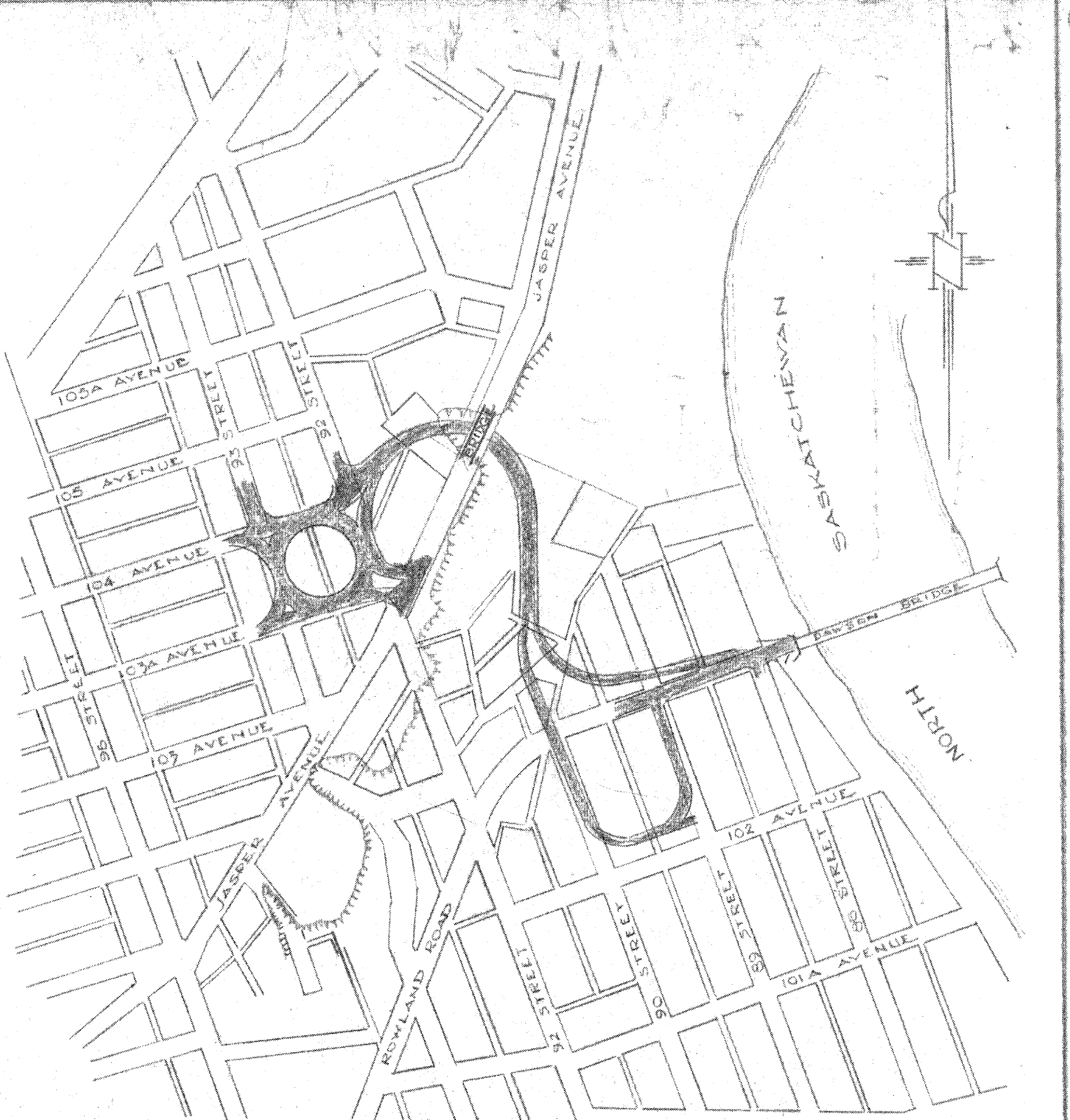


Fill Mohr-Coulomb 19 kN/m³ 10 kPa 13 ° 1
Clay Till Mohr-Coulomb 21 kN/m³ 5 kPa 30 ° 1
Sand Mohr-Coulomb 20 kN/m³ 0 kPa 34 ° 1
Clay Shale Mohr-Coulomb 19 kN/m³ 10 kPa 26 ° 1

THURBER

APPENDIX G

Previous Geotechnical Investigations Results

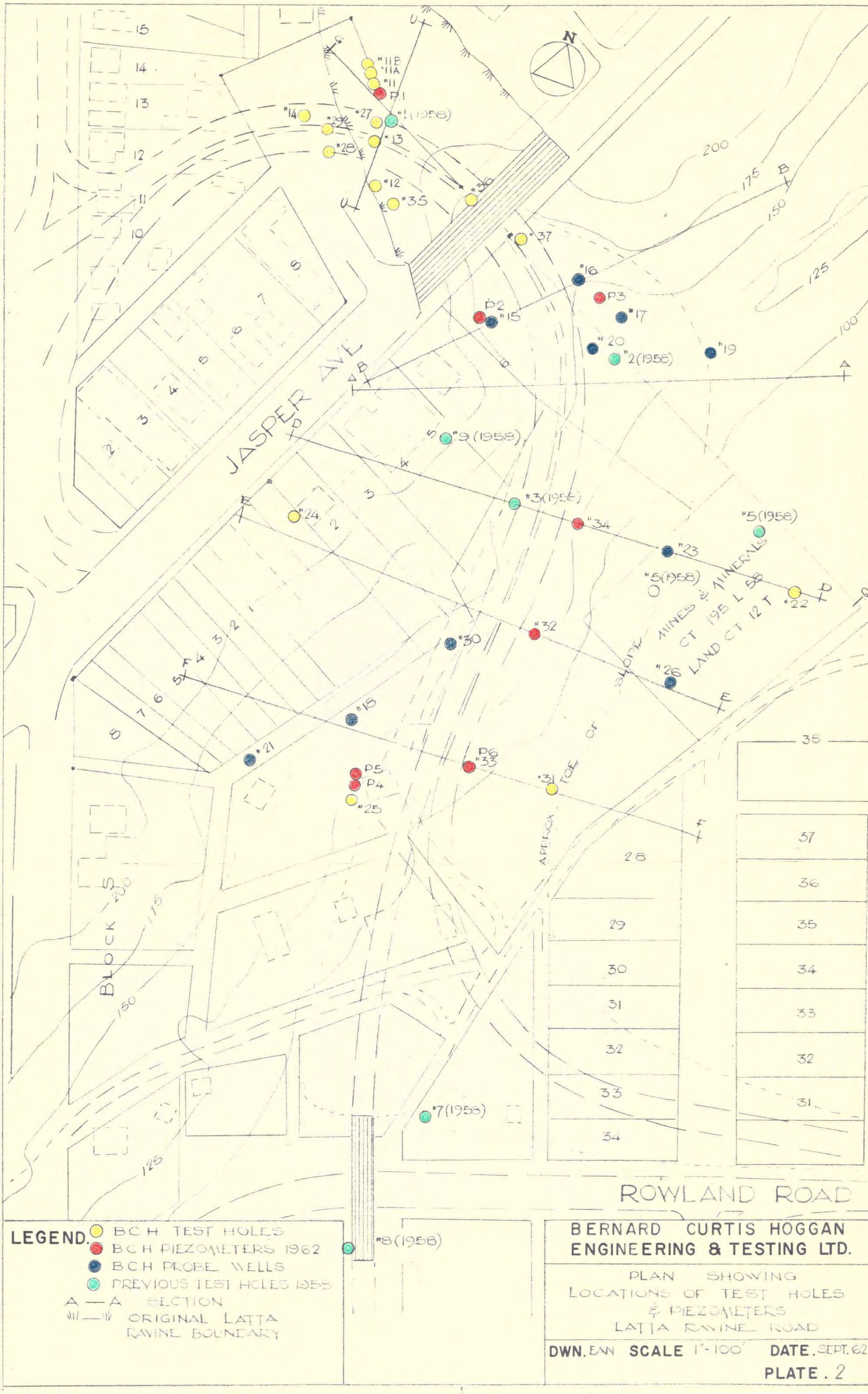


BERNARD CURTIS HOGGAN ENGINEERING & TESTING LTD.

SITE PLAN OF PROPOSED LATTA RAVINE ROAD

DWN. EAN **SCALE.** 1"-500' **DATE.** SEPT 62

PLATE : 1


N
JASPER AVE
ROWLAND ROAD
BLOCK 5
APPROX TOE OF SLOPE
MINES & MINERALS CT 195 L 58
LAND CT 12 T
#11B
#11A
#11
P.1
#14
#29
#27
#1 (1958)
#13
#28
#12
#35
#36
#37
#16
P3
P2
#15
#17
#20
#2 (1958)
#19
#9 (1958)
#3 (1958)
#34
#5 (1958)
#24
#23
#5 (1958)
#22
#32
#30
#26
#18
#21
P6
#33
P5
P4
#25
#31
#7 (1958)
#8 (1958)
200
175
150
125
100
LEGEND.
BCH TEST HOLES
BCH PIEZOMETERS 1962
BCH PROBE WELLS
PREVIOUS TEST HOLES 1958
A — A SECTION
ORIGINAL LATTA RAVINE BOUNDARY
BERNARD CURTIS HOGGAN
ENGINEERING & TESTING LTD.
PLAN SHOWING
LOCATIONS OF TEST HOLES
& PIEZOMETERS
LATTA RAVINE ROAD
DWN. EAN
SCALE 1"-100'
DATE. SEPT. 62
PLATE. 2

B.C.H. 1.

Bernard, Curtis, Hoggan
ENGINEERING & TESTING LTD.
10429 - 79TH AVE.
EDMONTON, - ALBERTA

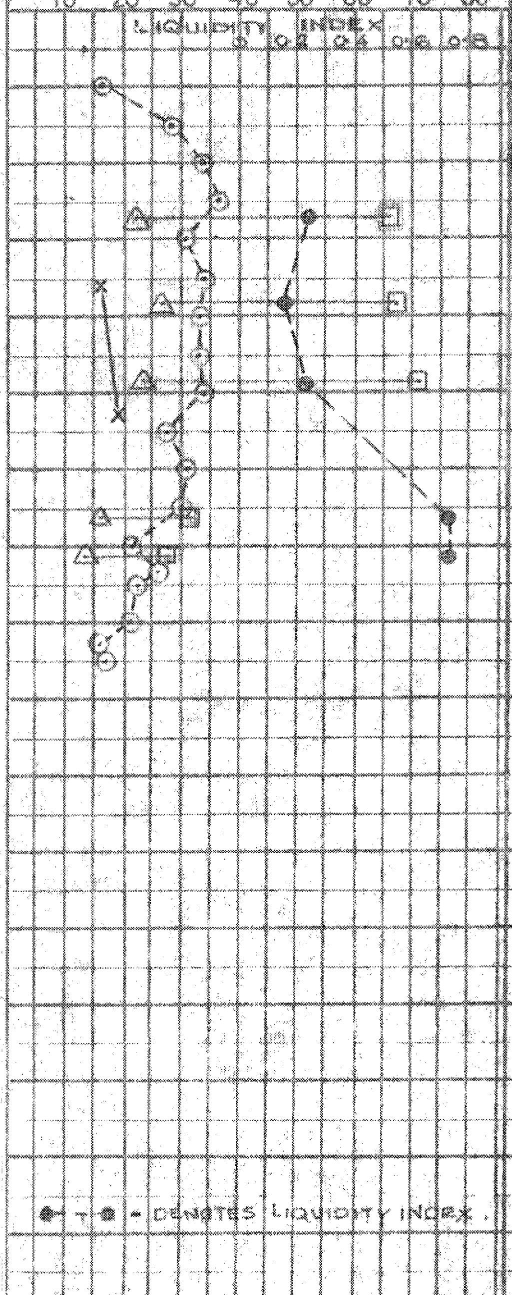
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

DWN. EAN	CKD.	JOB NO. 161	DATE	HOLE NO. 11	PLATE NO. 15

NATURAL MOISTURE CONTENT O—O
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80
LIQUIDITY INDEX 0 0.2 0.4 0.6 0.8



SOIL PROFILE

GROUND SURFACE ELEV. 212.95

DEPTH ELEV FT.	CLASSIFICATION	OTHER TESTS	UNCONFINED COMP. STRENGTH T/FT²	TYPE	DEPTH SCALE
	CLAY FILL				
4	LIGHT BROWN MOTTLED STIFF SILTY		Qu. 2.3	U1	4
8					8
12				U2	12
16	DARK GREY	N = 16	Qu. 1.3	DS, U3	16
20	LIGHT BROWN	N = 19	Qu. 0.9	U4, DS	20
24	GREY				24
28	SANDY WITH ROOTS		Qu. 1.62	U5	28
			Qu. 1.1	U6	
32	SAND — WATER BEARING				32
36	GLACIAL TILL — VERY SANDY DRY			U8	36

END OF HOLE
ELEV. 176.95

NOTE: WATER 27'-9" FROM GROUND SURFACE 28 1/2 HRS AFTER COMPLETION OF DRILLING

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	UNDISTURBED, DISTURBED, LOST SAMPLE	U - 3" ø SHELBY; D.S. - DRIVE SAMPLE; M. - MOISTURE; R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/ft²; γd. DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.

B.C.H. 1

Bernard, Curtis, Hoggan
ENGINEERING & TESTING LTD.
10429 - 79TH AVE.
EDMONTON, - ALBERTA

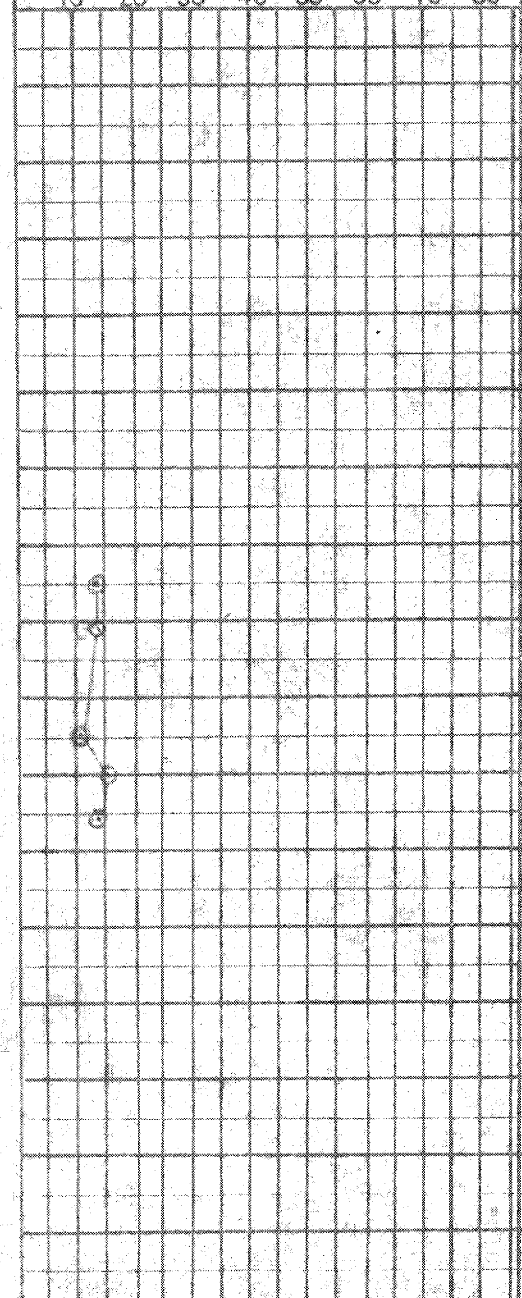
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE ROAD
EDMONTON ALBERTA

DWN. EAN.	CKD.	JOB NO. 161	DATE OCT 17/61	HOLE NO. 11 B.	PLATE NO. 16

NATURAL MOISTURE CONTENT O—O
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE / **SAMPLES**

GROUND SURFACE ELEV. 212.89

DEPTH ELEV FT.	CLASSIFICATION	SOIL SYMBOL	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE
	CLAY FILL						
4							4
8	LIGHT BROWN MOTTLED, STIFF SILTY						8
12							12
16	DARK GREY						16
20	LIGHT BROWN						20
24	GREY						24
28							28
32	CLAY TILL HARD			Qu. 1.0	CONTINUOUS SAMPLING		32
36	SOFTER SAND LAYER HARD			Qu. 6.2			36
40	SOFTER						40
	END OF HOLE ELEV 172.89						

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT	-UNDISTURBED	U - 3" ø SHELBY	Qu. UNCONFINED COMP. STR. T/Ft²	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.
PEAT, SAND	-DISTURBED	D.S.- DRIVE SAMPLE	γ_d. DRY UNIT WEIGHT lb/ft³	
FILL, TILL		M. - MOISTURE	C. CONSOLIDATION TEST	
CLAY, BED-ROCK	LOST SAMPLE	R.C.- ROCK CORE	M.A. GRAIN SIZE ANALYSIS	

B.C.H. 1

Bernard, Curtis, Hoggan
ENGINEERING & TESTING LTD.
10429 - 79TH AVE.
EDMONTON, - ALBERTA

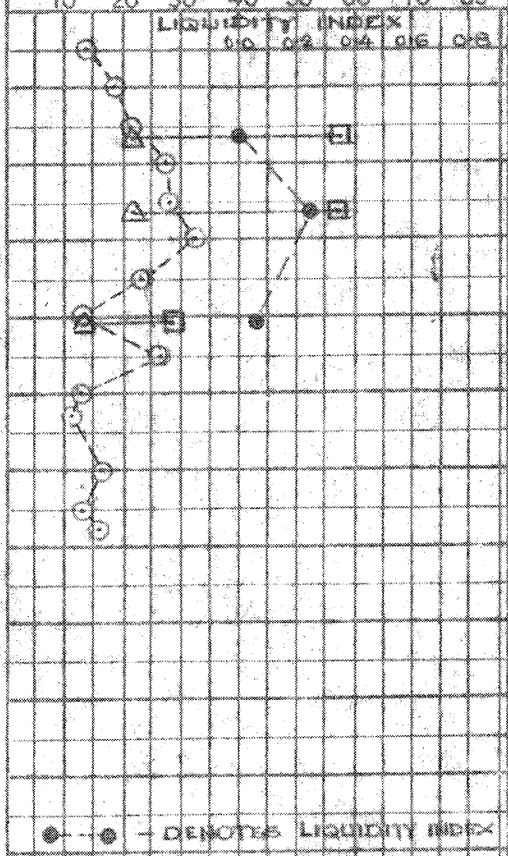
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE ROAD
EDMONTON ALBERTA

DWN. EAN	CKD.	JOB NO. 161	DATE OCT 17/61	HOLE NO. 12	PLATE NO. 17

NATURAL MOISTURE CONTENT O—O
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE / SAMPLES

GROUND SURFACE ELEV. 215.04

DEPTH ELEV FT.	CLASSIFICATION	SOIL SYMBOL	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE
	GRAVEL & CLAY						
	TOP SOIL						
4	CLAY						4
8	DRY SILTY			Qu 1.8		U1	8
12				Qu 0.7 / 2.2		U2	12
	WITH SILT LAYERS						
16				Qu 3.2		U3	16
	TILL SANDY						
20	CLAY			Qu 0.9		U4	20
	GLACIAL TILL		N-120			D.S.	
24	SANDY VERY HARD			Qu 7.5 / 10.0		D.S.	24
28	SILTY						28
32	SANDY						32
36	END OF HOLE ELEV 181.04						36

NOTE WATER SEAM AT 28'

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	UNDISTURBED, DISTURBED, LOST SAMPLE	U.- 3"ø SHELBY D.S.- DRIVE SAMPLE M.- MOISTURE R.C.- ROCK CORE	Qu. UNCONFINED COMP. STR. T/Ft² γd. DRY UNIT WEIGHT lb/ft³ C. CONSOLIDATION TEST M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D Raymond type Sampler the distance shown into the soil.

PLATE No 17

B.C.H. 1.

Bernard, Curtis, Hoggan
ENGINEERING & TESTING LTD.
10429 - 79TH AVE.
EDMONTON, - ALBERTA

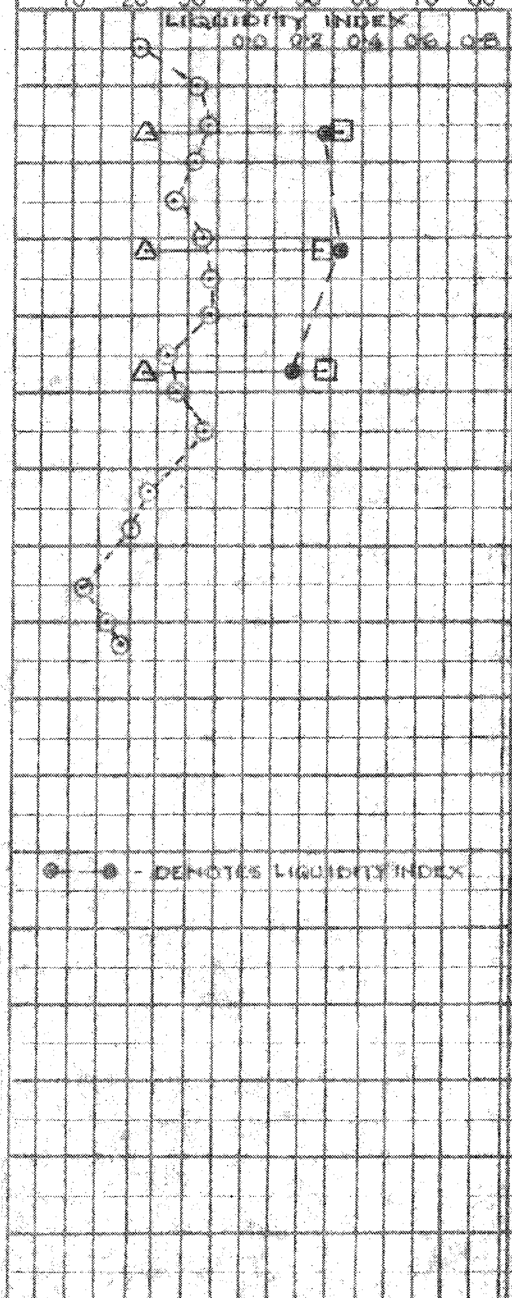
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

DWN. EAN	CKD.	JOB NO. 161	DATE OCT 18/61	HOLE NO. 13	PLATE NO. 18

NATURAL MOISTURE CONTENT ○—○
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80
LIQUIDITY INDEX 0.0 0.2 0.4 0.6 0.8



●—● - DENOTES LIQUIDITY INDEX

SOIL PROFILE — GROUND SURFACE ELEV. 213.82

DEPTH / ELEV FT.	CLASSIFICATION	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE
0–4	FILL — GRAVEL AND CLAY					4
8	CLAY & COAL		0.6		U1	8
12	CLAY, GRAVEL & COAL, WET.		0.75		U2	12
16–20	CLAY STICKY				U3	16, 20
24	CLAY — DARK GREY					24
28–32	GLACIAL TILL — LIGHT BROWN SANDY WITH COAL & SAND LAYERS				U4	28, 32
36	END OF HOLE ELEV. 180.82					36
40						40
44						44

NOTE
FREE WATER AT 26'. HOLE CAVING AT 23' (WATER ZONE)

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	UNDISTURBED, DISTURBED, LOST SAMPLE	U - 3" ø SHELBY; D.S. - DRIVE SAMPLE; M. - MOISTURE; R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/Ft²; γd DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.

BCH.1

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EDMONTON, - ALBERTA

TEST HOLE LOG & LABORATORY TEST DATA

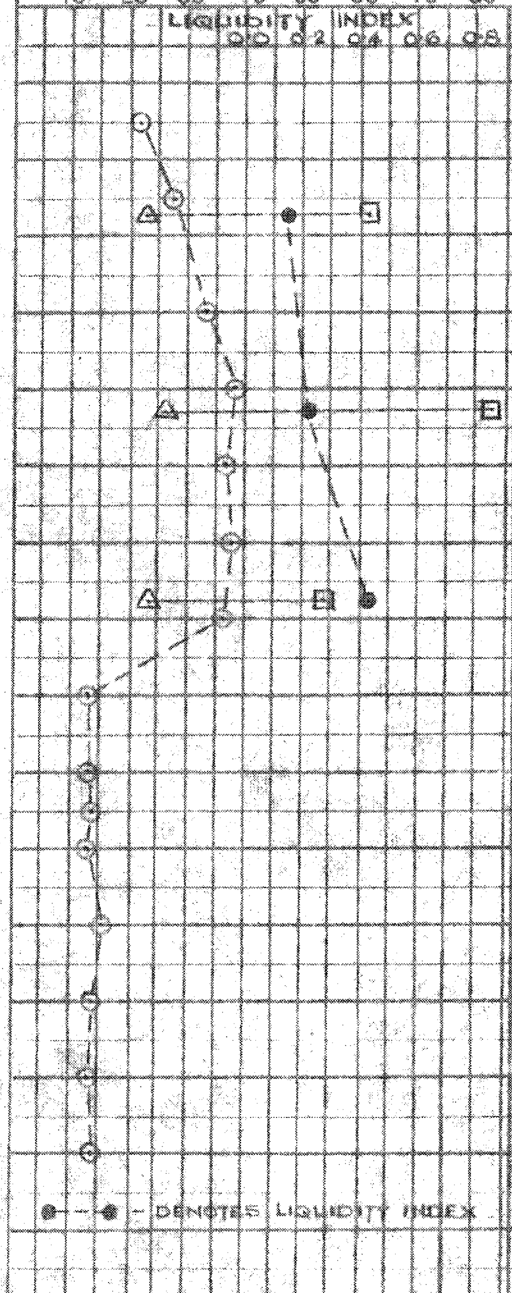
PROJECT LATTA RAVINE ROAD
EDMONTON ALBERTA

DWN. EAN	CKD.	JOB NO. 161	DATE OCT 19/61	HOLE NO. #14	PLATE NO. 19

NATURAL MOISTURE CONTENT O—O
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80

LIQUIDITY INDEX
0.0 0.2 0.4 0.6 0.8



SOIL PROFILE / SAMPLES

GROUND SURFACE ELEV. 2147.0

DEPTH / ELEV FT.	CLASSIFICATION	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE
0	FILL					
6			DISTURBED	disturbed	U1	6
10	CLAY		Qu 1.3	undisturbed	U2	10
14	LIGHT BROWN HIGHLY PLASTIC SLICKENSIDES					14
16			Qu 1.1	undisturbed	U3	16
17	SAND VERY DENSE	N = 48 →			DS	
18	GLACIAL TILL					18
21	BROWN VERY HARD WITH ROCKS	N = 150 →			DS	20
26	LAMINATED SANDY	N = 110 →			DS	26
30	DARK GREY MORE CLAYEY VERY HARD				U4	30
32	END OF HOLE ELEV. 183.70					32

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT	– UNDISTURBED	U – 3" ø SHELBY	Qu. UNCONFINED COMP. STR. T/Ft²	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.
PEAT, SAND	– DISTURBED	D.S. – DRIVE SAMPLE	γd. DRY UNIT WEIGHT lb/ft³	
FILL, TILL	– LOST SAMPLE	M. – MOISTURE	C. CONSOLIDATION TEST	
CLAY, BED-ROCK		R.C. – ROCK CORE	M.A. GRAIN SIZE ANALYSIS	

B.C.H. 1.

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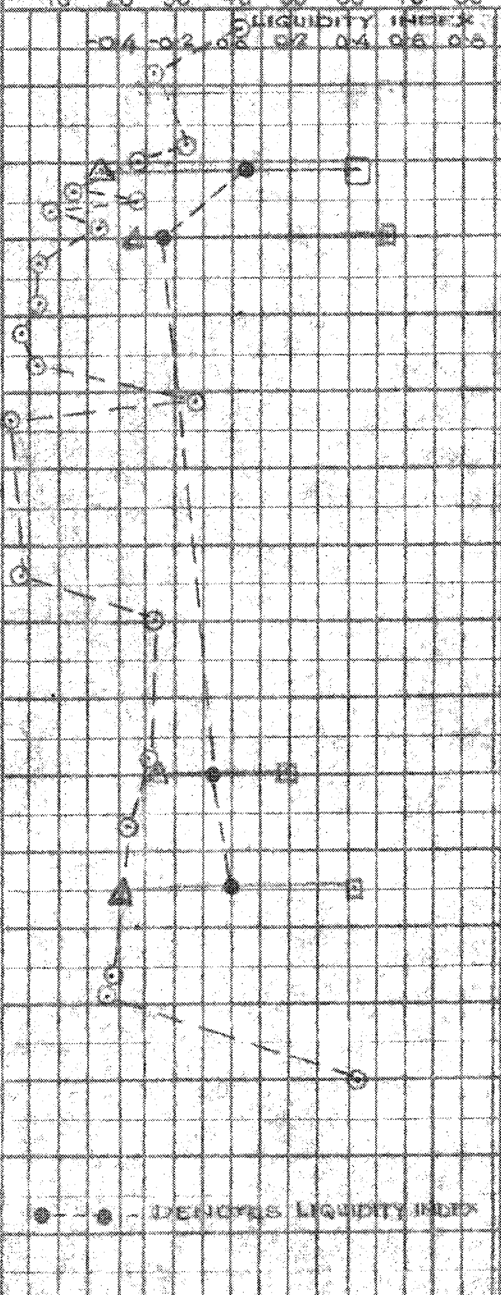
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE ROAD
EDMONTON ALBERTA

DWN. EAN.	CKD.	JOB NO. 161	DATE OCT 20/61	HOLE NO. 15.	PLATE NO. 20

NATURAL MOISTURE CONTENT ○—○
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE / SAMPLES

TOP OF CASING
GROUND SURFACE ELEV. 169.8

DEPTH ELEV FT.	CLASSIFICATION	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	TYPE	DEPTH SCALE
	FILL — CLAY				
5	COAL BRICK SAND GLASS WOOD ETC.		Qu: 0.9	U1	5
10	CLAY — DARK GREY STIFF HIGHLY PLASTIC		Qu: 0.8	U2	10
		N - 27		DS	
15	SAND — BROWN			U3	15
	GREY	N - 22		DS	
20	BROWN	N - 21		DS	20
25					25
	GREY. DRY COARSE	N - 28		DS	
30					30
35					35
		N - 27		DS	
40	COAL				40
	SHALE — DARK BROWN-GREY	N - 58		DS	
				U4	
45	LIGHT GREY			U5	45
	SANDSTONE — FINE SOFT				
50		N - 140		DS	50
	SHALE	N - 192		DS	
55					55
	WITH COAL		Qu: 0.43	U6	
60		N - 100		U7 DS	60
65	4" LAYER OF BENTONITE AT 76.5' IN SHALE.				65
70					70
75					75
80					80
	END OF HOLE.				

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	UNDISTURBED; DISTURBED; LOST SAMPLE	U - 3" ⌀ SHELBY; D.S. - DRIVE SAMPLE; M. - MOISTURE; R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/Ft²; γd. DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ⌀ O.D. Raymond type Sampler the distance shown into the soil.

PLATE No 20

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EDMONTON. - ALBERTA

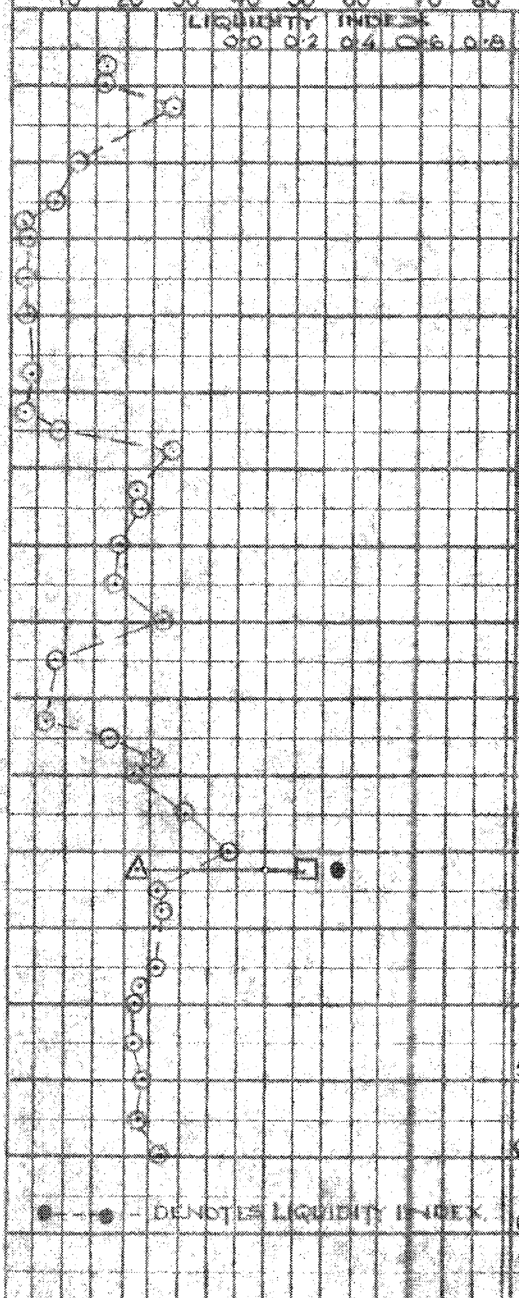
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

DWN. EAN	CKD.	JOB NO. 161	DATE	HOLE NO. 16	PLATE NO. 21

NATURAL MOISTURE CONTENT o—o
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) x—x

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80
LIQUIDITY INDEX
0.0 0.2 0.4 0.6 0.8



TOP OF CASING
GROUND SURFACE ELEV. 152.68

DEPTH / ELEV FT.	SOIL PROFILE — CLASSIFICATION	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	TYPE	DEPTH SCALE
4	CLAY — With Some Wood; Stiff				4
8	SAND — Fine				8
12		N-22		U1, DS	12
16	Coarse With Small Stones	N-48		DS	16
20	Dense	N-44		DS	20
24	COAL				24
28	SHALE — Soft	N-32	1.55	U2, DS	28
32	With Sand	N-24		DS, U3	32
36	SAND — With Some Red Clay			U4	36
40	SHALE — Soft With Rust Stains				40
44	MINE WORKINGS — Soft Sandstone Wood Paper etc.	N-13		DS, U6, U7	44
48	SHALE	N-36	Qu-2.5	U8, DS	48
52		N-52		DS	52
56	Hard Brown				56
60		N-230		U9, DS	60
64	END OF HOLE ELEV				64

NOTE: NO FREE WATER

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	UNDISTURBED; DISTURBED; LOST SAMPLE	U - 3" ø SHELBY; D.S.-DRIVE SAMPLE; M. - MOISTURE; R.C.-ROCK CORE	Qu. UNCONFINED COMP. STR T/ft²; γ_d DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D Raymond type Sampler the distance shown into the soil.

B.C.H. 1.

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Edmonton - Calgary
Alberta

TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE ROAD
EDMONTON ALBERTA

DWN. EAK	CKD.	JOB NO. 161	DATE OCT 61	HOLE NO. 17	PLATE NO. 22

NATURAL MOISTURE CONTENT ○—○
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80

SOIL PROFILE

DEPTH / ELEV FT.	CLASSIFICATION — GROUND SURFACE ELEV.
0–20	SAND
20–36	SHALE — SOFT
36–37	COAL
37–56	SHALE — HARD BROWN
56	BENTONITE
	END OF HOLE

SAMPLES

SOIL SYMBOL	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE

Depth scale: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	UNDISTURBED, DISTURBED, LOST SAMPLE	U - 3"ø SHELBY; D.S.-DRIVE SAMPLE; M.—MOISTURE; R.C.-ROCK CORE	Qu. UNCONFINED COMP. STR T/Ft²; γ_d DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2"ø O.D Raymond type Sampler the distance shown into the soil.

PLATE No 22

B.C.H.1.

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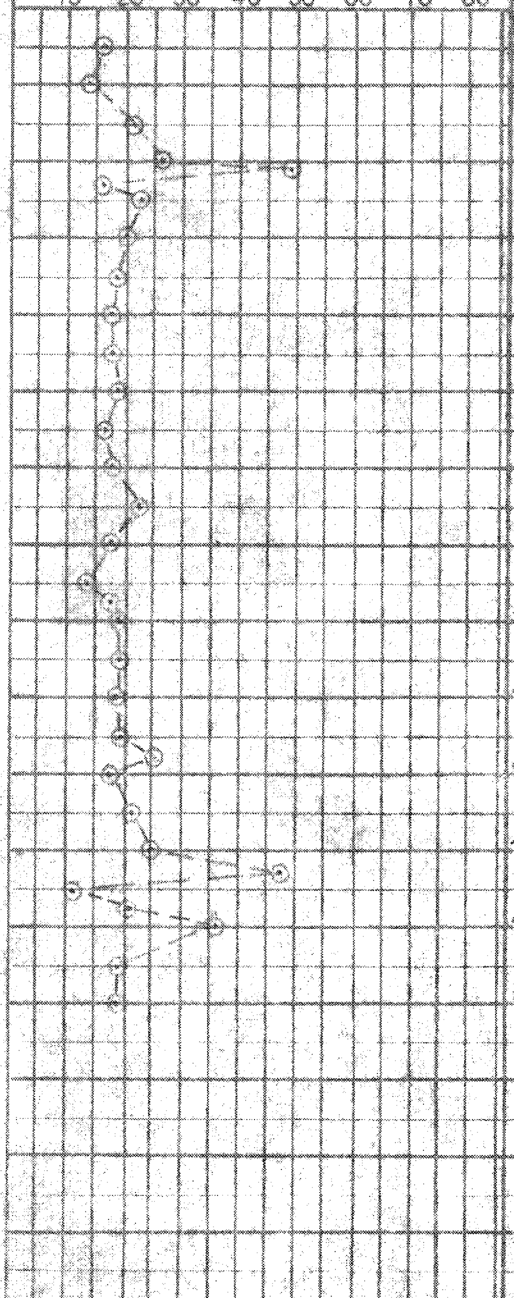
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE ROAD
EDMONTON ALBERTA

DWN. EAN	CKD.	JOB NO. 161	DATE	HOLE NO. 18	PLATE NO. 23

NATURAL MOISTURE CONTENT o—o
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) x—x

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE

GROUND SURFACE ELEV. 132 70

DEPTH ELEV FT.	CLASSIFICATION
	TOPSOIL
	SANDSTONE DECOMPOSED VERY HARD
4	SHALE GREY
8	COAL
12	SHALE GREY
	SANDSTONE DENSE
16	SHALE BROWN, VERY DENSE
	SANDSTONE VERY HARD
20	
24	SOFTER
28	COAL POWDERED
32	SHALE
36	BROWN DRY VERY HARD
40	
44	BENTONITIC CLAY
	COAL
48	BENTONITIC CLAY
52	END OF HOLE ELEV. 81 70

SAMPLES

OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	TYPE	DEPTH SCALE
			4
		U1	
N-20		DS	8
		U2	
N-73		DS	12
		U3	16
			20
			24
		U4	
			28
N-120		DS	32
			36
N-100		DS	40
			44
			48
			52

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT	UNDISTURBED	U - 3"ø SHELBY	Qu. UNCONFINED COMP. STR. T/ft²	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D Raymond type Sampler the distance shown into the soil.
PEAT, SAND	DISTURBED	D.S. - DRIVE SAMPLE	γ_d. DRY UNIT WEIGHT lb/ft³	
FILL, TILL	LOST SAMPLE	M. - MOISTURE	C. CONSOLIDATION TEST	
CLAY, BED-ROCK		R.C. - ROCK CORE	M.A. GRAIN SIZE ANALYSIS	

PLATE No 23

BCH 1

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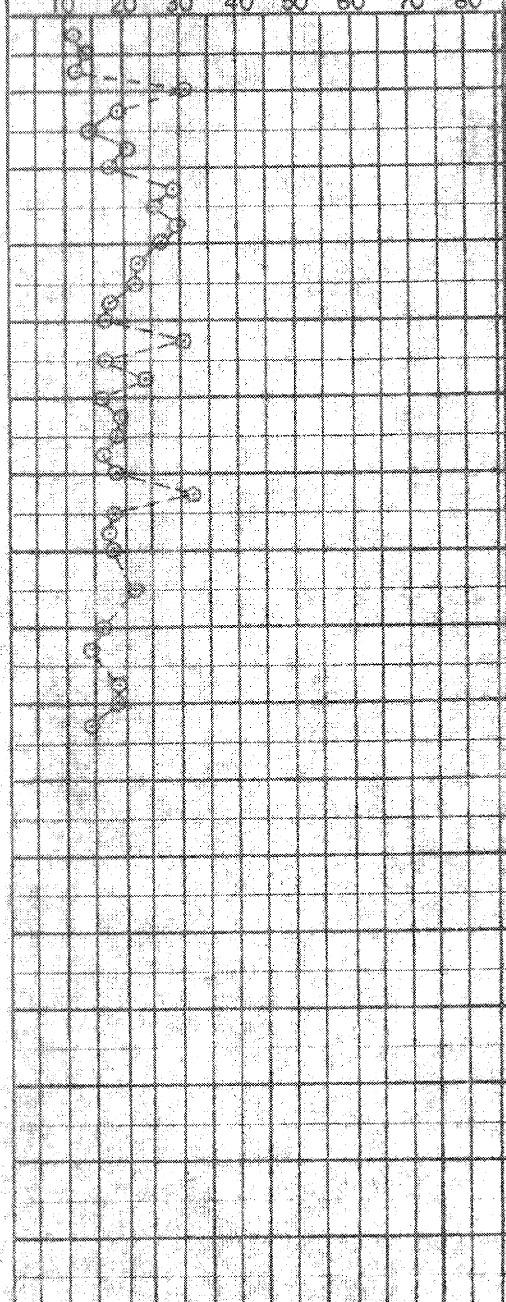
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

DWN. EAN	CKD.	JOB NO.	DATE JAN 18/82	HOLE NO. 19	PLATE NO. 24

NATURAL MOISTURE CONTENT O—O
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE / SAMPLES

DEPTH ELEV. FT.	CLASSIFICATION (GROUND SURFACE ELEV.)	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	TYPE	DEPTH SCALE
	FILL — Clay with Coal, Rubble, Cinders, Ashes. Material quite dense				
8				U1	8
		N = 22		DS	
	Clay. Ash. Coal. Pebbles laminations. Sandstone & Clay				
16				U2	16
	Clay. Rubble Ashes. & Pebbles	N = 18		DS	
				U3	
24	CLAY — Sandy, Silty, Soft with Sand layers				24
	SAND — Clayey, Soft	N = 13		DS	
	Saturated. Fine Medium. Dense. Coal specks.			U4	
32					32
		N = 42		DS	
	CLAY TILL — Shale layer 38'			U5	
40	SANDSTONE — Hard Blue				40
	SHALE	N = 41 FOR 3" PEN.		DS	
48	Hard Brown				48
56					56
	SANDSTONE				
64	Blue - Grey				64
	SHALE				
72	Hard Brown				72
80	Coal				80
	END OF HOLE				
88	ELEV.				88

NOTE: Free water in Sand layer at 27'

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	UNDISTURBED, DISTURBED, LOST SAMPLE	U - 3" ø SHELBY; D.S. - DRIVE SAMPLE; M. - MOISTURE; R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/Ft²; γd. DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.

B.C.H. 1

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EDMONTON, — ALBERTA

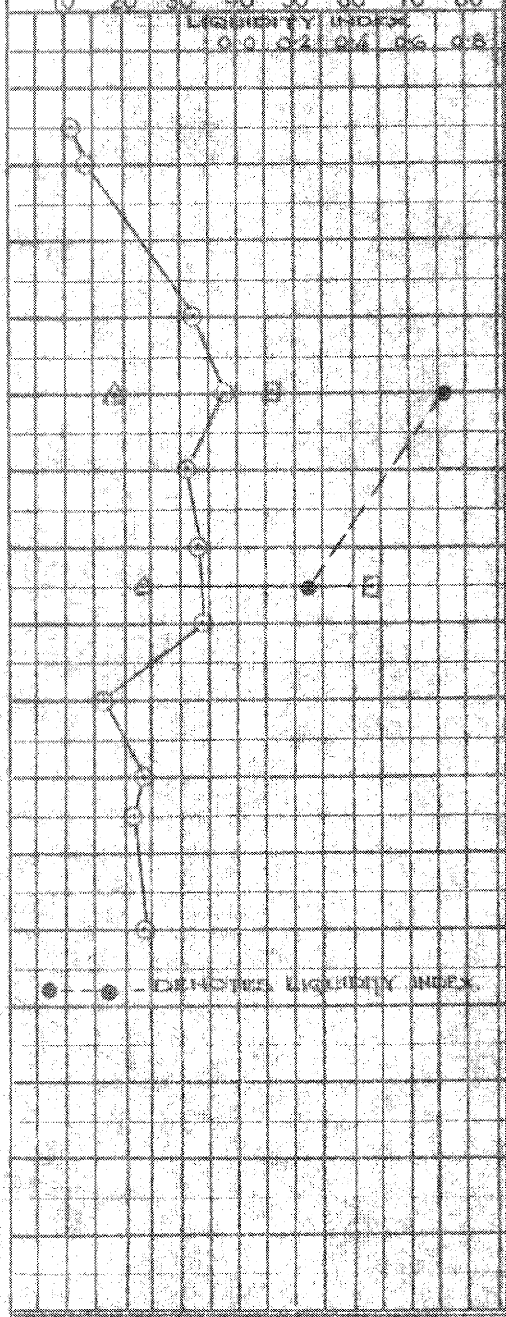
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE ROAD
EDMONTON ALBERTA

DWN. EAN	CKD.	JOB NO. 161	DATE NOV 13/61	HOLE NO. 20	PLATE NO. 25

NATURAL MOISTURE CONTENT ○—○
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE — SAMPLES

DEPTH / ELEV FT.	CLASSIFICATION — GROUND SURFACE ELEV. 135.4	SOIL SYMBOL	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE
	TOPSOIL						
2	FILL						2
4	CLAY BRICK RUBBLE, SILT						4
6							6
8	CLAY — SANDY LIGHT BROWN						8
10	SILTY WITH COAL SPECKS			2.7		U1	10
12	BLUE-GREY, ROCK & COAL INCLUSIONS						12
14	SILTY LIGHT BROWN WITH COAL						14
16	SILTY BLUE WITH ORGANICS			1.35		U2	16
18	SANDY						18
20	SANDY WITH ROCK INCLUSIONS			1.5		U3	20
22	AS ABOVE WITH CLAY						22
24	WITH SILT, RUST COAL ROOTS						24
26	SAND — SILTY CLAYEY WITH COAL & ROCK					U4	26
28	COAL ▼						28
	SHALE						
30	SILT, SAND & CLAY						30
	SHALE						
32	END OF HOLE ELEV 104.4						
	NOTE FREE WATER AT 28'						

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, PEAT, FILL, CLAY, SILT, SAND, TILL, BED-ROCK	UNDISTURBED, DISTURBED, LOST SAMPLE	U - 3" ø SHELBY; D.S. - DRIVE SAMPLE; M. - MOISTURE; R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR T/Ft²; γ_d DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D Raymond type Sampler the distance shown into the soil.

PLATE No 25

B.C.H. 1

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EDMONTON, - ALBERTA

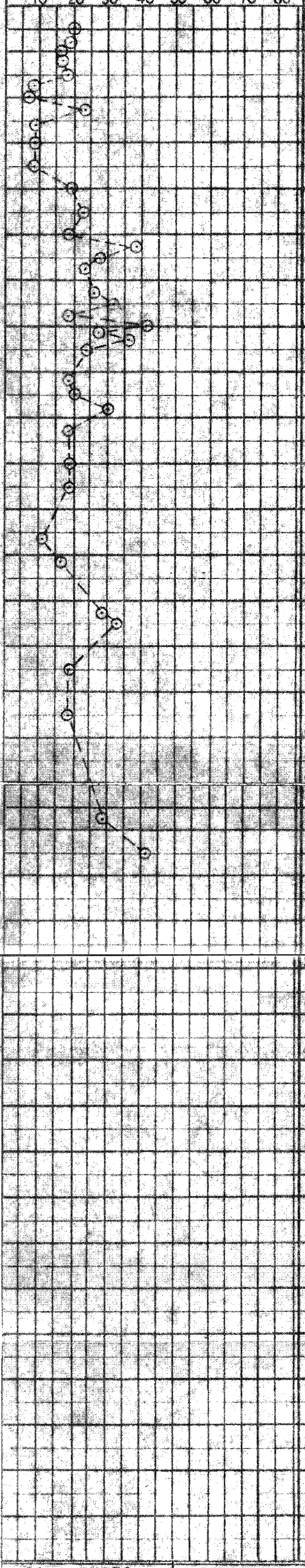
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE ROAD, EDMONTON ALBERTA

DWN. EAN	CKD.	JOB NO. 161	DATE NOV 14/61	HOLE NO. 21	PLATE NO. 26

NATURAL MOISTURE CONTENT ○—○
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%) / Standard Penetration (N): 10 20 30 40 50 60 70 80



GROUND SURFACE ELEV. 160.9

DEPTH (FT.)	CLASSIFICATION	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	TYPE
0–5	SAND SILT & CLAY With Coal			
5–8	CLAY With Sand & Coal			U1
8–15	SAND With Coal / Clean / With Gravel & Coal	N-25		DS
15–17	GRAVEL Clean			
17–22	SANDSTONE	N-42	2.5	DS, U2
22–24	COAL			
24	SHALE			
24–25	COAL Dry			
25–27	SHALE Grey Dry			
27–32	SANDSTONE			
32–34	SHALE Grey Dry			
34–37	COAL			
37–40	SHALE Grey Dry			
40–53	SANDSTONE	N-164		DS
53–54	SANDY CLAY Blue			
54–58	COAL Dry			
58–73	CLAY Dark Grey	N-149		DS
73–75	BENTONITE			
75–79	COAL Fairly Moist			U3
79–95	BENTONITE	N-153		DS
95–96	SHALE	N-138		DS

END OF HOLE
ELEV. 65.50

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED ROCK	UNDISTURBED, DISTURBED, LOST SAMPLE	U - 3" ø SHELBY; D.S. - DRIVE SAMPLE; M. - MOISTURE; R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/Ft²; γd. DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.

B.C.H. 1.

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10429 - 79TH AVE.
EDMONTON, - ALBERTA

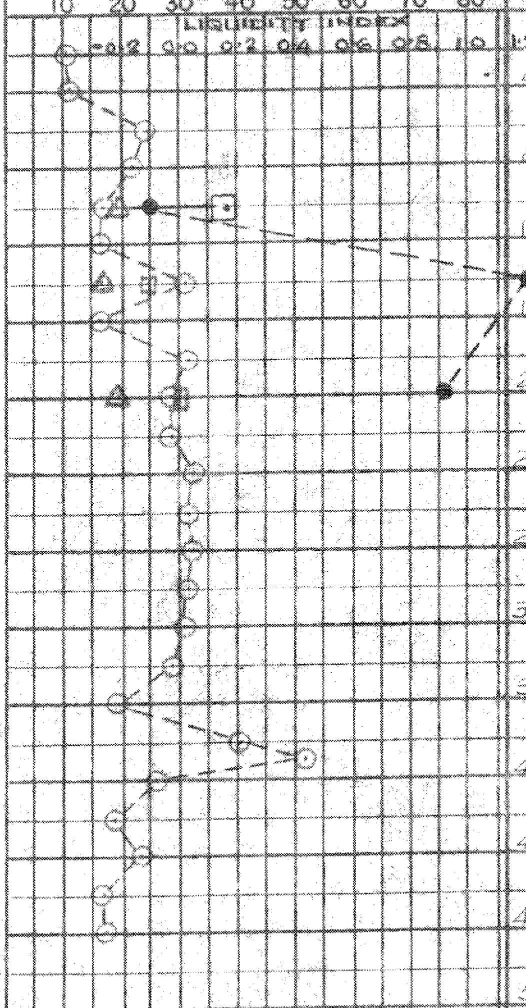
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE ROAD
EDMONTON ALBERTA

DWN. J.T.F.	CKD.	JOB NO. 161	DATE JAN. 25/62	HOLE NO. 22	PLATE NO. 27

NATURAL MOISTURE CONTENT O—O
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) X—X

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80
LIQUIDITY INDEX
-0.2 0.0 0.2 0.4 0.6 0.8 1.0 1.2



●—● DENOTES LIQUIDITY INDEX

SOIL PROFILE

DEPTH ELEV FT.	CLASSIFICATION GROUND SURFACE ELEV.
	TOPSOIL
	SAND - GRAVEL
4	CLAY - SANDY, SOFT, MEDIUM PLASTIC, LIGHT BROWN
8	SILT - SANDY, CLAYEY, LOW PLASTIC, SOFT.
12	SILT - SANDY, LIGHT BROWN, SOFT, LOW PLASTICITY, THIN COAL LAYERS.
16	SAND
	SILT. - VERY SANDY, HIGHLY SENSITIVE TO SHAKE TEST.
20	
	FREE WATER
24	
28	SAND. - SOFT, SATURATED, WELL-GRADED.
32	BROWN SHALE - SOFT
	BECOMING HARDER
36	
	BENTONITIC CLAY
40	BROWN SHALE - SANDY, DRY & HARD.
44	
48	BLUE SANDSTONE
	END OF HOLE ELEV.
52	

SAMPLES

OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE
				4
			U1	
				8
N=9			DS	
			U2	12
			U3	16
N=10			DS	
			U4	20
				24
			U5	
N=14			DS	28
				32
			U6	
				36
N=42			DS	
				40
				44
				48
				52

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	- UNDISTURBED - DISTURBED LOST SAMPLE	U - 3"ø SHELBY D.S. - DRIVE SAMPLE M. - MOISTURE R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/Ft² γd. DRY UNIT WEIGHT lb/ft³ C. CONSOLIDATION TEST M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2 ø O.D. Raymond type Sampler the distance shown into the soil.

B.C.H. 1.

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EDMONTON, - ALBERTA

TEST HOLE LOG & LABORATORY TEST DATA

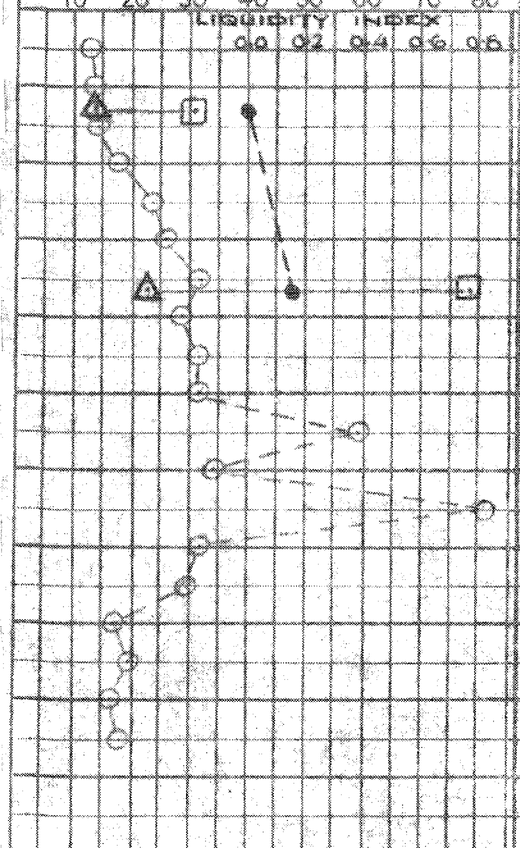
PROJECT LATTA RAVINE ROAD
EDMONTON ALBERTA

DWN. J.T.F.	CKD.	JOB NO. 161	DATE JAN. 29/62	HOLE NO. 23	PLATE NO. 28

NATURAL MOISTURE CONTENT o—o
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) x—x

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80

LIQUIDITY INDEX
0.0 0.2 0.4 0.6 0.8



●—● DENOTES LIQUIDITY INDEX.

SOIL PROFILE / SAMPLES

DEPTH / ELEV FT.	CLASSIFICATION (GROUND SURFACE ELEV.)	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	TYPE	DEPTH SCALE
	TOPSOIL				
4	FILL — SANDY, MED. DENSE, COAL PIECES, ASHES, CLAY RUBBLE			U1	4
8	SAND — GREY, MED. DENSE.			U2	8
12	CLAY — SANDY, SOFT, GREY BROWN, MED. PLASTIC, COAL, BENTONITIC POCKETS	N=18		U3, DS, U4	12
16	CLAY — SOFT, MED. BROWN, MED. PLASTIC	N=26		DS	16
20	BENTONITE				20
24	COAL — PARTLY MINED OUT & BACKFILLED WITH SAND & GRAVEL			U5, U6	24
28	SAND — CLAYEY, SOFT.	N=14		DS	28
	BLUE SANDSTONE — SOFT, HARD & DENSE				
32	BROWN SHALE	REFUSAL		DS	32
36	BLUE SANDSTONE				36
40	BROWN SHALE				40
44	END OF HOLE ELEV.				44

NOTE: FREE WATER @ 17'

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	UNDISTURBED; DISTURBED; LOST SAMPLE	U - 3" ø SHELBY; D.S. - DRIVE SAMPLE; M. - MOISTURE; R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/ft²; γd. DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.

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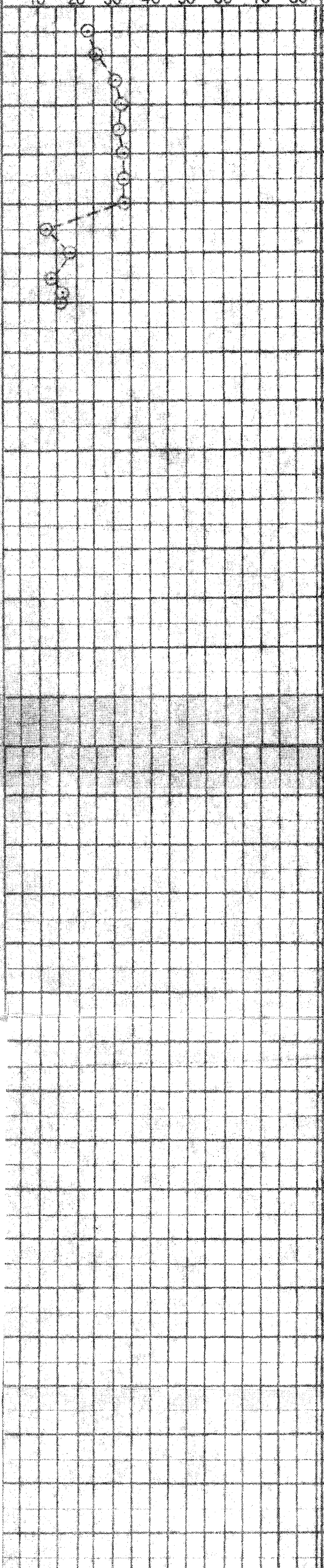
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE ROAD
EDMONTON ALBERTA

DWN. EAN	CKD.	JOB NO. 161	DATE NOV. 1961	HOLE NO. 24	PLATE NO. 29

NATURAL MOISTURE CONTENT O—O
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE

DEPTH / ELEV FT. — CLASSIFICATION — GROUND SURFACE ELEV.

Classification
TOPSOIL
CLAY — SILTY STICKY MOTTLED - BROWN; STIFFER MOTTLED BROWN
SANDY TILL
SAND & GRAVEL
CLAY TILL — HARD
SAND
CLAY TILL
SHALE — SANDY
SAND GRAVEL & COAL
CLAY TILL — HIGHLY PLASTIC
SAND — FINE UNIFORM DRY
GRAVEL WITH SOME COAL
SHALE — HARD
COAL
SANDSTONE
END OF HOLE ELEV.

NOTE
LOSING CIRCULATION AT 85 FT.

Depth scale: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, 60, 64, 68, 72, 76, 80, 84, 88, 92, 96, 100

SAMPLES

OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE
			U1
			U2
N - 12			DS
			U3
			U4
			U5
			U6
N - 50			DS
N - 60			DS
			U7
N - 48			DS
			U8
N - 60			DS
N - 85			DS
N - 150			DS
N - 60			DS
N - 80			DS

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	UNDISTURBED; DISTURBED; LOST SAMPLE	U - 3"ø SHELBY; D.S. - DRIVE SAMPLE; M. - MOISTURE; R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/Ft²; γd. DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D Raymond type Sampler the distance shown into the soil.

B.C.H. 1

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TEST HOLE LOG & LABORATORY TEST DATA

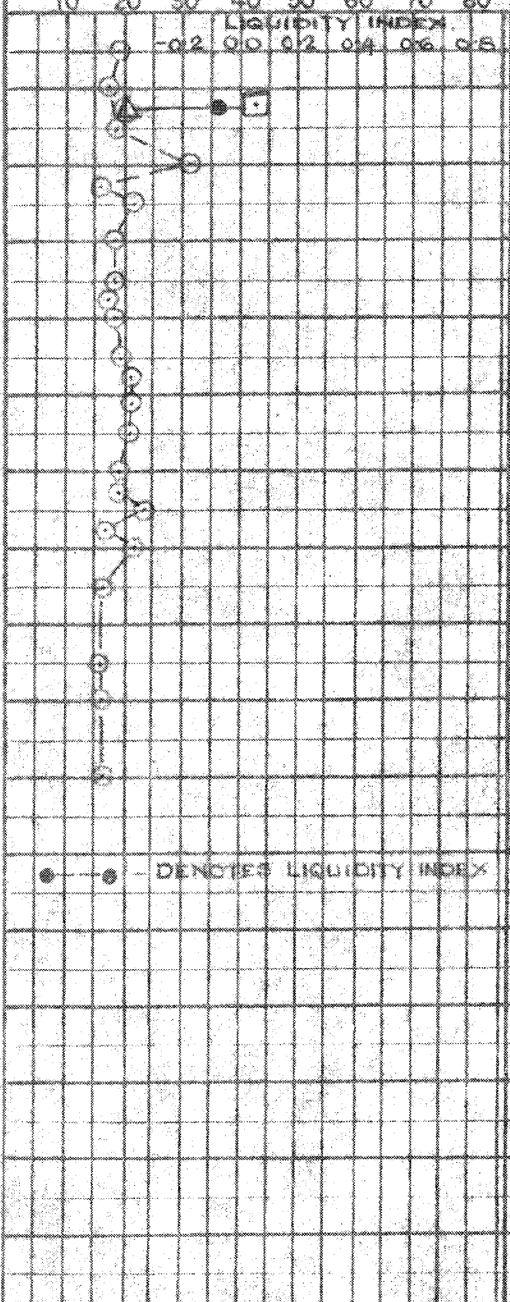
PROJECT LATTA RAVINE ROAD
EDMONTON ALBERTA

DWN. EAN	CKD.	JOB NO. 161	DATE OCT 23/61	HOLE NO. 25	PLATE NO. 30

NATURAL MOISTURE CONTENT O—O
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) Δ—Δ
STANDARD PENETRATION TEST (N) x—x

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80

LIQUIDITY INDEX
-0.2 0.0 0.2 0.4 0.6 0.8



•—• - DENOTES LIQUIDITY INDEX

SOIL PROFILE

TOP OF CASING ~~GROUND SURFACE~~ ELEV. 210.41

DEPTH / ELEV FT.	CLASSIFICATION
	TOPSOIL
4	CLAY — ORGANIC
	CLAY TILL
8	← MARSH COAL LAYER
12	← SAND LAYER
16	← WHITE SAND LAYER, SANDY
20	WET, SOFT
24	FINE GRAINED FIRM.
	CLAY HIGHLY PLASTIC
28	CLAY SHALE
	BENTONITIC CLAY
	COAL
32	SHALE
36	HARD DRY BROWN
40	END OF HOLE. ELEV. 172.41

SAMPLES

OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE
		Undisturbed	U1	4–8
N - 36	→	Disturbed	D.S	8–12
		Undisturbed	U2	12
		Undisturbed	U3	16
N - 14	→	Disturbed	DS	20
		Undisturbed	U4	20–24
N - 28	→	Disturbed	DS	24–28
		Undisturbed	U6	28
N - 120	→	Undisturbed	DS	32–36
N - 150	→	Undisturbed	DS	36–40

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	- UNDISTURBED - DISTURBED - LOST SAMPLE	U - 3" ø SHELBY D.S - DRIVE SAMPLE M. - MOISTURE R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/Ft² γd. DRY UNIT WEIGHT lb/ft³ C. CONSOLIDATION TEST M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.

PLATE No 30

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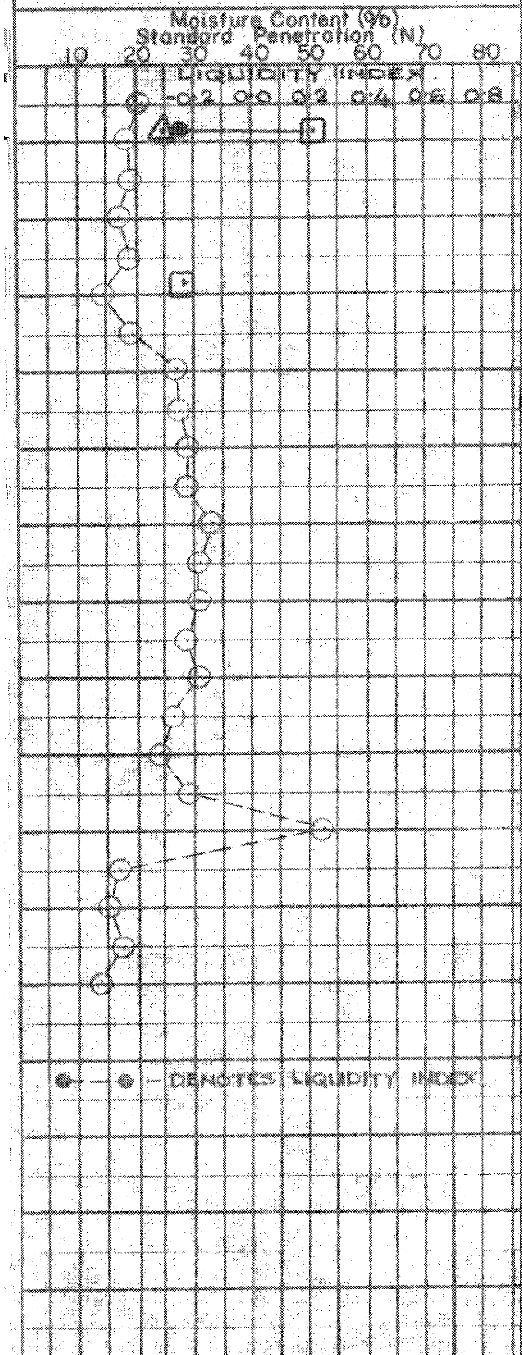
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE ROAD
EDMONTON ALBERTA

DWN. J.T.F.	CKD.	JOB NO. 161	DATE JAN. 31/62	HOLE NO. 26	PLATE NO. 31

NATURAL MOISTURE CONTENT o—o
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) x—x



SOIL PROFILE / SAMPLES

DEPTH / ELEV. FT.	CLASSIFICATION (GROUND SURFACE ELEV.)	SOIL SYMBOL	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE
	TOPSOIL						
4	CLAY — SILTY, SANDY, FIRM, DRY, MEDIUM PLASTIC					U1	4
						U2	
8			N = 4			DS	8
	SILT — SANDY, LOW PLASTICITY, SOFT, SPONGY					U3	
12						U4	12
16	SAND. — SILTY, NO DRY STRENGTH, LOW DENSITY					U5	16
	VERY SENSITIVE TO SHAKE TEST @ 16'		N = 6			DS	
20	WATER VISIBLE IN SAND @ 19'						20
24						U6	24
	SAND — BLUE, COARSE GRAINED, MED. DENSITY, SATURATED.					U7	
28							28
	BROWN SHALE		N = 38			DS	
						U8	
32							32
36			N = 74			DS	36
40							40
	BENTONITIC CLAY						
	SANDSTONE — FINE-GRAINED, GREEN, VERY DENSE.						
44							44
	SANDSTONE — BLUE, COARSE - GRAINED						
48	END OF HOLE						48
	ELEV.						
52							52

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT	- UNDISTURBED	U - 3" ø SHELBY	Qu. UNCONFINED COMP. STR. T/Ft²	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.
PEAT, SAND	- DISTURBED	D.S. - DRIVE SAMPLE	γ_d. DRY UNIT WEIGHT lb/ft³	
FILL, TILL	- LOST SAMPLE	M. - MOISTURE	C. CONSOLIDATION TEST	
CLAY, BED-ROCK		R.C. - ROCK CORE	M.A. GRAIN SIZE ANALYSIS	

PLATE No 31

B.C.H. 1

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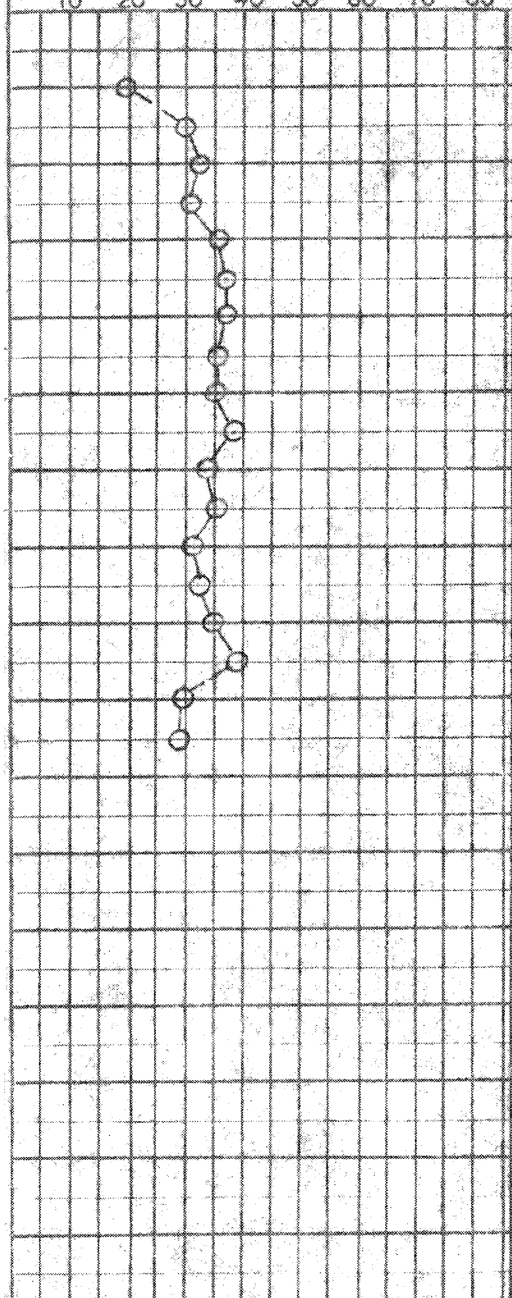
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

DWN. J.T.F.	CKD.	JOB NO. 161	DATE FEB. 5/62	HOLE NO. 27	PLATE NO. 32

NATURAL MOISTURE CONTENT O—O
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE / SAMPLES

DEPTH / ELEV FT.	CLASSIFICATION (GROUND SURFACE ELEV.)	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE
	TOPSOIL					
	GRAVEL FILL					
4	FILL — CLAY, GRAVEL, SAND, RUBBLE, DRY & HARD				U1	4
8	FILL — SILTY CLAY, SOFT, MEDIUM PLASTICITY, YELLOW-BROWN				U2	8
12		N=13			DS	12
					U3	
16	CLAY FILL — MOTTLED BROWN, SOFT, MEDIUM PLASTICITY, GRAVEL, ORGANIC INCLUSIONS					16
20		N=11			DS	20
24					U4	24
28						28
32	END OF FILL MAT'L.					32
	OLD TOPSOIL					
36	SAND — SILTY, WET, MED. DENSE					36
40	END OF HOLE ELEV.					40

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, PEAT, FILL, CLAY, SILT, SAND, TILL, BED-ROCK	UNDISTURBED, DISTURBED, LOST SAMPLE	U - 3" ø SHELBY; D.S. - DRIVE SAMPLE; M. - MOISTURE; R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/Ft²; γ_d DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D Raymond type Sampler the distance shown into the soil.

67

B.C.H.1

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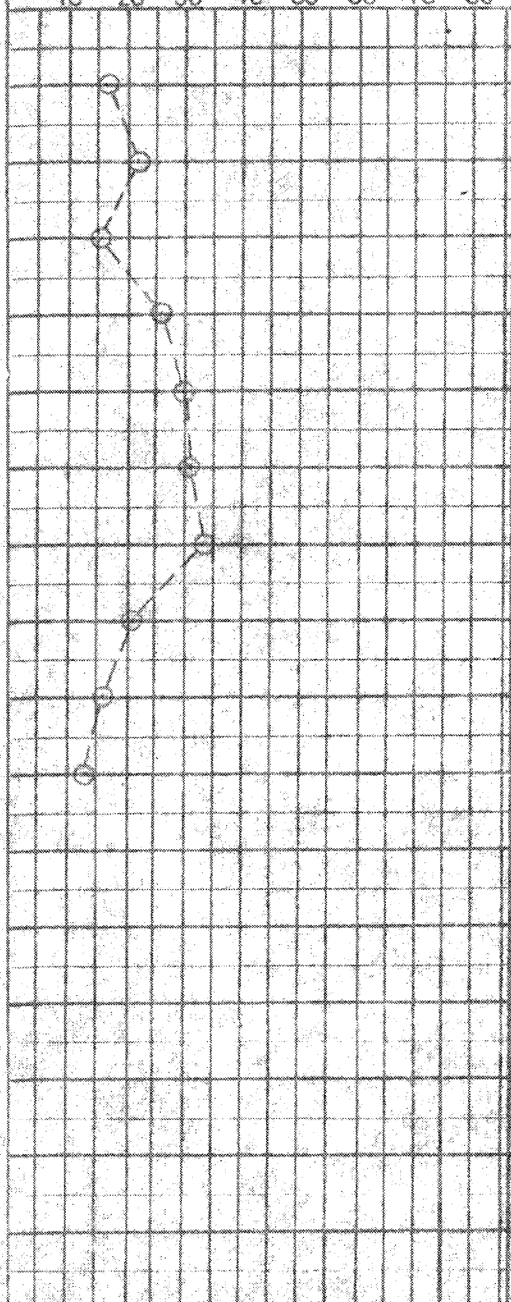
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE ROAD EDMONTON ALBERTA

DWN. J.T.F. | CKD. | JOB NO. 161 | DATE FEB 9/62 | HOLE NO. 29 | PLATE NO. 34

NATURAL MOISTURE CONTENT O—O
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×



DEPTH / ELEV FT.	SOIL PROFILE — CLASSIFICATION (GROUND SURFACE ELEV.)	SOIL SYMBOL	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE
0	TOPSOIL						
2–10	FILL — ASHES, RUBBLE, CLAY, SAND, NAILS, WIRE; OLD DISCARDED ASH PILE; END OF FILL MAT'L.						2, 4, 6, 8, 10
6						U1	6
11	OLD DECAYED TOPSOIL						
12	CLAY — SILTY, RUST BANDS, SAND LAMINATIONS, DECAYED ROOTS, SOFT, MED. PL.					U2	12
15			N = 12			DS	14
16	SAND — CLAYEY, LOW PLASTIC, VERY SOFT, COAL SPECKS, PEBBLES, SILT POCKETS, RUST BANDS.						16
18						U3	18
19	CLAY — SANDY, FIRM, MED. PL.						20
20	END OF HOLE ELEV.						22

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, PEAT, FILL, CLAY, SILT, SAND, TILL, BED-ROCK	UNDISTURBED, DISTURBED, LOST SAMPLE	U - 3" ø SHELBY; D.S. - DRIVE SAMPLE; M. - MOISTURE; R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/ft²; γd. DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.

PLATE NO 34

B.C.H. 1

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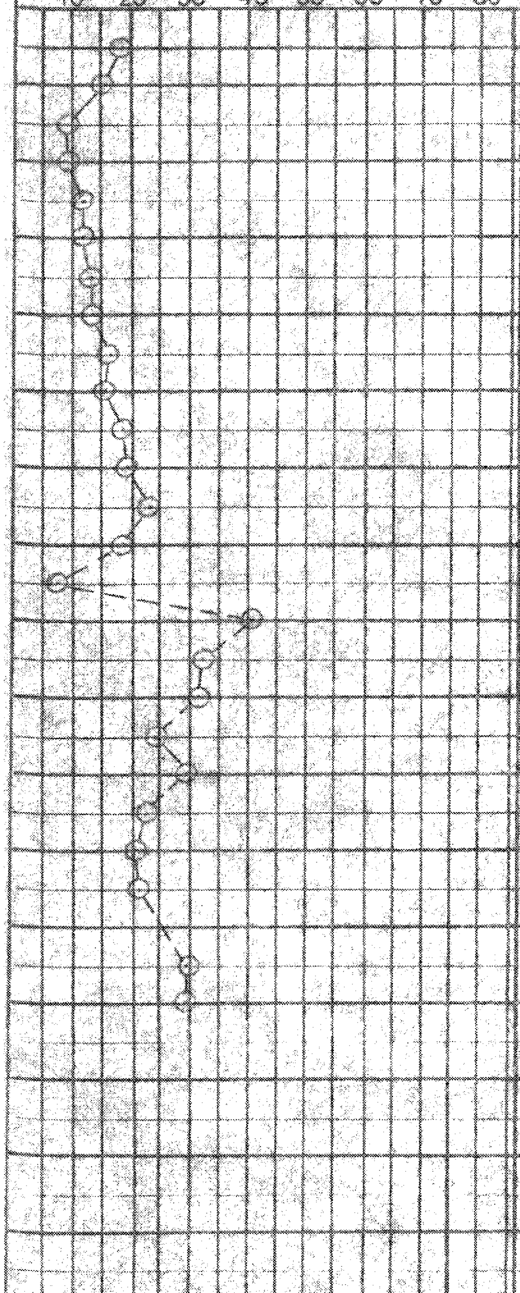
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE ROAD, EDMONTON ALBERTA

DWN.	CKD.	JOB NO.	DATE	HOLE NO.	PLATE NO.
J.T.F.		161	JAN 23/62	30	35

NATURAL MOISTURE CONTENT ○—○
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE / SAMPLES

GROUND SURFACE ELEV.

DEPTH ELEV FT.	CLASSIFICATION	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	TYPE	DEPTH SCALE
	CLAY — LIGHT BROWN, SANDY, MED. PLASTIC, ROOTLETS				
4	FILL — RUBBLE, SAND, GRAVEL, VERY DENSE			U1	4
8		N=54		DS	8
	SAND — CLAYEY, MED. DENSE, COAL SPECKS, LAYERS OF FINE YELLOW SAND			U2	
12					12
16				U3	16
20	CLAY TILL — SANDY, DARK GREY, MED. PLASTIC, SHALE PIECES, PEBBLES, FIRM	N=27		DS	20
				U4	
24					24
28	SAND — YELLOW-BROWN, LOOSE, WELL-GRADED	N=32		DS	28
				U5	
32	COAL				32
36	WHITE SANDSTONE — SOFT				36
	SHALE — SANDY	N=34		DS	
40					40
	CLAYEY, HARD & DENSE			U6	
44					44
	BLUE SANDSTONE				
48	COAL	REFUSAL		DS	48
	SHALE				
52					52
56	END OF HOLE ELEV.				56

NOTE: WATER IN HOLE AT 36'

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	UNDISTURBED, DISTURBED, LOST SAMPLE	U - 3" ø SHELBY; D.S. - DRIVE SAMPLE; M. - MOISTURE; R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/ft²; γd. DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.

B.C.H. 1.

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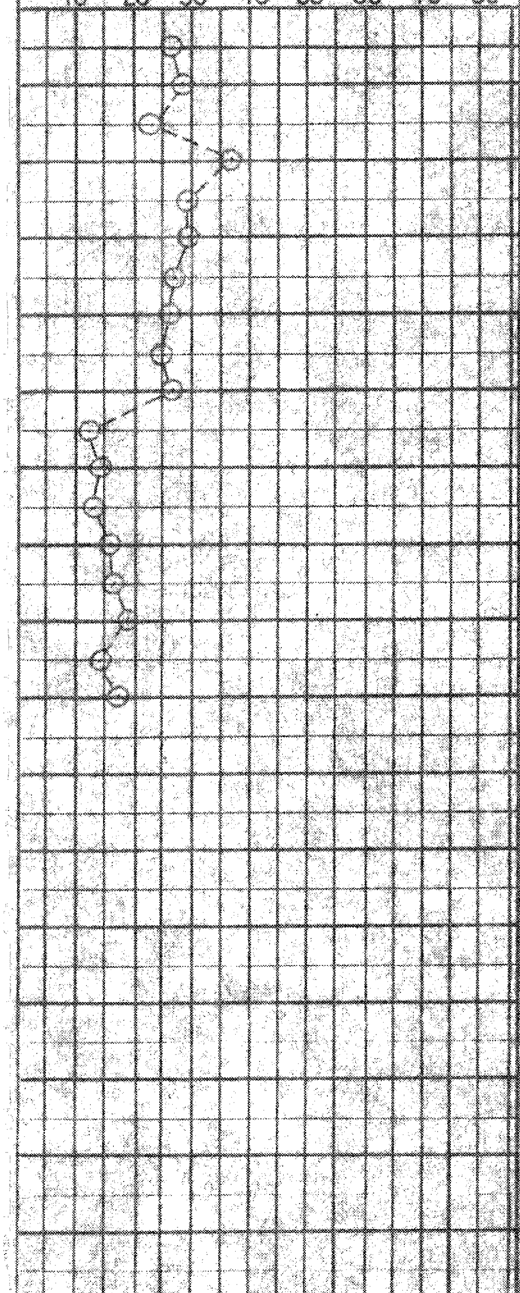
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT: LATTA RAVINE ROAD. EDMONTON ALBERTA

DWN. J.T.F.	CKD.	JOB NO. 161	DATE JAN. 25/61	HOLE NO. 31	PLATE NO. 36

NATURAL MOISTURE CONTENT O—O
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) Δ—Δ
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE

DEPTH / ELEV FT.	CLASSIFICATION (GROUND SURFACE ELEV.)	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE
	TOPSOIL					
4	FILL — RUBBLE, ASHES, COAL, CLAY & SANDSTONE POCKETS.				U1	4
8	CLAY — SANDY, SILTY, SOFT, LOW PLASTICITY, YELLOW-BROWN				U2	8
12		N=14			DS	12
16	SAND					16
20	CLAY-TILL — GREY BROWN, FIRM, MEDIUM PLASTIC, FISSURED, COAL PEBBLES, RUST POCKETS.				U3	20
24	SANDSTONE — BLUE, DENSE	REFUSAL			DS	24
28						28
32	BROWN SHALE — 3" COAL SEAM					32
36						36
40	END OF HOLE ELEV.					40

NOTE: FREEWATER IN SAND SEAM @ 16'

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	UNDISTURBED, DISTURBED, LOST SAMPLE	U - 3" ø SHELBY; D.S. - DRIVE SAMPLE; M. - MOISTURE; R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/Ft²; γd. DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.

B.C.H. 1

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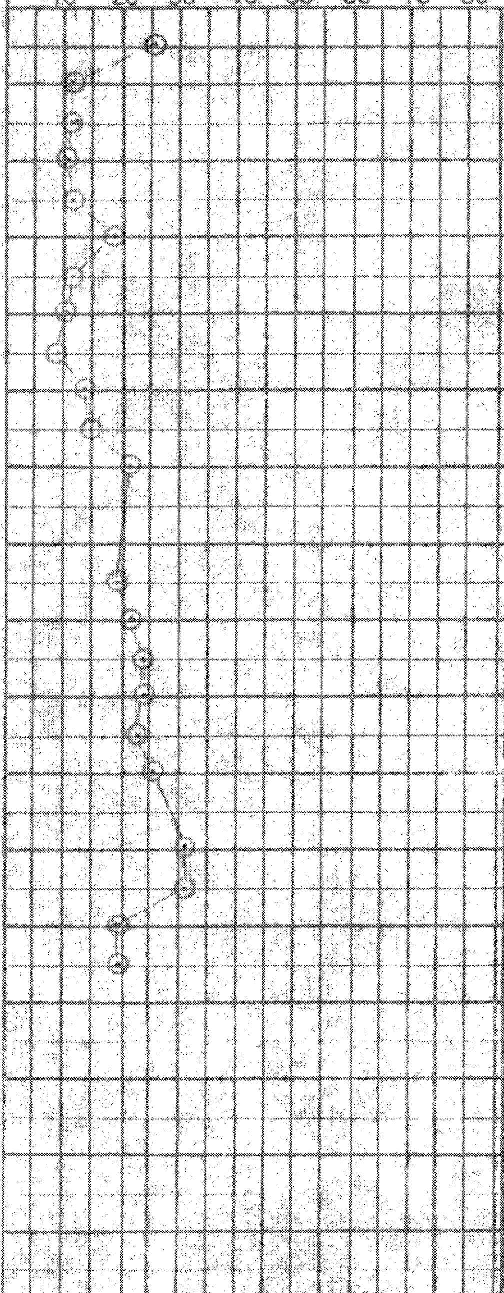
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

DWN. E.A.N.	CKD.	JOB NO.	DATE April 19/62	HOLE NO. 32	PLATE NO. 37

NATURAL MOISTURE CONTENT ○—○
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE / SAMPLES

DEPTH / ELEV FT.	CLASSIFICATION (GROUND SURFACE ELEV.)	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE
	CLAY. SANDY. YELLOW BROWN					
4	SAND. COAL SPECKS. ROCK SHALE PIECES. DENSE. DRY. TOP 2" COARSE BLUE - GREY. RUSTY BROWN WITH SALTS AT 3.5 FT.					4
8		N·23			U1, D.S.	8
12	SHALE. SOFT RED WITH SEAMS OF VERY SOFT COAL				U2	12
	SANDSTONE. BLUE - GREY					
16					U3	16
20	RUSTY BROWN WITH THIN LAMINATED COAL BANDS.	N·73			D.S., U4	20
24	SHALE. BROWN & BLACK.					24
	COAL					
28						28
	SANDSTONE. WHITE. VERY DENSE.	N·125			D.S.	
32	SHALE					32
36	BROWN	N·42			D.S.	36
40						40
44	COAL ▼ WATER BEARING					44
	SHALE					
48	BROWN	N·124			D.S.	48
52						52
	END OF HOLE					
56						56

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	UNDISTURBED, DISTURBED, LOST SAMPLE	U - 3" ø SHELBY; D.S. - DRIVE SAMPLE; M. - MOISTURE; R.C. - ROCK CORE	Qu. UNCONFINED COMP STR T/Ft²; γ_d DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.

BCH 1

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10429 - 79TH AVE.
EDMONTON, - ALBERTA

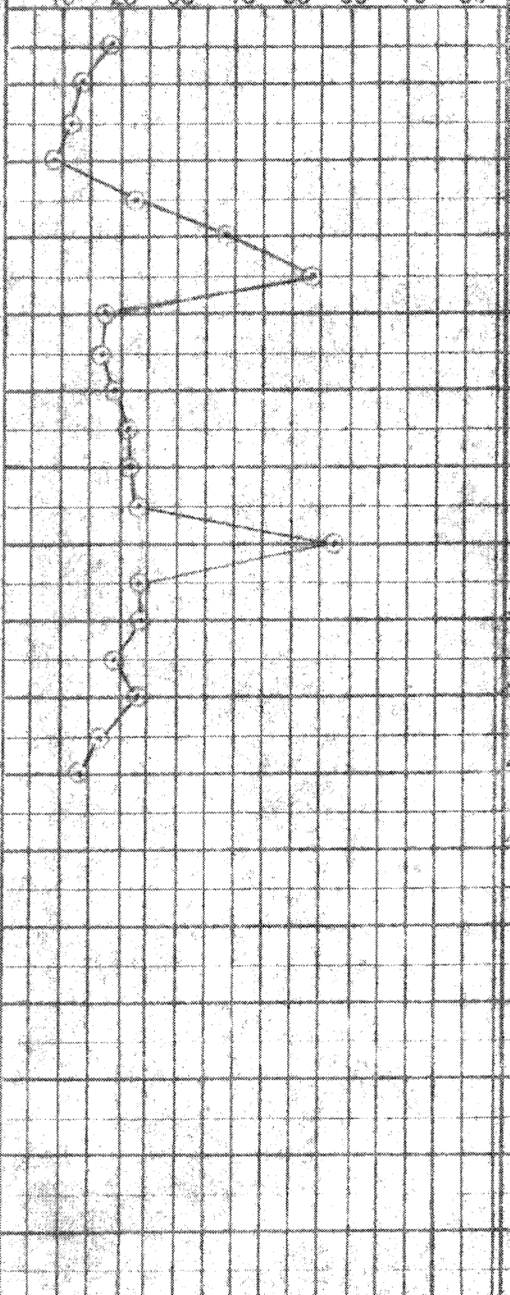
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE ROAD EDMONTON ALBERTA

DWN. E.A.N.	CKD.	JOB NO.	DATE APR. 26/62	HOLE NO. 33	PLATE NO. 38

NATURAL MOISTURE CONTENT O—O
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE / SAMPLES

DEPTH ELEV FT.	CLASSIFICATION — GROUND SURFACE ELEV.	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	TYPE	DEPTH SCALE
	SANDSTONE				
4	Blue-grey Medium dense. Dry Fractured Structure. Rust bands at 4'-Shale inclusions			U1	4
8		N: 59		DS	8
	SHALE Brown to Black			U2	
12	COAL Quite loose Dark Red Brown				12
16	SANDSTONE Light grey			U3	16
	SHALE				
20	Light grey-brown Silty	N: 160		DS	20
				U4	
24	▼				24
	Bentonite Layer			U5	
28	COAL Water bearing				28
32	SHALE	N 92		DS	32
36	Brown Very hard			U7	36
40	SANDSTONE Blue-grey	N: 204		DS	40
44	END OF HOLE.				44

NOTE.
Water on Kelly to 24 ft

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	UNDISTURBED, DISTURBED, LOST SAMPLE	U - 3" ø SHELBY; D.S. - DRIVE SAMPLE; M. - MOISTURE; R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/Ft²; γ_d DRY UNIT WEIGHT lb/ft³; C. CONSOLIDATION TEST; M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.

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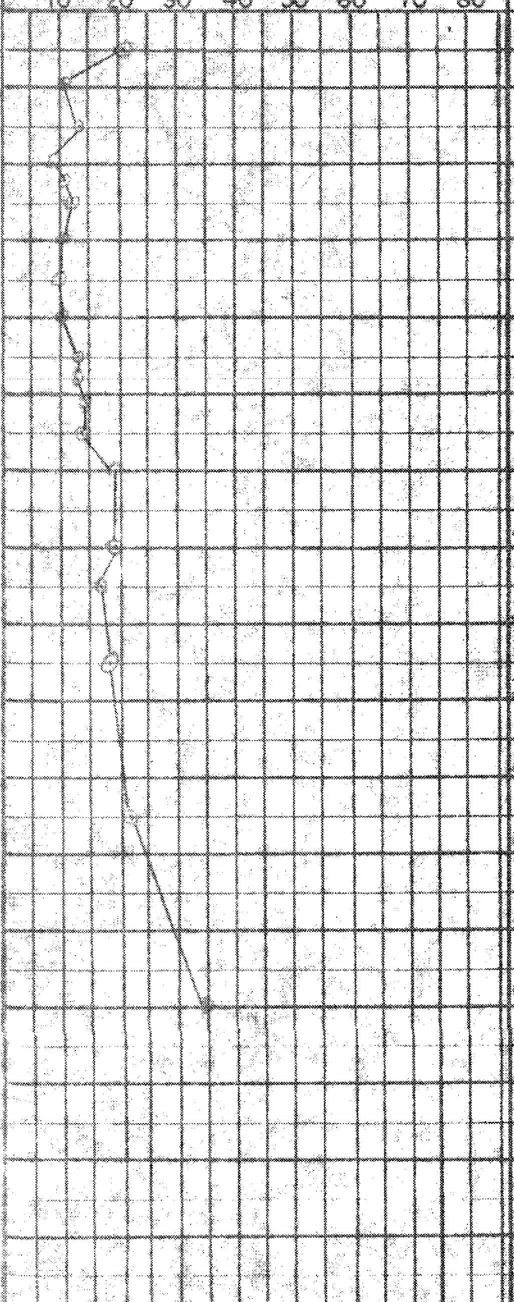
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE ROAD
EDMONTON ALBERTA

DWN. EAN	CKD.	JOB NO. 161	DATE	HOLE NO. 34	PLATE NO. 39

NATURAL MOISTURE CONTENT o—o
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) x—x

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE / SAMPLES

DEPTH ELEV FT.	CLASSIFICATION (GROUND SURFACE ELEV.)	OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	TYPE	DEPTH SCALE
	CLAY FILL — LIGHT BROWN SILTY SANDY.				
4	CLAY — BROWN WITH STONES DRY				4
8	SAND — SILTY WITH STONES DRY	N: 28		U1, DS	8
12	CLAY — SANDY SILTY WITH COAL & RUST INCLUSIONS			U2	12
16	SAND — SILTY CLAYEY WITH COAL RUST & GRAVEL; LARGE COAL POCKETS			U3	16
20	SHALE — SOFT	N: 42		DS, U4	20
24				U6	24
28	SANDSTONE	▼GWL			28
	CLAY — SANDY, WITH SAND LAYERS IN CLAY	N: 42		DS	
32	SAND — CLAYEY WITH SALTS				32
36					36
40	WET CLEAN				40
44					44
48	COAL — WET				48
52	END OF HOLE				52
54					54

NOTE
END OF HOLE IN HARD SHALE
FREE WATER AT 28 FT.

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT	UNDISTURBED	U - 3" ø SHELBY	Qu. UNCONFINED COMP. STR. T/Ft²	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.
PEAT, SAND	DISTURBED	D.S.- DRIVE SAMPLE	γ_d DRY UNIT WEIGHT lb/ft³	
FILL, TILL	LOST SAMPLE	M. - MOISTURE	C. CONSOLIDATION TEST	
CLAY, BED-ROCK		R.C.-ROCK CORE	M.A. GRAIN SIZE ANALYSIS	

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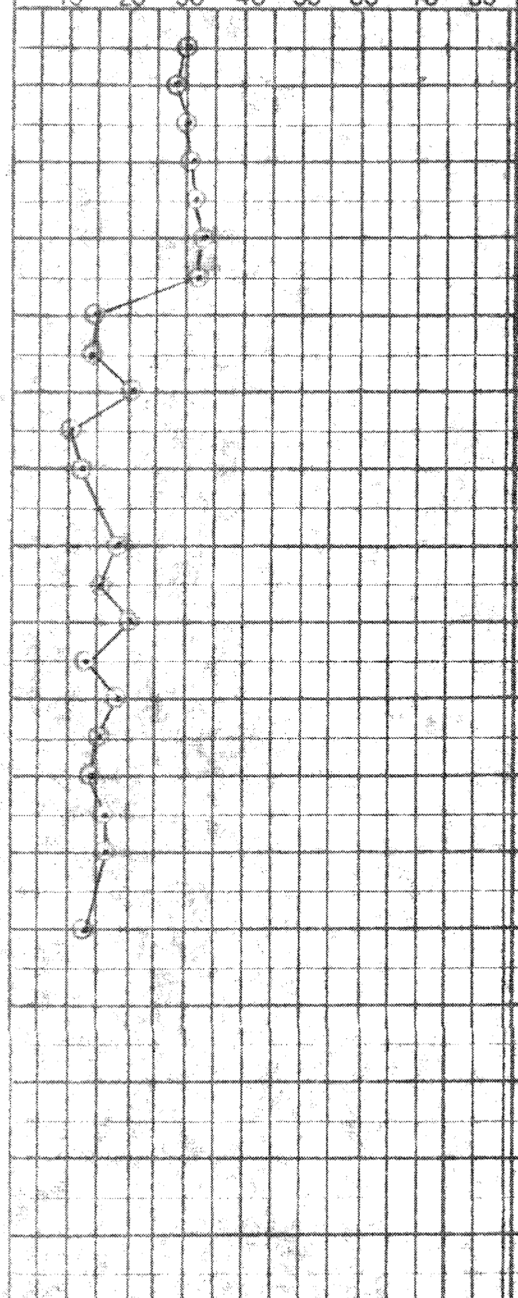
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT: LATTA RAVINE, EDMONTON ALBERTA

DWN.	CKD.	JOB NO.	DATE June 26/62	HOLE NO. 35	PLATE NO. 40

NATURAL MOISTURE CONTENT ○—○
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE | SAMPLES

DEPTH / ELEV FT.	CLASSIFICATION		OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE
	GROUND SURFACE ELEV. 214.4						
	FILL	Dirty Gravel					
4	CLAY	Coal Specks - Little Gravel - Soft					4
8							8
12		Dark Grey - Soft Medium Plasticity Small Amount of Pea Gravel - Wood Pieces.					12
16							16
	SAND	Silty - Soft					
20	CLAY	Sand Pockets - Firm Low to Medium Plasticity					20
24	SAND	Silty - Medium Moisture					24
28		Coarse - Saturated Hole Sluffing					28
32	CLAY	Fine Sand - Soft Low Plasticity					32
36	TILL	Coal Specks - Pea Gravel - Firm - Low to Medium Plasticity					36
40							40
44		Pea Gravel to ½" Dia. Rust Lens - Stiff					44
	SHALE	Pea Gravel - Medium To High Plasticity					
48							48
52	END OF HOLE	Elev.					52

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT, PEAT, SAND, FILL, TILL, CLAY, BED-ROCK	UNDISTURBED, DISTURBED, LOST SAMPLE	U - 3"ø SHELBY D.S. - DRIVE SAMPLE M. - MOISTURE R.C. - ROCK CORE	Qu. UNCONFINED COMP. STR. T/Ft² γd. DRY UNIT WEIGHT lb/ft³ C. CONSOLIDATION TEST M.A. GRAIN SIZE ANALYSIS	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.

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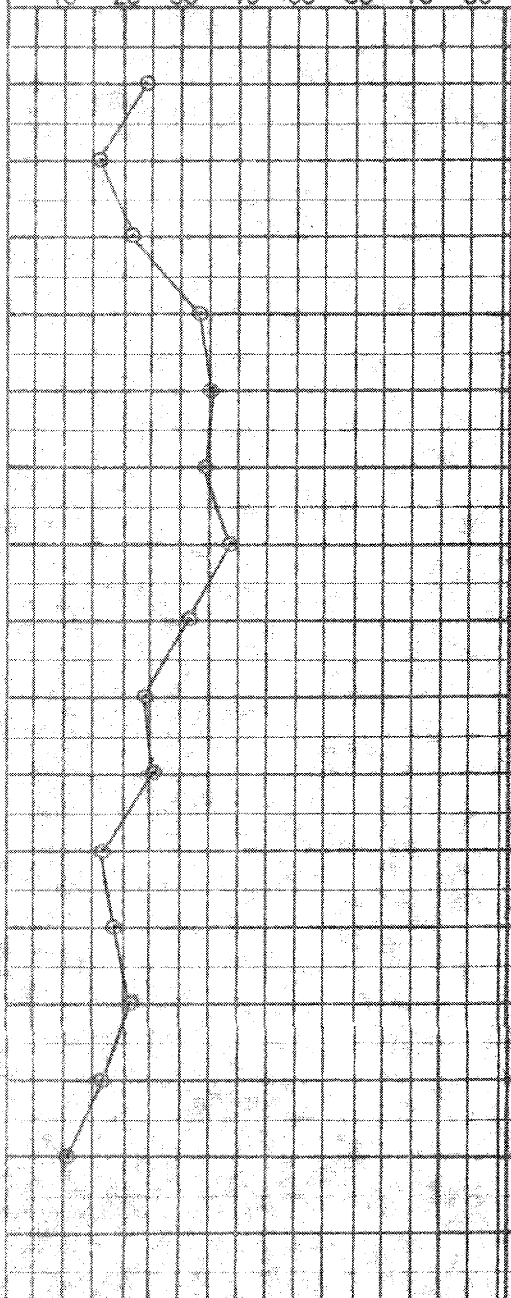
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE
EDMONTON ALBERTA

DWN.	CKD.	JOB NO.	DATE June 25/62	HOLE NO. 36	PLATE NO. 41

NATURAL MOISTURE CONTENT ○—○
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE / **SAMPLES**

GROUND SURFACE ELEV. 1798

DEPTH ELEV FT.	CLASSIFICATION	OTHER TESTS
0–2	TOPSOIL	
2–8	FILL — Clay & Gravel - Low Plasticity - Medium Moisture	N = 14
8–15	CLAY — Silt - Small Wood Chips - Soft - Low to Medium Plasticity Large Coal Specks / Medium Plasticity - Mottled Gray & Brown	N = 18
15	2" Seam of Medium Grain Sand	▼
15–22	Silty - Soft Saturated - Medium Plasticity / Sandy & Silty Coal Specks -	N = 14
22–27	TILL — Firm to Stiff - Medium Plasticity Small Coal Specks	
27–29	BLUE CLAY — Stiff - High Plasticity	
29–31	SAND — Fine - Silt & Small Amount of Clay Soft -	
31	END OF HOLE Elev.	

Depth scale: 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

SOIL TYPES	CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL, SILT	- UNDISTURBED	U - 3" ø SHELBY	Qu. UNCONFINED COMP. STR. T/Ft²	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D. Raymond type Sampler the distance shown into the soil.
PEAT, SAND	- DISTURBED	D.S. - DRIVE SAMPLE	γ_d DRY UNIT WEIGHT lb/ft³	
FILL, TILL	LOST SAMPLE	M. - MOISTURE	C. CONSOLIDATION TEST	
CLAY, BED-ROCK		R.C. - ROCK CORE	M.A. GRAIN SIZE ANALYSIS	

B.C.H. 1.

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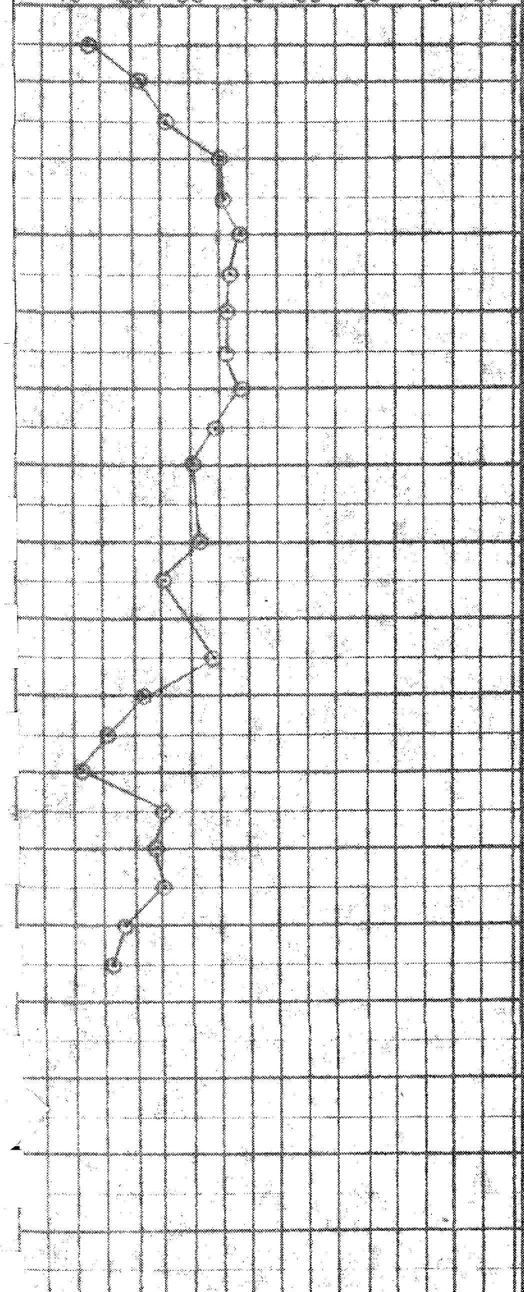
TEST HOLE LOG & LABORATORY TEST DATA

PROJECT LATTA RAVINE
EDMONTON ALBERTA

DWN.	CKD.	JOB NO.	DATE June 29/52	HOLE NO. 37	PLATE NO. 42

NATURAL MOISTURE CONTENT O—O
LIQUID LIMIT (W_l) □—□
PLASTIC LIMIT (W_p) △—△
STANDARD PENETRATION TEST (N) ×—×

Moisture Content (%)
Standard Penetration (N)
10 20 30 40 50 60 70 80



SOIL PROFILE

DEPTH / ELEV FT.	CLASSIFICATION — GROUND SURFACE ELEV. 172.7		SOIL SYMBOL
	SAND	Silty - Organic Matter	
4	CLAY		
		Fine Sand & Silt	
		Coal Specks - Firm	
8		Gravel	
		Sandy - No Coal - Soft	
12			
		Mottled Gray & Brown	
		Soft to Firm - Medium	
16		Plasticity	
20			
24		Thin Coal Lens	
		Pea Gravel	
28			
		Blue Gray - No Gravel	
		Soft - Medium to	
32		High Plasticity	
36		Gray - Small Amount	
		of Pea Gravel - Very	
		Soft - Medium Plasticity	
40	SAND	Medium Moisture	
		12" Coal Seam	
		Black Clay - Stiff	
44		Medium Plasticity	
48	SHALE	Stiff - Medium to	
		High Plasticity	
52	END OF HOLE		
	Elev.		

SAMPLES

OTHER TESTS	UNCONFINED COMP. STRENGTH T/Ft²	SAMPLE COND.	TYPE	DEPTH SCALE
				4
				8
				12
				16
				20
				24
				28
				32
				36
				40
				44
				48
				52

SOIL TYPES		CONDITION	SAMPLE TYPE	LABORATORY TEST SYMBOLS	PENETRATION RESISTANCE
TOPSOIL	SILT	- UNDISTURBED	U - 3" ø SHELBY	Qu. UNCONFINED COMP. STR. T/ft²	(N) = Number of blows of a 140 lb hammer dropped 30 ins (Free Fall) required to drive a 2" ø O.D Raymond type Sampler the distance shown into the soil.
PEAT	SAND	- DISTURBED	D.S. - DRIVE SAMPLE	γ_d DRY UNIT WEIGHT lb/ft³	
FILL	TILL	- LOST SAMPLE	M. - MOISTURE	C. CONSOLIDATION TEST	
CLAY	BED-ROCK		R.C. - ROCK CORE	M.A. GRAIN SIZE ANALYSIS	

PLATE No 42

BERNARD, CURTIS, HOGGAN
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CONSOLIDATION RESULTS

PROJECT	161
LAB. ORDER	Latta Ravine Road
SAMPLE	11-U3
LOCATION	
HOLE	11 — DEPTH 15'
TECHNICIAN	J.F. — DATE Nov.16/61

Specific Gravity of Soil Solids G_s = 2.72 est Height of Soil Solids H_s = 0.484 ins

Void Ratio e (End) = 0.696

Void Ratio e(Start) = 1.101

Void Ratio e (Start Dimensions) = 1.067

$e(End) = W\%(End) \times G_s$ $H_s = \left(\frac{Wt.\ Soil}{G_s \times Area \times 2.54}\right)$ ins. $e = \text{previous } e \pm \frac{Def'l.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	Deflection / H_s	Void Ratio e	Pressure $Kg/cm^2 = T/ft^2$
		9500			1.101	
1340	20	9545	+ 0.0045	+ 0.0093	1.1103	0.064
1525	50	9539	+ 0.0039	+ 0.0081	1.1091	0.158
2920	100	9528	+ 0.0028	+ 0.0058	1.1068	0.316
1125	200	9495	- 0.0005	- 0.0010	1.1020	0.632
5850	400	9362	- 0.0138	- 0.0286	1.0724	1.264
1425	800	9093	- 0.0407	- 0.0830	1.0180	2.528
1440	1500	8715	- 0.0785	- 0.1621	0.9389	4.750
2850	3000	8213	- 0.1287	- 0.266	0.835	9.500
1320	6000	7800	- 0.1700	- 0.351	0.750	19.000
2927	12000	7540	- 0.1960	- 0.405	0.696	38.000

Compressive Index = 0.30

Swelling Pressure = ______ T/ft^2

Pre-Cons. Load = ______ T/ft^2

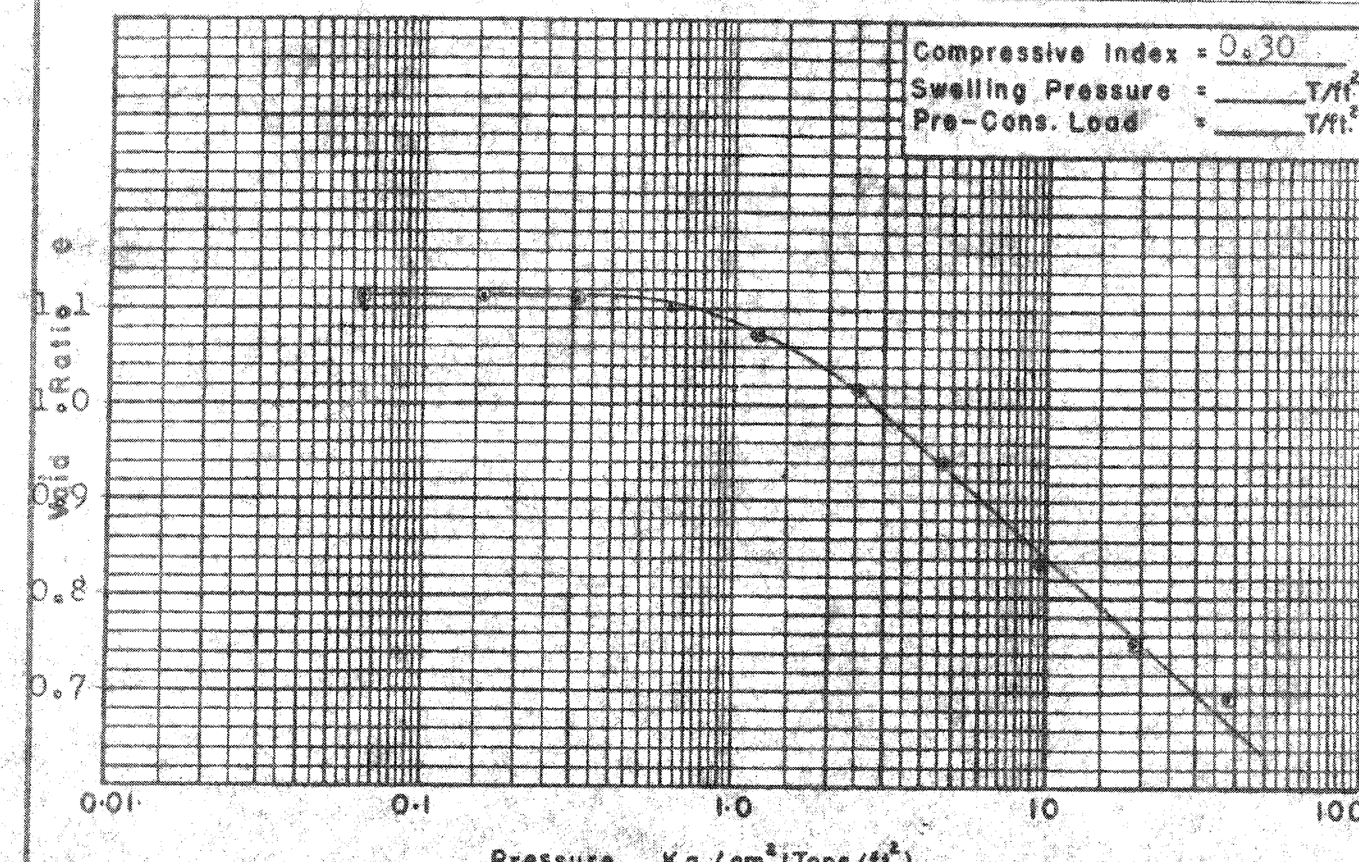

PLATE N° 43

PROJECT	Latta Ravine Road		
LAB. ORDER	161		
SAMPLE	11-U4		
LOCATION			
HOLE	11	DEPTH	19' - 20'
TECHNICIAN	E.A.N.	DATE	Oct. 20/61

BERNARD, CURTIS, HOGGAN
ENGINEERING & TESTING LTD.

CONSOLIDATION RESULTS

Specific Gravity of Soil Solids G_s = 2.75 (est.) Height of Soil Solids H_s = 0.502 ins

Void Ratio e (End) = 0.685

Void Ratio e (Start) = 1.085

Void Ratio e (Start Dimensions) = 0.992

$e\,(End) = W\%(End) \times G_s$ $\quad H_s = \left(\frac{Wt \cdot Soil}{G_s \times Area \times 2.54}\right)$ ins. $\quad e = \text{previous } e \pm \frac{Def'l.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	Deflection / H_s	Void Ratio e	Pressure Kg/cm² = T/ft²
-	0	8000			1.085	
1026	20	7990	- 0.0010	0.002	1.083	0.064
1700	50	7982	- 0.0018	0.004	1.081	0.158
60	100	7968	- 0.0032	0.006	1.079	0.316
1005	200	7890	- 0.0110	0.022	1.063	0.632
1420	400	7732	- 0.0268	0.053	1.032	1.264
1410	800	7504	- 0.0496	0.099	0.986	2.528
1424	1500	7210	- 0.0790	0.157	0.928	4.750
1415	3000	6840	- 0.1160	0.230	0.855	9.500
4320	6000	6360	- 0.1640	0.326	0.759	19.000
1380	12000	5988	- 0.2012	0.400	0.685	38.000

Compressive Index = 0.30

Swelling Pressure = ______ T/ft²

Pre-Cons. Load = ______ T/ft²

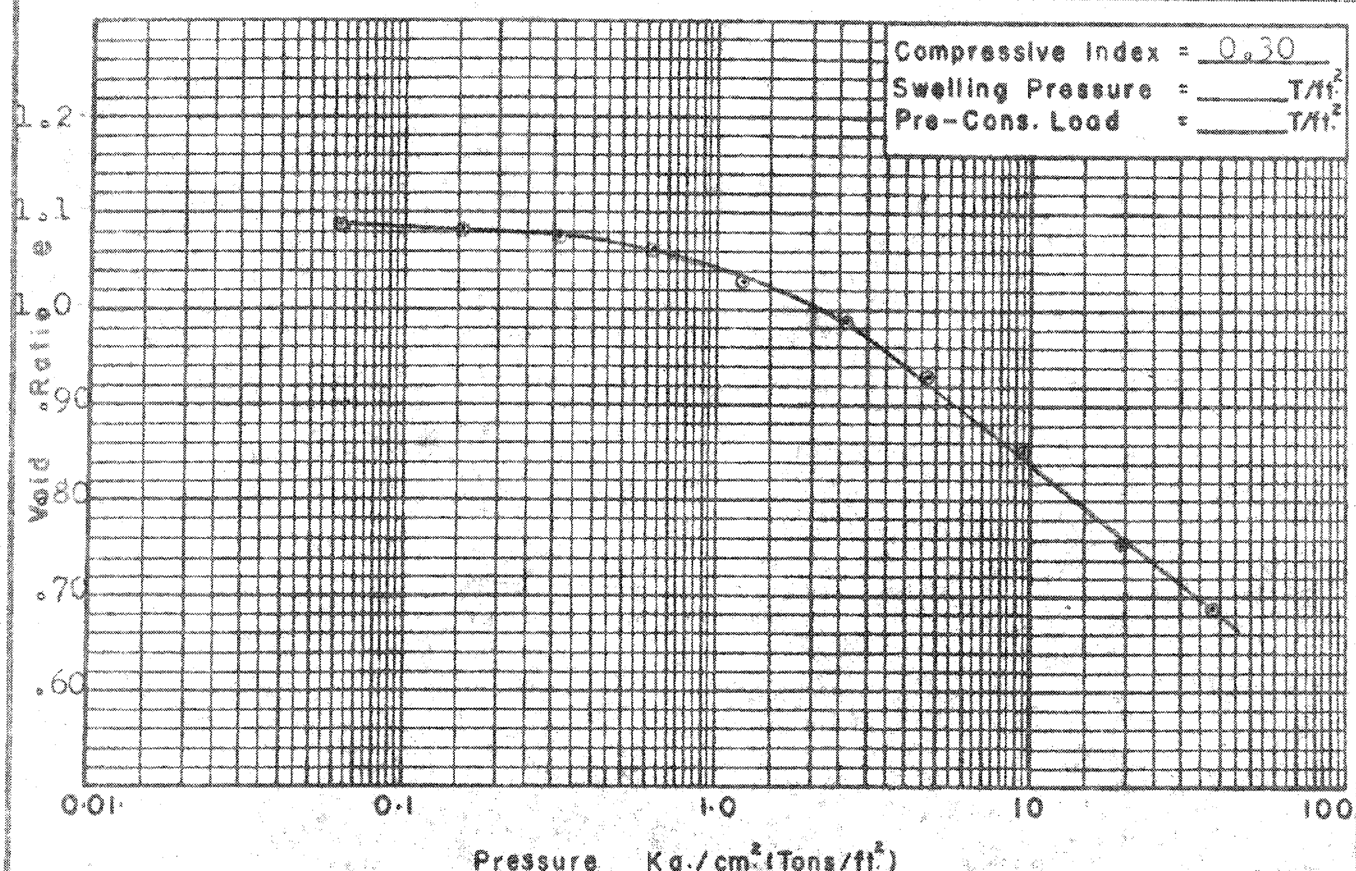

PLATE Nº 44

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CONSOLIDATION RESULTS

PROJECT	Latta Ravine Road
LAB. ORDER	161
SAMPLE	11B
LOCATION	
HOLE	11B DEPTH 32' - 35'
TECHNICIAN	J.F. DATE Nov. 20/61

Specific Gravity of Soil Solids G_s = 2.72 (est) Height of Soil Solids H_s = 0.715 ins

Void Ratio e (End) = 0.316

Void Ratio e(Start) = 0.384

Void Ratio e (Start Dimensions) = 0.399

$e(End) = W\%(End) \times G_s$ $H_s = \left(\frac{Wt \cdot Soil}{G_s \times Area \times 2 \cdot 54}\right)$ ins. $e = \text{previous } e \pm \frac{Def'l.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	Deflection / H_s	Void Ratio e	Pressure Kg/cm² = T/ft²
–	0	0709	–	–	0.384	
1395	20	0672	+0.0037	+0.005	0.389	0.064
183	50	0672	+0.0037	+0.005	0.389	0.158
1185	100	0678	+0.0031	+0.004	0.388	0.316
256	200	0687	+0.0022	+0.003	0.387	0.632
1145	400	0722	-0.0013	-0.002	0.382	1.264
237	800	0770	-0.0061	-0.009	0.375	2.528
1150	1500	0830	-0.0121	-0.017	0.367	4.750
1590	3000	0934	-0.0225	-0.032	0.352	9.500
2680	6000	1062	-0.0353	-0.049	0.335	19.000
1395	12000	1191	-0.0482	-0.068	0.316	38.000

Compressive Index = 0.07

Swelling Pressure = 0.85 T/ft²

Pre-Cons. Load = ______ T/ft²

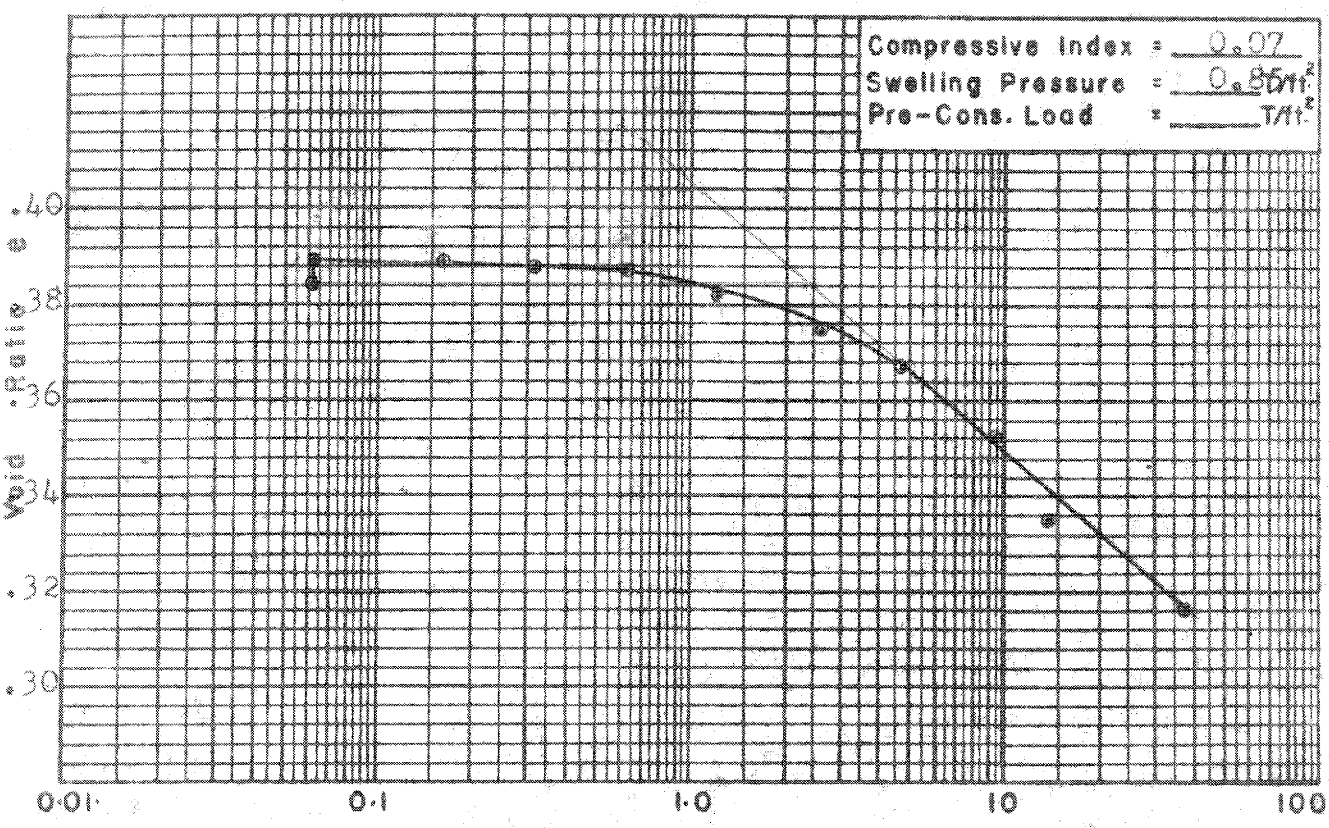

PLATE Nº 45

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CONSOLIDATION RESULTS

PROJECT	Latta Ravine Road
LAB. ORDER	#161
SAMPLE	13-U2
LOCATION	
HOLE	13 — DEPTH 12' - 13'
TECHNICIAN	E.A.N. — DATE Nov.1/61

Specific Gravity of Soil Solids G_s = 2.75 (est) Height of Soil Solids H_s = 0.497 ins

Void Ratio e (End) = 0.604

Void Ratio e(Start) = 1.037

Void Ratio e (Start Dimensions) = 1.011

$e(End) = W\%(End) \times G_s$ $\quad H_s = \left(\frac{Wt \cdot Soil}{G_s \times Area \times 2.54}\right)$ ins. $\quad e$ (st) $=$ previous $e \pm \frac{Def'l.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	Deflection / H_s	Void Ratio e	Pressure $Kg/cm^2 = T/ft^2$
–	0	9000			1.037	
1365	20	8950	- 0.0050	- 0.010	1.027	0.064
1340	50	8900	- 0.0100	- 0.020	1.017	0.158
2880	100	8790	- 0.0210	- 0.042	0.995	0.316
1484	200	8715	- 0.0285	- 0.057	0.980	0.632
2745	400	8510	- 0.0490	- 0.099	0.938	1.264
265	800	8290	- 0.0710	- 0.143	0.894	2.528
1845	1500	7958	- 0.1042	- 0.210	0.827	4.750
1450	3000	7649	- 0.1351	- 0.272	0.765	9.500
1570	6000	7245	- 0.1755	- 0.354	0.683	19.0
1179	12000	6848	- 0.2152	- 0.433	0.604	38.0

Compressive Index = 0.258

Swelling Pressure = ______ T/ft^2

Pre-Cons. Load = ______ T/ft^2

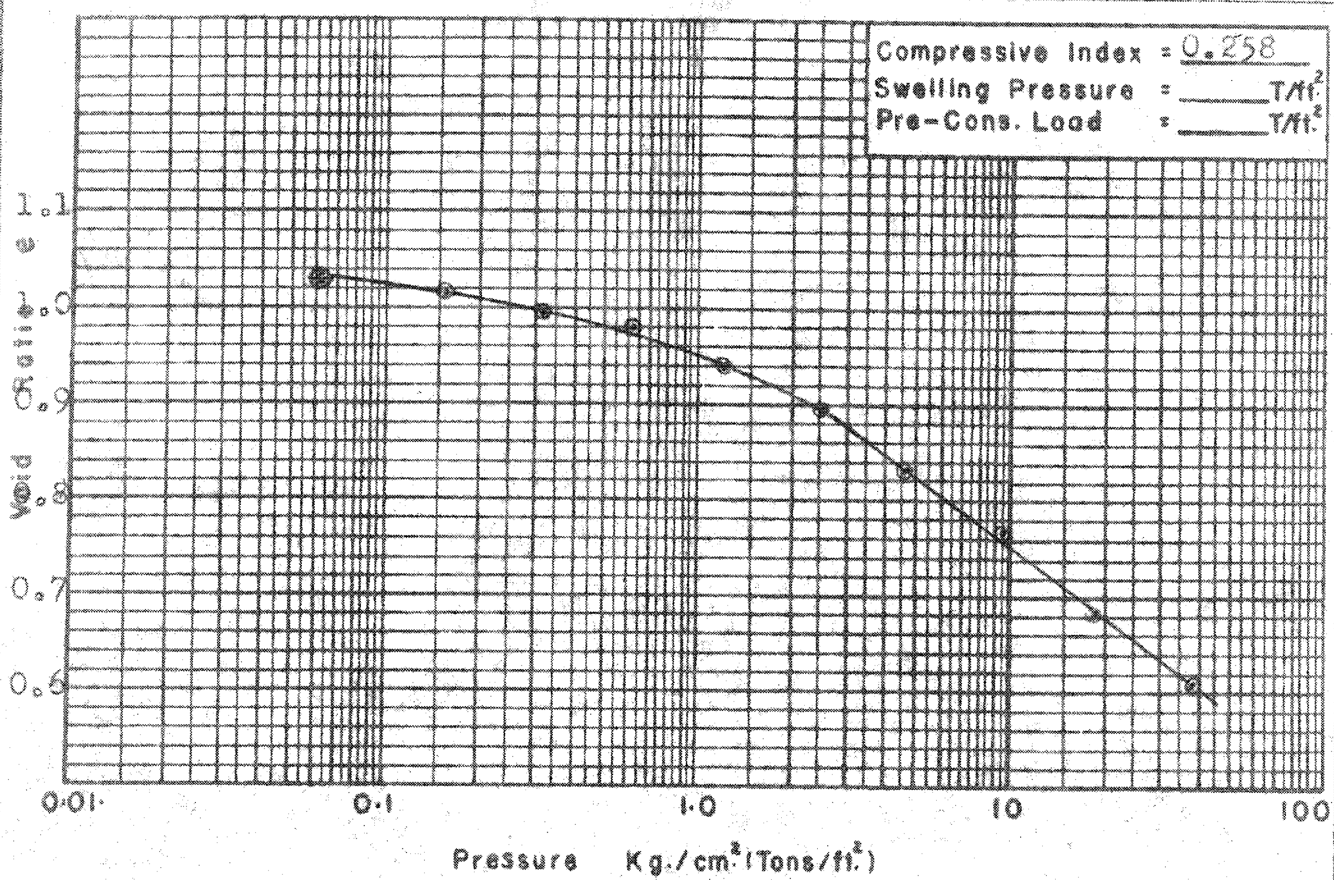

PLATE N° 46

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CONSOLIDATION RESULTS

PROJECT 161
LAB. ORDER Latta Ravine Road
SAMPLE 15-U6
LOCATION
HOLE 15 DEPTH 57'
TECHNICIAN J.F. DATE Nov. 28/61

Specific Gravity of Soil Solids G_s = 2.75 est Weight of Soil Solids H_s = 0.586 ins
Void Ratio e (End) = 0.632
Void Ratio e(Start) = 0.706 0.841
Void Ratio e (Start Dimensions) = 0.706

$e(End) = W\%(End) \times G_s$ $H_s = \left(\frac{Wt \cdot Soil}{G_s \times Area \times 2 \cdot 54}\right)$ ins. e = previous $e \pm \frac{Def'l.}{H_s}$

Time interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	$\frac{Deflection}{H_s}$	Void Ratio e	Pressure $Kg/cm^2 = T/ft^2$
		635			0.841	
120	20	641	- 0.0006	- 0.0010	0.840	0.064
1200	50	648	- 0.0013	- 0.0022	0.839	0.158
1715	100	684	- 0.0049	- 0.0084	0.833	0.316
1025	200	729	- 0.0094	- 0.0161	0.825	0.632
2927	400	820	- 0.0185	- 0.0316	0.809	1.264
1455	800	930	- 0.0295	- 0.0504	0.791	2.528
1410	1500	1010	- 0.0375	- 0.0641	0.777	4.750
1410	3000	1355	- 0.0720	- 0.1230	0.718	9.500
1415	6000	1605	- 0.0970	- 0.1660	0.675	19.000
244	12000	1857	- 0.1222	- 0.2090	0.632	38.000

Compressive Index = 0.168
Swelling Pressure = ______ T/ft^2
Pre-Cons. Load = ______ T/ft^2

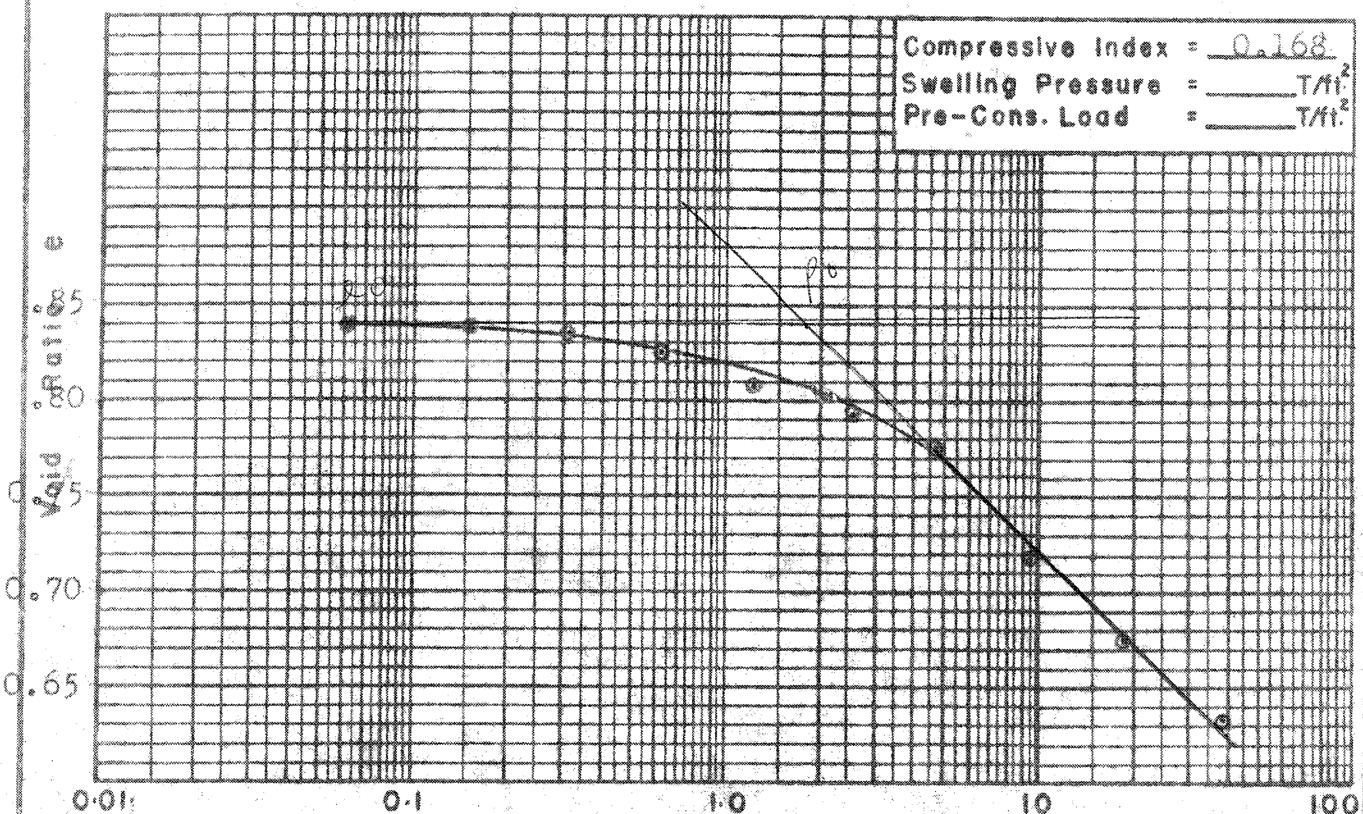


PLATE Nº 47

BERNARD, CURTIS, HOGGAN
ENGINEERING & TESTING LTD.

CONSOLIDATION RESULTS

PROJECT	Latta Ravine Road
LAB. ORDER	161
SAMPLE	16-U2
LOCATION	
HOLE	16 — DEPTH 24' - 25'
TECHNICIAN	J.F. — DATE Dec.11/61

Specific Gravity of Soil Solids G_s = 2.72 (est) Height of Soil Solids H_s = 0.586 ins

Void Ratio e (End) = 0.426

Void Ratio e (Start) = 0.644

Void Ratio e (Start Dimensions) = 0.707

$e(End) = W\%(End) \times G_s$ $H_s = \left(\frac{Wt \cdot Soil}{G_s \times Area \times 2 \cdot 54}\right)$ ins. e = previous $e \pm \frac{Def'l.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	Deflection / H_s	Void Ratio e	Pressure Kg/cm² = T/ft²
-	0	0580	-	-	0.644	-
1300	20	0590	- 0.0010	- 0.002	0.642	0.064
300	50	0612	- 0.0032	- 0.005	0.639	0.158
1130	100	0651	- 0.0071	- 0.012	0.632	0.316
480	200	0718	- 0.0138	- 0.023	0.621	0.632
257	400	0808	- 0.0228	- 0.039	0.605	1.264
1125	800	0930	- 0.0350	- 0.059	0.585	2.528
1440	1500	1110	- 0.0530	- 0.090	0.554	4.750
2790	3000	1340	- 0.0760	- 0.129	0.515	9.500
1400	6000	1559	- 0.0979	- 0.168	0.476	19.000
1430	12000	1860	- 0.1280	- 0.218	0.426	38.000

Compressive Index = 0.17

Swelling Pressure = ______ T/ft²

Pre-Cons. Load = ______ T/ft²

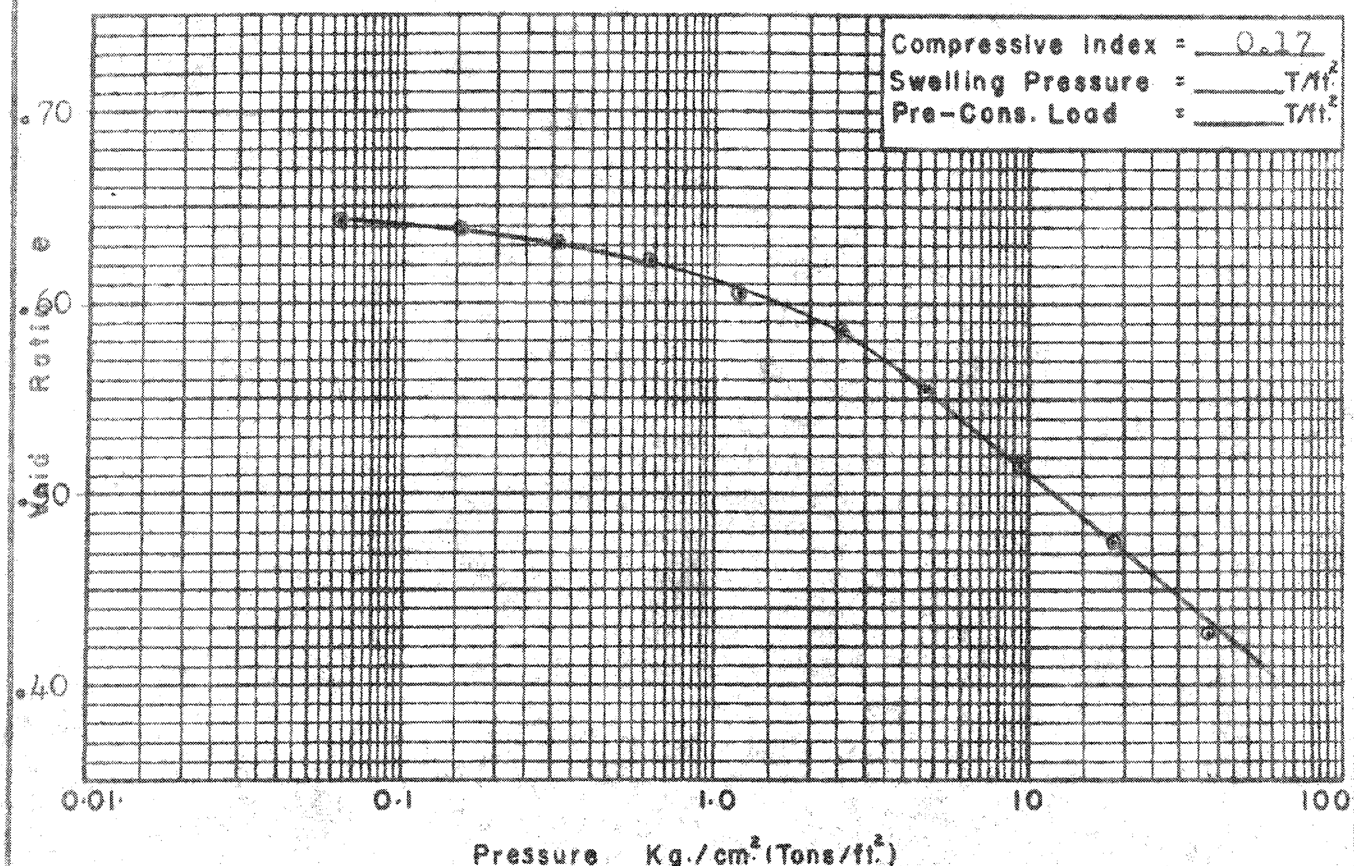


PLATE N° 48

BERNARD, CURTIS, HOGGAN
ENGINEERING & TESTING LTD.

CONSOLIDATION RESULTS

PROJECT Latta Ravine Road	
LAB. ORDER 161	
SAMPLE 19-U3	
LOCATION	
HOLE 19	DEPTH 22'-23'
TECHNICIAN EAN	DATE May 16/62

Specific Gravity of Soil Solids G_s = 2.72(est.) Height of Soil Solids H_s = 0.568 ins

Void Ratio e (End) = 0.571

Void Ratio e(Start) = 0.846

Void Ratio e (Start Dimensions) = 0.761

$e(End) = W\%(End) \times G_s$ $\quad H_s = \left(\frac{Wt \cdot Soil}{G_s \times Area \times 2 \cdot 54}\right)$ ins. $\quad e = \text{previous } e \pm \frac{Def'l.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	$\frac{Deflection}{H_s}$	Void Ratio e	Pressure $Kg/cm^2 = T/ft^2$
	0	8850			0.846	
2640	1 lb	8888	+ 0.0038	+ 0.007	0.853	0.115
1345	2 lbs	3824	+ 0.0024	+ 0.004	0.850	0.23
1655	4 "	8848	+ 0.0002	+ 0.000	0.846	0.575
1310	10 "	8599	- 0.0251	- 0.044	0.802	1.159
1280	20 "	8388	- 0.0462	- 0.082	0.764	2.30
1400	40 "	8088	- 0.0762	- 0.136	0.710	4.60
1430	80 "	7718	- 0.1132	- 0.201	0.645	9.20
1451	160 "	7289	- 0.1568	- 0.275	0.571	18.40

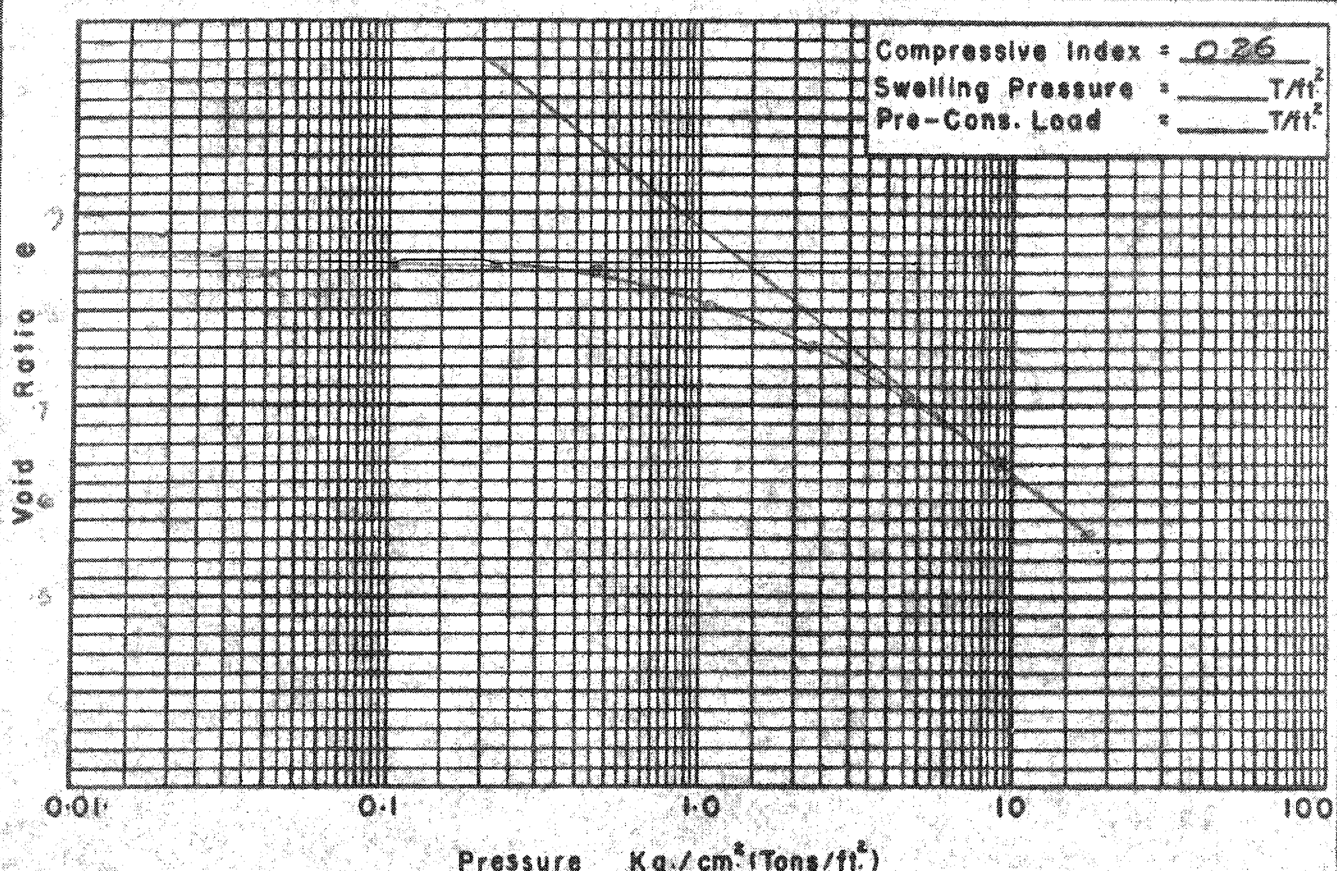


PLATE N° 49

PROJECT	#161
LAB. ORDER	Latta Ravine Road
SAMPLE	22-U3
LOCATION	
HOLE	22 DEPTH 15' - 16'
TECHNICIAN	D.J. DATE Feb.5/62

BERNARD, CURTIS, HOGGAN
ENGINEERING & TESTING LTD.

CONSOLIDATION RESULTS

Specific Gravity of Soil Solids G_s = 2.60 est Height of Soil Solids H_s = 0.587 ins

Void Ratio e (End) = 0.658

Void Ratio e(Start) = 0.912

Void Ratio e (Start Dimensions) = 0.704

e(End) = W%(End) x G_s $H_s = \left(\frac{\text{Wt. Soil}}{G_s \times \text{Area} \times 2.54}\right)$ins. e = previous e $\pm \frac{\text{Def'l.}}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins)	Deflection (ins.)	$\frac{\text{Deflection}}{H_s}$	Void Ratio e	Pressure $Kg/cm^2 = T/ft^2$
	-	0822			0.912	
2820	20	1062	0.0240	0.041	0.871	0.064
1470	50	1080	0.0258	0.044	0.868	0.158
1380	100	1112	0.0290	0.049	0.863	0.316
1420	200	1170	0.0348	0.059	0.853	0.632
2820	400	1255	0.0433	0.074	0.838	1.264
1430	800	1360	0.0538	0.092	0.820	2.528
1450	1500	1501	0.0679	0.116	0.796	4.750
1410	3000	1719	0.0897	0.153	0.759	9.500
1440	6000	1940	0.1118	0.191	0.721	19.000
4260	12000	2312	0.1490	0.254	0.658	38.000

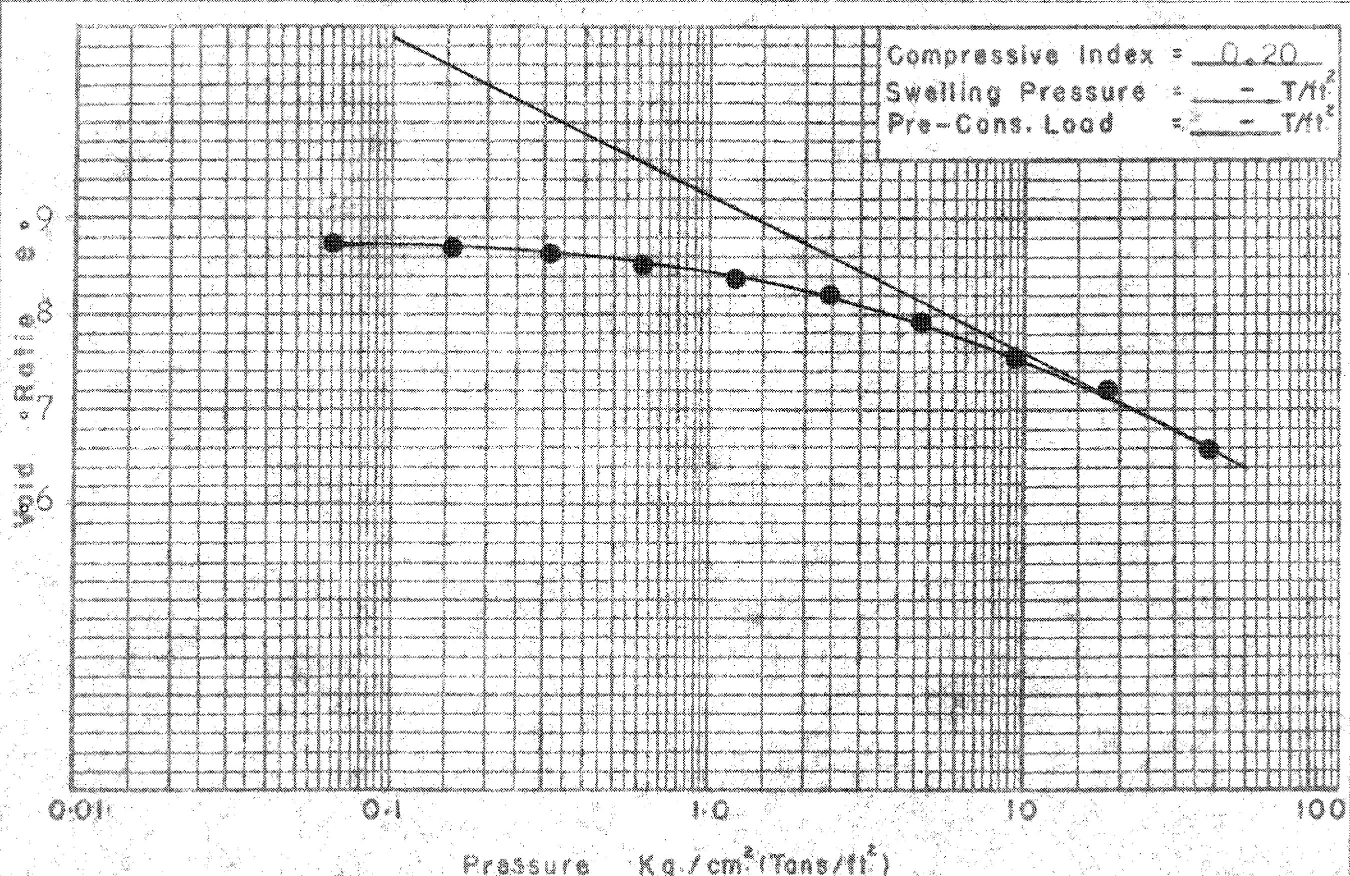


PLATE Nº 50

BERNARD, CURTIS, HOGGAN
ENGINEERING & TESTING LTD.

CONSOLIDATION RESULTS

PROJECT Latta Ravine
LAB. ORDER 161
SAMPLE 22 - U4
LOCATION
HOLE 22 DEPTH 20' - 21'
TECHNICIAN NT DATE Apr 23'62

Specific Gravity of Soil Solids G_s = 2.72(est) Height of Soil Solids H_s = 0.554 ins
Void Ratio e (End) = 0.486
Void Ratio e(Start) = 0.783
Void Ratio e (Start Dimensions) = 0.805

e(End) = W%(End) x G_s $H_s = \left(\frac{\text{Wt. Soil}}{G_s \times \text{Area} \times 2.54}\right)$ ins. e = previous e $\pm \frac{\text{Def'l.}}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	Deflection / H_s	Void Ratio e	Pressure Kg/cm² = T/ft²
	0	6736			0.783	
120	50	6697	- 0.0039	- 0.007	0.776	0.158
1050	100	6634	- 0.0102	- 0.018	0.765	0.316
1430	200	6529	- 0.0207	- 0.037	0.746	0.632
1425	400	6388	- 0.0348	- 0.063	0.720	1.264
1425	800	6194	- 0.0542	- 0.098	0.685	2.528
1475	1500	5987	- 0.0749	- 0.135	0.648	4.750
2820	3000	5714	- 0.1022	- 0.184	0.599	9.500
1475	6000	5413	- 0.1323	- 0.239	0.544	19.000
1375	12000	5093	- 0.1643	- 0.297	0.486	38.000

Compressive Index = 0.20
Swelling Pressure = ______ T/ft²
Pre-Cons. Load = ______ T/ft²

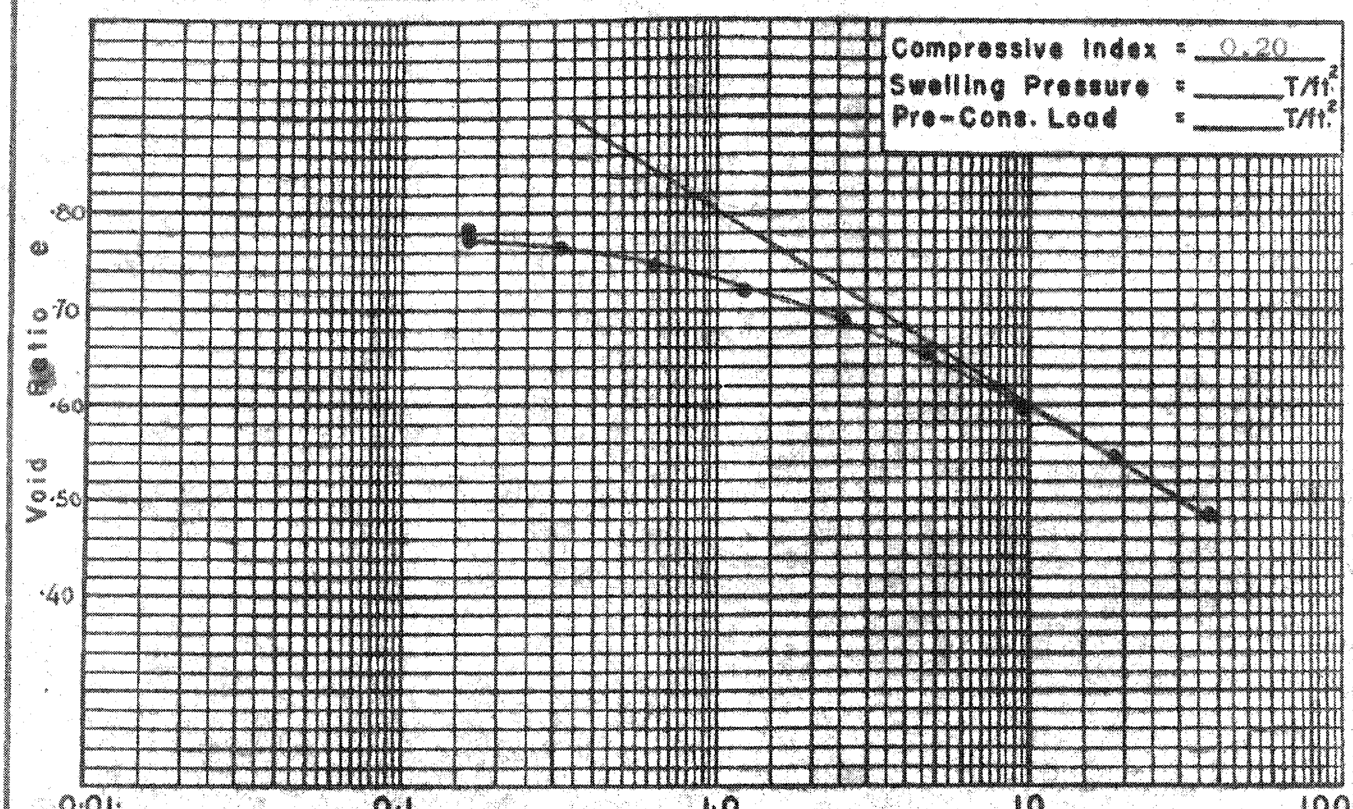


PLATE Nº 51

BERNARD, CURTIS, HOGGAN
ENGINEERING & TESTING LTD.

CONSOLIDATION RESULTS

PROJECT Latta Ravine Road
LAB. ORDER 161
SAMPLE 31-U3
LOCATION
HOLE 31 DEPTH 18'-19'
TECHNICIAN OF DATE May 17/62

Specific Gravity of Soil Solids G_s =2.70(est) Height of Soil Solids H_s = 0.534 ins
Void Ratio e (End) = 0.691
Void Ratio e(Start) = 0.975
Void Ratio e (Start Dimensions) = 0.874

$e(End) = W\%(End) \times G_s$ $H_s = \left(\frac{Wt. Soil}{G_s \times Area \times 2.54}\right)$ ins. $e = \text{previous } e \pm \frac{Defl.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins)	Deflection (ins.)	Deflection / H_s	Void Ratio e	Pressure Kg/cm² = T/ft²
	0	9562			0.975	
1290	1	9633	+ 0.0071	+ 0.013	0.988	0.115
1630	2	9612	+ 0.0050	+ 0.009	0.984	0.230
1300	5	9518	- 0.0044	- 0.008	0.967	0.575
1275	10	9327	- 0.0135	- 0.025	0.950	1.159
68	20	9123	- 0.0439	- 0.082	0.893	2.30
1360	40	8911	- 0.0651	- 0.122	0.853	4.60
150	80	8599	- 0.0963	- 0.181	0.794	9.20
1120	160	8044	- 0.1518	- 0.284	0.691	18.4

Compressive Index = 0.29
Swelling Pressure = 0.6 T/ft²
Pre-Cons. Load = T/ft²

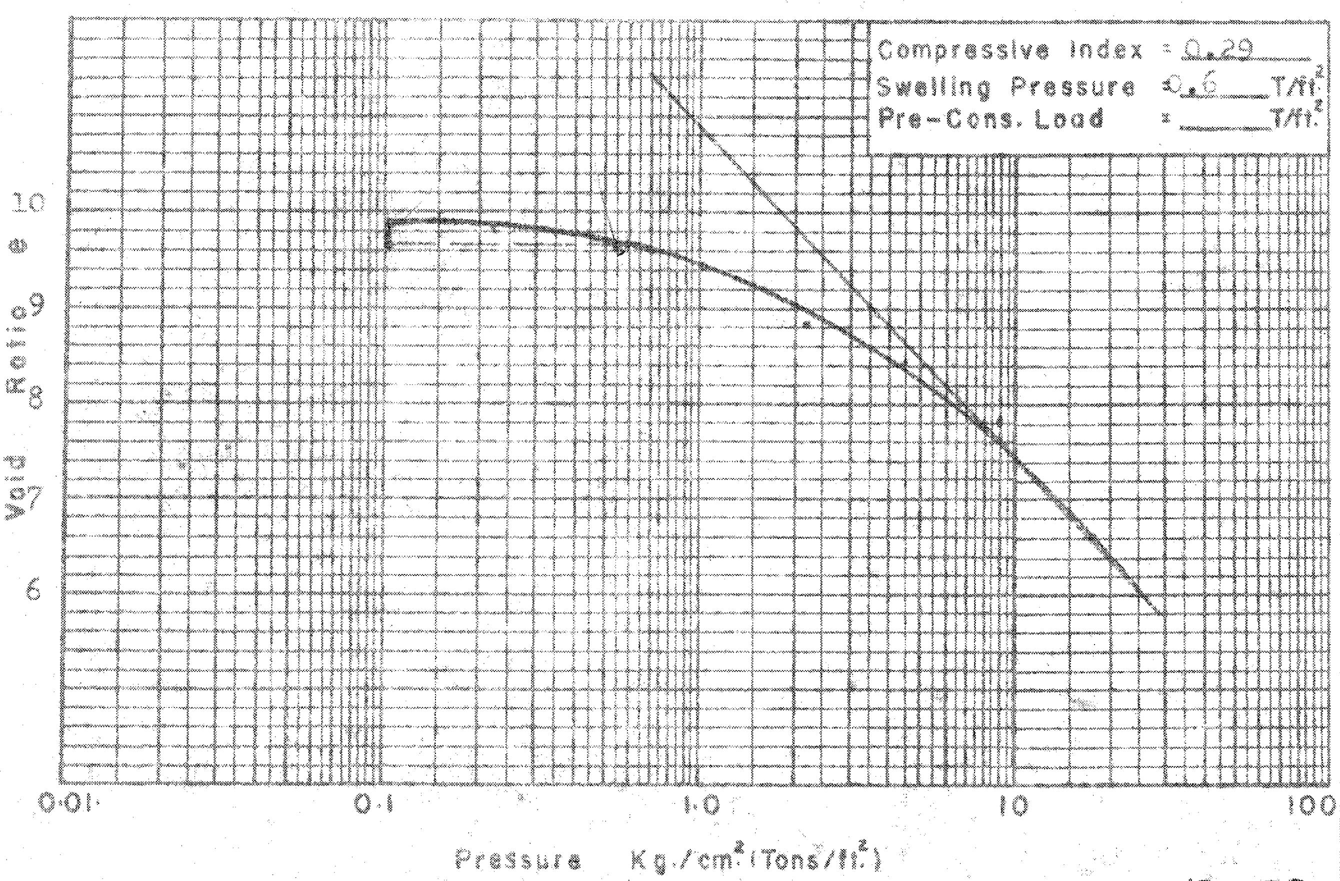


PLATE No 52

RMH — 3

R.M. HARDY & ASSOCIATES LTD.
EDMONTON ALBERTA

CITY OF EDMONTON ROADS
PROPOSED TRAFFIC INTERCHANGE AT WEST END OF DAWSON BRIDGE
LOCATION OF TEST HOLES

DWN. W.S.T.	SCALE 1" = 500'	DATE MAY 58
CKD.	JOB NO. 410	PLATE I

RMH — 5

R.M. HARDY & ASSOCIATES LTD.
EDMONTON — ALBERTA

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

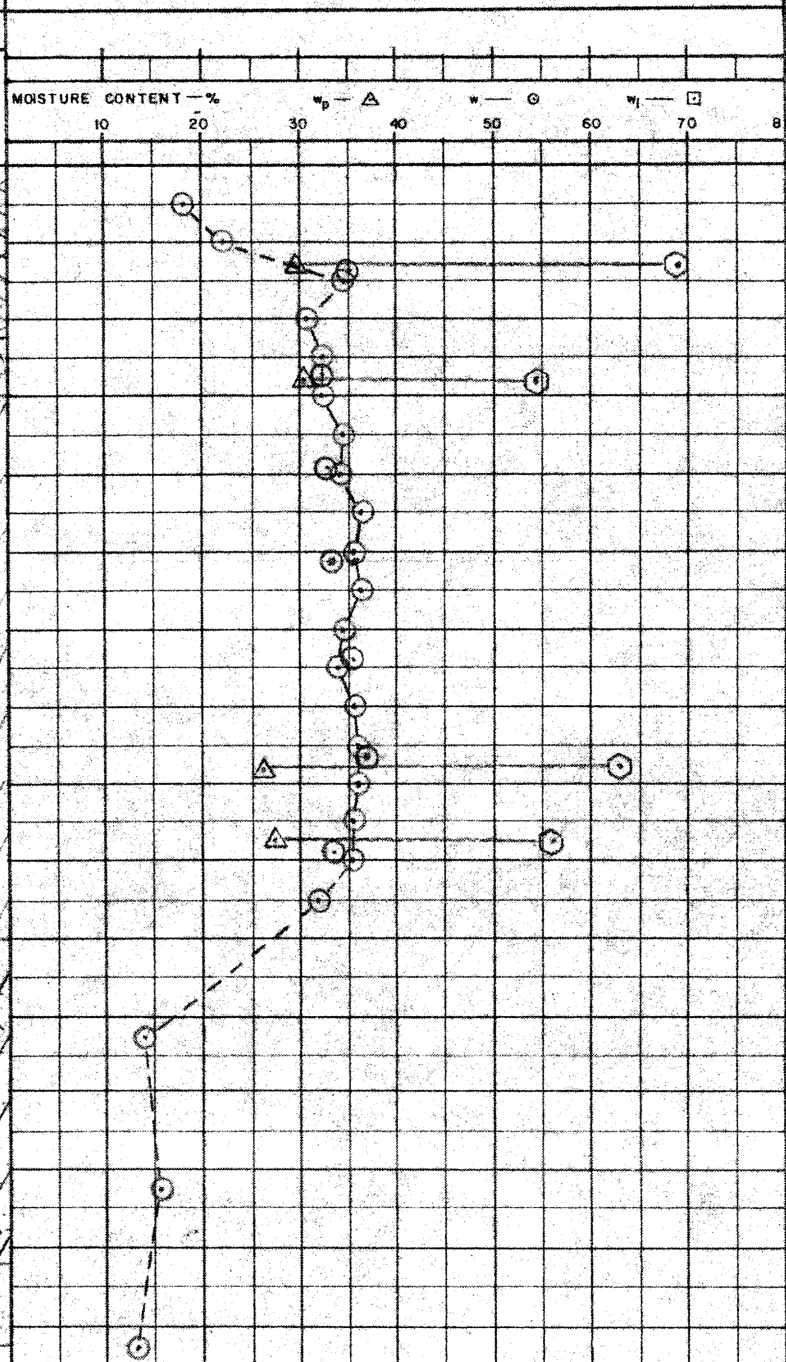
DWN. | CK D. W.S.F. | JOB NO. 931 | DATE JANUARY/58 | HOLE No 1 | PLATE III

SOIL PROFILE

DATUM 2212.7

ELEV. DEPTH FEET	SOIL DESCRIPTION
4	FILL — Dry Silty clay, Red Shale & Brick; Slightly more moist Silty clay
8	Soft Silty clay, Some Topsoil, Sand pebbles
12	TOPSOIL — With Shale, Brick, Nails etc
16	CLAY — Soft Silty with Topsoil; Slightly harder Grey & Brown Mottled, Silty, Traces of Shale Topsoil
20	Soft grey & brown Mottled Silty with Red Shale
24	Silty Grey-brown Mottled Medium to Highly plastic
28	Highly plastic Hard, Some Topsoil
32	Blue grey. Highly plastic. Silty, Sand pockets, Fairly soft
36	Greenish Silty Organic, Some decayed Rootlets (Marsh clay)
40	Highly plastic
44	GLACIAL TILL — Blue-grey Sandy, Small stones, Coal specks, Rust.
48–56	Dark grey Hard
60	SAND — Brown, Medium, Dry, Very dense
64	END OF HOLE

MOISTURE CONDITIONS & ATTERBERG LIMITS



SOIL SAMPLES

OTHER TESTS	CONDITION	TYPE	PENETRATION RESISTANCE	RECOVERY % DEPTH-FEET
$q_u = 2.1$ T/□'		U		
$q_u = 0.7$ T/□'		U		
$q_u = 1.4$ T/□'		U		
$q_u = 1.1, 1.2, 1.4$ T/□'; C (see plate XII)		U		
$q_u = 1.1$ T/□'		U		
$q_u = 0.6, 0.7, 0.8$ T/□'; C (see plate XIII)		U		
$q_u = 1.4$ T/□'		U		
		U		
		DS	95"	
		DS	75"	
		DS	100"/0.4'	

NOTE

Free water at 32 ft. Coal & Wood in clay at 31 ft & 34 ft.

Over 1300 gallons water lost in this hole during drilling

Suspect old mine tunnel or other very porous zone at depth 31–36'

PLATE III

RMH—5

R.M. HARDY & ASSOCIATES LTD.
EDMONTON — ALBERTA

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

DWN.	CK D. W.S.F.	JOB NO. 931	DATE JANUARY / 58	HOLE No 2	PLATE IV

SOIL PROFILE — SOIL DESCRIPTION

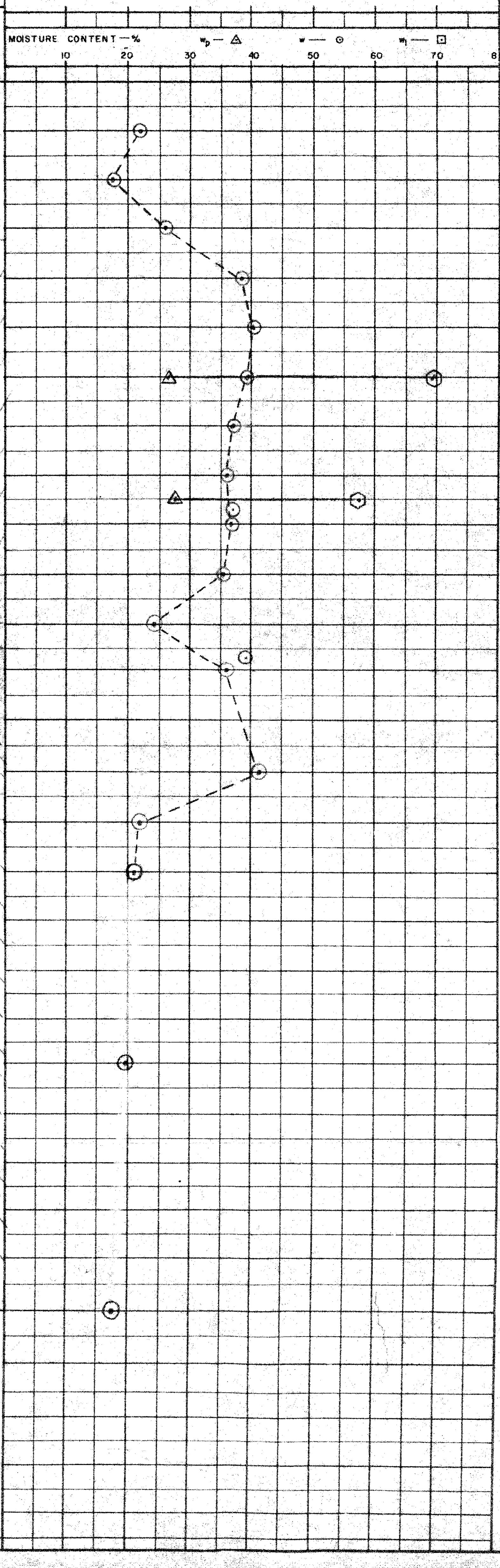
ELEV. DEPTH FEET — DATUM 2134.8

Depth (ft)	Soil	Description
0–6	SAND	Light grey with brick
6–20	CLAY	Brown & grey Mottled Soft Sandy; Brown Sandy with Coal & Stones; Harder dark grey Sandy
20–22	PEAT & TOPSOIL	Black
22–23	SAND	Brown Med. fine with Topsoil Shale Stones
23–27	COAL	
27–29	SHALE	Red with Coal & Clay
29–30	CLAY	Very Sandy High plastic dry with Red Shale
30–50	SHALE	Grey Highly plastic Dry Clayey

END OF HOLE

NOTE: Free water at 5 ft. 2" layer of Sandstone at 48 ft.

MOISTURE CONDITIONS & ATTERBERG LIMITS



SOIL SAMPLES

Depth (ft)	Other Tests	Type	Penetration Resistance
6	γ_d = 102.5 #/ft³	U	
13	q_u = 0.8 T/ft²; C (see plate XIV)	U	
18	q_u = 0.2 T/ft²	U	
24	q_u = 0.2 T/ft²	U	
31		DS	100″/0.8′
42		DS	100″/0.4′
50		DS	100″/0.3′

PLATE IV

RMH—5

R.M. HARDY & ASSOCIATES LTD.
EDMONTON — ALBERTA

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

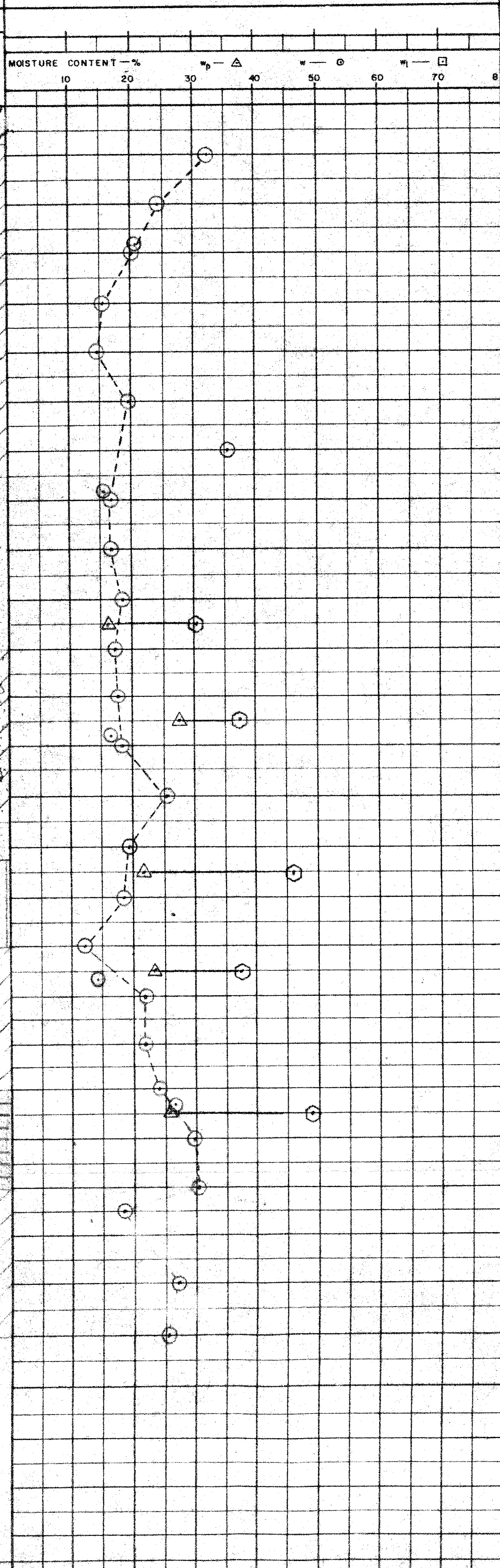
DWN. D.L.A.	CK D. W.S.F.	JOB NO. 931	DATE JANUARY '58	HOLE No. 3	PLATE V

SOIL PROFILE — SOIL DESCRIPTION

ELEV. DEPTH FEET — DATUM 2147.0

Depth (ft)	Soil Description	Other Tests	Condition	Type	Penetration Resistance
0	TOPSOIL with Black Clay, Slightly Organic.				
2	CLAY Dark Brown, Some Topsoil, Coal Specks				
6	Brown Sandy, Fairly Stiff.	q_u = 2.4 T/ft²		U	
10	Silty Sandy, Small Coal Specks, Small Stones.			DS	30"
14	Grey Brown, High Plastic, Sand Lenses, Rust Streaks, Stones				
15	SAND Grey Brown, Medium Fine, Slightly Clayey, Dense, Small Stones, Coal Specks	q_u = 1.2 T/ft²		U	
21				DS	40"
22	GLACIAL TILL Dark Grey, Sand Pockets, Rust Streaks, Small Stones, Coal Specks.				
26	Blue Grey, Very Sandy, Rust, Stones	q_u = 1.9 T/ft²		U	
29	SAND Brown Grey, Fine to Medium, Some Clay Seams.				
30	SILTSTONE Blue Grey, Hard Dry, Shaly			DS	100"/0.9'
34	SHALE Grey, Dry, Silty.				
37	Grey, Softer, Slightly Damp, Silty.			U	
40	COAL Black (Marsh)	q_u = 2.3 T/ft²		U	
44	SHALE Dry Dark, Wood Timber				
46				DS	100"
48	Dark Grey, Hard Silty, Dry, Coal Streaks.				
50	END of HOLE				

MOISTURE CONDITIONS & ATTERBERG LIMITS



SOIL SAMPLES — OTHER TESTS — CONDITION — TYPE — PENETRATION RESISTANCE — RECOVERY % DEPTH-FEET

NOTE Free Water at 44'.

Very loose zone at 34' auger dropped under own weight ~ probable old mine between 34' & 44'

PLATE V

RMH-5

SUMMARY OF SAMPLING & LABORATORY TESTS

R.M. HARDY & ASSOCIATES LTD.
EDMONTON — ALBERTA

PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

DWN. D.L.A. | CK D. W.S.F. | JOB NO. 931 | DATE JANUARY '58 | HOLE No. 4 | PLATE VI

DATUM: 2120.7

SOIL PROFILE

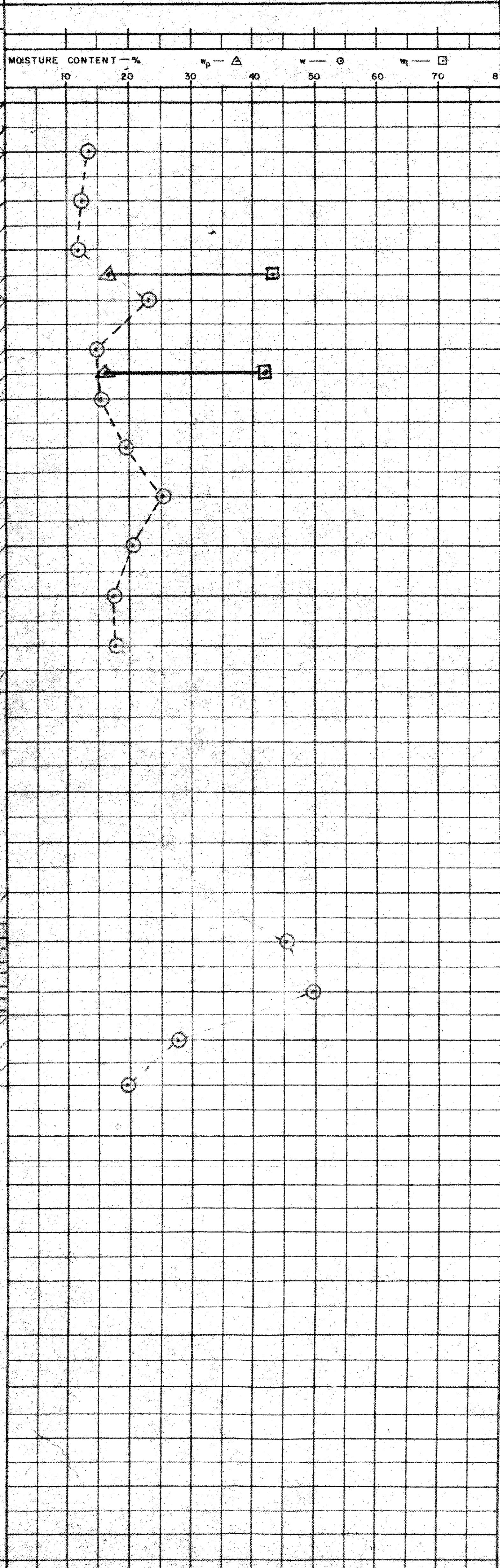
DEPTH (FEET)	SOIL DESCRIPTION	
0–1.5	TOPSOIL	Dry.
1.5–6	CLAY	Brown. Hard. Dry.
6–7	SAND	Brown. Clayey. Small Stones. Coal Specks.
7–12	TILL	Brown & Grey. Hard. Sandy Clay. Coal. Stones. Silt Pockets.
12–16	SAND	Clayey. / Brown & Grey. Slightly Moist. Coal Specks.
16–20	CLAY	Dark Grey. Highly Plastic.
20–23.5	SAND	Light Brown. Medium Fine. Dense. Coal. Stones.
23.5–24	CLAY	Grey Blue. Softer. Shaly. Sand Lenses. Coal Streaks.
24–32	SAND	Light Grey. Clayey. / Mixed with Shale. Coal. Stones.
32–33	CLAY	Black. Shaly.
33–37	COAL	Black. Hard.
37–40	SHALE	Grey Black. Hard. / Grey. Very Hard.

END of HOLE

NOTE
Free Water @ 24'

MOISTURE CONDITIONS & ATTERBERG LIMITS

MOISTURE CONTENT — % w_p — △ w — ⊙ w_l — ⊡



SOIL SAMPLES

Depth (approx.)	OTHER TESTS	TYPE	PENETRATION RESISTANCE
7		U	
11.5	$q_u = 2.1$ T/□'	DS	42
16		U	
21		DS	75
26	C (see plate XX)	U	
31		DS	40
41		DS	100/0.3

PLATE VI

RMH-5

R.M. HARDY & ASSOCIATES LTD.
EDMONTON — ALBERTA

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

DWN.	CK D.	JOB NO.	DATE	HOLE	PLATE
D.L.A.	W.S.F.	931	JANUARY '58	No. 5	VII

SOIL PROFILE

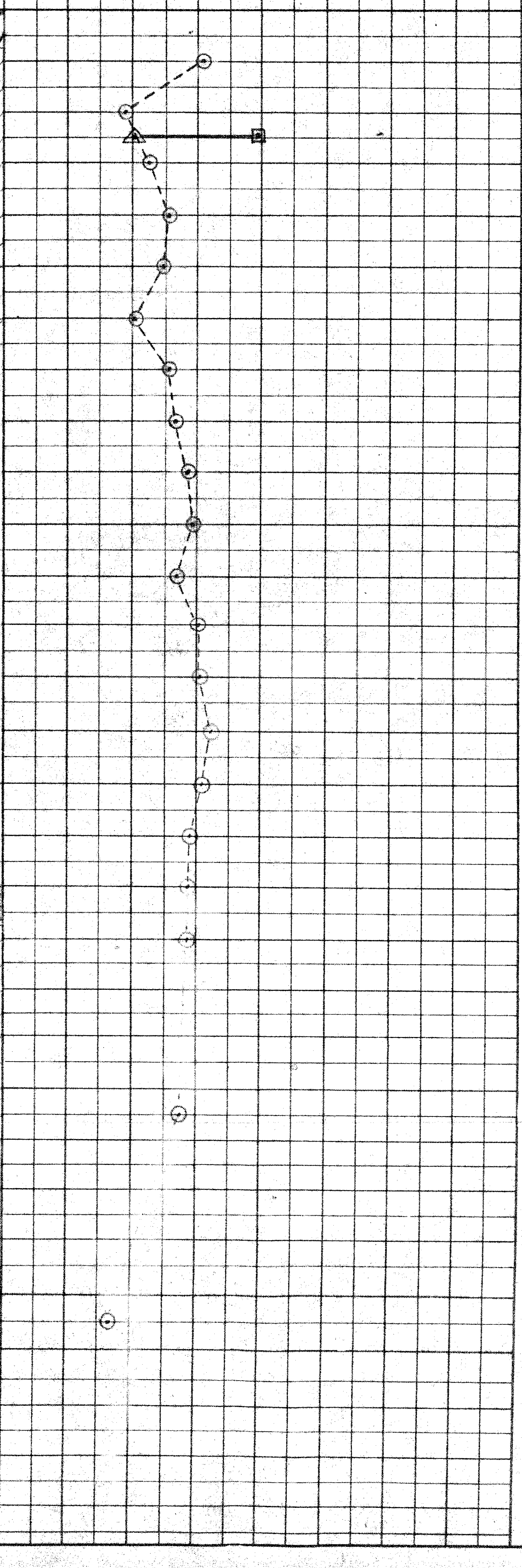
ELEV / DEPTH FEET — DATUM 2088.7

Depth (ft)	Soil Description
0–1.5	TOPSOIL
1.5–10	GLACIAL TILL Brown. Sandy Clay. Rust Streaks. Sand Pockets. Small Stones
10–12	SAND Brown Grey. Med. Fine
12–13	CLAY Dark Brown Grey. Sandy
13–21	SAND Very Silty - Clayey, Fine. Light Brown. Changes to fine clayey Sandy Silt. Fairly soft. Brown Fine. Silty.
21–30	SILT Fine Sandy. Damp. Plastic. More Sandy.
30–33.5	SAND Grey Silty Fine
33.5–34.5	SANDSTONE Clayey. Light Grey. Coal Seams
34.5–35.5	COAL Black
35.5–52	SHALE Grey. Dry. Hard. Softer
52	END of HOLE

NOTE: Free Water at 35'

MOISTURE CONDITIONS & ATTERBERG LIMITS

MOISTURE CONTENT — % ; w_p — △ ; w — ⊙ ; w_l — ⊡



SOIL SAMPLES

OTHER TESTS

Depth (ft)	Type	Penetration Resistance
6	U	
11	U	
16	U	
21	U	
24	DS	8"
32	DS	22"
36	U	
37	DS	76"
44	DS	100" / 0.8'
52	DS	100" / 0.3'

Columns: CONDITION, TYPE, PENETRATION RESISTANCE, RECOVERY % DEPTH-FEET

PLATE VII

RMH—5

R.M. HARDY & ASSOCIATES LTD.
EDMONTON — ALBERTA

SUMMARY OF SAMPLING & LABORATORY TESTS

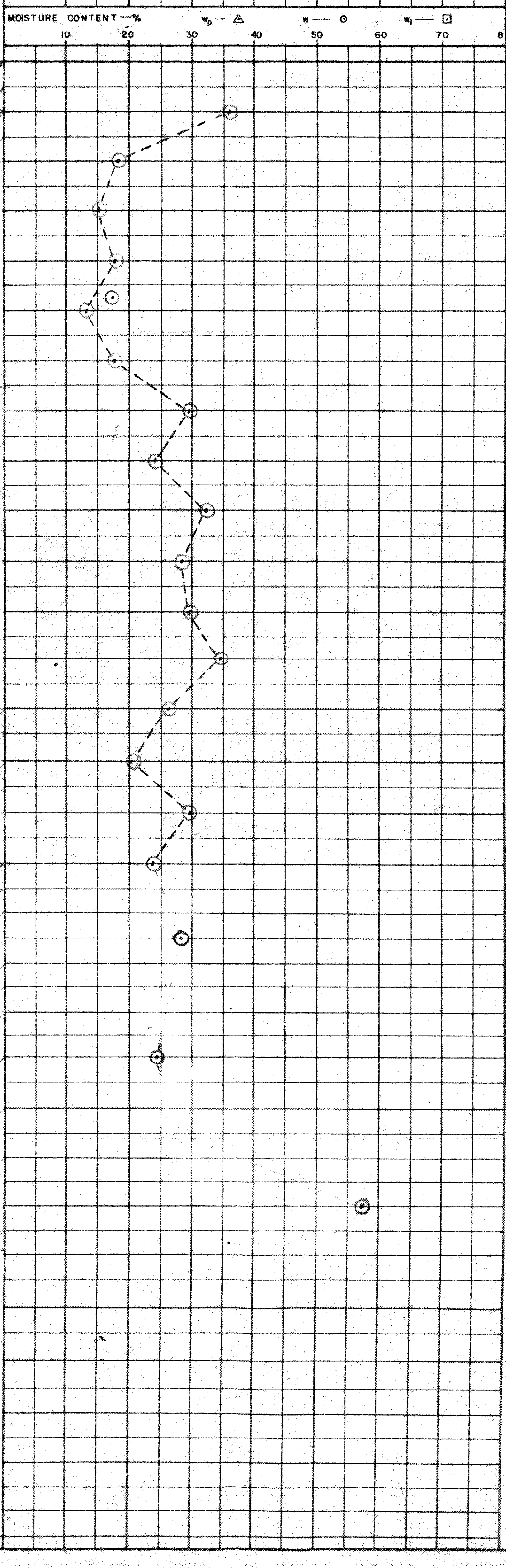
PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

DWN.	CK D.	JOB NO.	DATE	HOLE	PLATE
D.L.A.	W.S.G.	931	JANUARY '58	No. 6	VIII

SOIL PROFILE — SOIL DESCRIPTION — DATUM 2083.7

ELEV. DEPTH FEET	SOIL DESCRIPTION
0–2	TOPSOIL
2–4	CLAY — Brown. Silty. Sandy. / Brown. Very Silty. Dry.
4–13	SAND — Fine. Silty. slightly clayey. Dry. / Fine. Grey brown. Dry.
13–20	SILT — Moist / Coal. Red shale. / Fine. Sandy. Wet.
20–26	SAND — Fine. Wet.
26–27	SHALE — Black brown. Coal.
27–28	CLAY — White. Soft. Bentonite.
28–30	SHALE — Brown. Clay. Soft.
30–32	SANDSTONE — White. Soft.
32–48	SHALE — Black brown Clay. / Black brown. Clay. Highly organic. / Coal. Soft. / Light grey. Clayey. Silty. / Bright green grey clayey. Very silty. / Brown. Clayey. Very silty. / Highly Bentonitic clay. Grey white interbedded with black brown clay. Coal. Very hard. Dry.
48	END of HOLE

MOISTURE CONDITIONS & ATTERBERG LIMITS



SOIL SAMPLES

OTHER TESTS

Depth (ft)	CONDITION	TYPE	PENETRATION RESISTANCE	RECOVERY % DEPTH-FEET
~6		U		
~11		U		
~16		U		
~26		U		
~31		U		
~36		DS	6"-58^B / 6"-96^B	
~41		DS	6"-60^B / 6"-120^B / 3"-60^B	
~48		DS	3"-50^B / ½"-100^B	

PLATE VIII

RMH—5

R.M. HARDY & ASSOCIATES LTD.

EDMONTON — ALBERTA

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

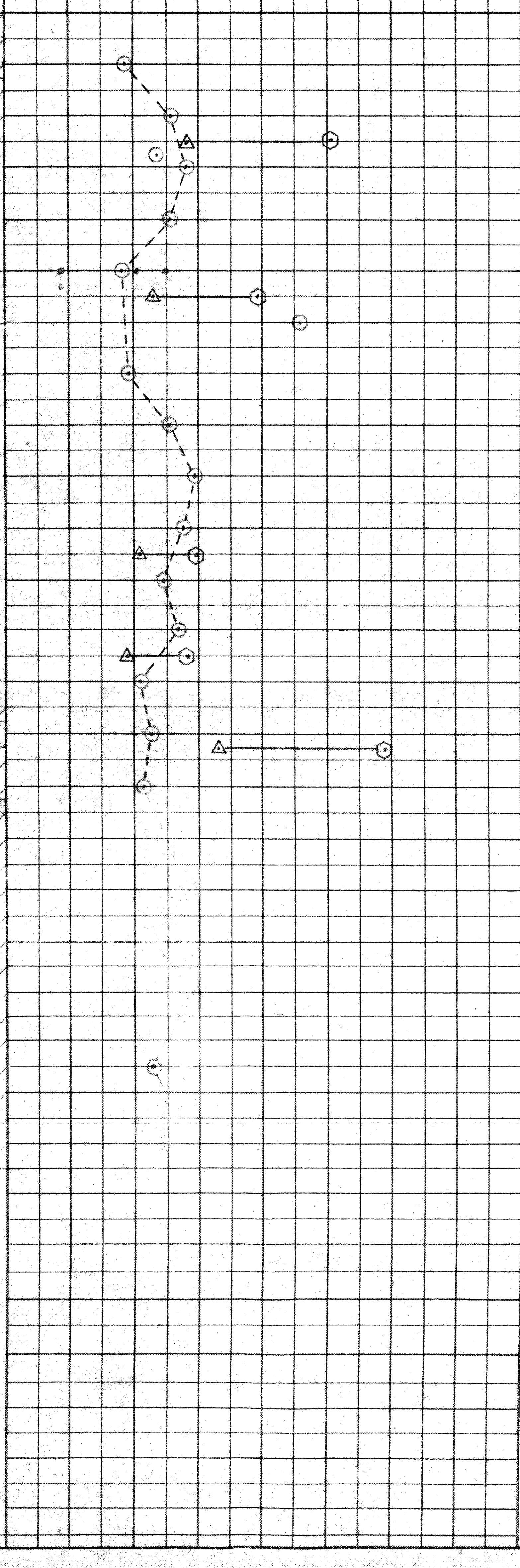
DWN.	CK D.	JOB NO.	DATE	HOLE	PLATE
D.L.A.	W.S.F.	931	JANUARY '58	7	IX

DATUM: 2085.5

Depth (feet)	Soil Description	Other Tests	Type	Penetration Resistance
0–3	TOPSOIL Cinders			
3–5	CLAY Dark brown. Silty. Sandy. Fairly dry. Medium plastic.			
5–7	SAND Brown. Clayey. Silty. Plastic.	q_u = 3.4 T/ft²	U	
7–10	SILT Lighter brown. Fine. Sandy. Clayey.			
10–12	SAND Light brown. Fine. Silty.	q_u = 1.0, 1.7, 1.9 T/ft²; C (see plate XV)	U	
12–26	SILT Darker brown. Fine. Sandy. Slightly clayey. Grey brown. Fine. Very sandy. Wet.	C (see plate XVI)	DS; U	22
26–27	SAND Rusty. Gravelly			
27–28	SHALE Dark grey. Dry.			
28–29	SANDSTONE Blue grey. Soft.			
29–31	SHALE Dark grey. Brown. Dry. Clayey. High plastic.		DS	100 / 0.5'
31	COAL Black hard with soft Mach.			
31–45	CLAY Dark grey. Sandy. Shaly. Hard. Dry. / Hard. Grey. Shaly with soft grey sandstone. / Very hard. Blue green. High plastic. Shaly. / Hard. Dark grey. Shaly. Dry. / Grey. Very sandy. Shaly.		DS	100 / 0.5'

MOISTURE CONDITIONS & ATTERBERG LIMITS

MOISTURE CONTENT — % w_p — △ w — ⊙ w_l — ⊡



Depth scale: 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46

Column headings: SOIL PROFILE | ELEV. DEPTH FEET | SOIL DESCRIPTION | SOIL SYMBOL | SOIL SAMPLES | OTHER TESTS | CONDITION | TYPE | PENETRATION RESISTANCE | RECOVERY % DEPTH-FEET

RMH—8

R.M. HARDY & ASSOCIATES LTD.
EDMONTON — ALBERTA

SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

DWN.	CK D.	JOB NO.	DATE	HOLE	PLATE
D.L.A	W.S.F.	931	JANUARY '58	No. 8	X

SOIL PROFILE

ELEV. DEPTH FEET — DATUM 2085.4

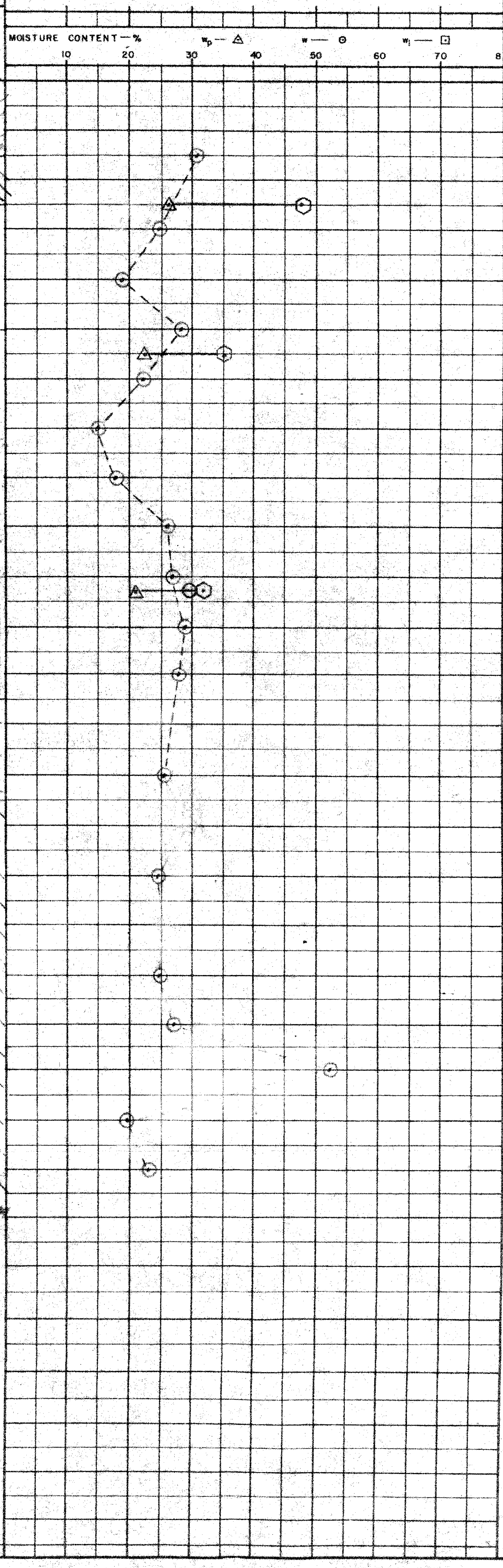
Depth (ft)	Soil Description
0–3	TOPSOIL. Clayey. High plastic.
3–5	CLAY. Light brown. Very Silty. Fairly dry.
5–10	SILT. Sandy. Clayey. Plastic.
10–14	SAND. Brown. Silty. Clayey.
14–20	Fine. Brown. Silty. Fairly Dry.
20–25	SILT. Brown. Fine Sandy. Brown and grey pockets. Rust streaks.
25–29	SAND. Rust. Stones. Coal.
29–31	SHALE. Grey brown. Sandy. Clayey. Hard.
31–40	Grey. Clayey. Hard. Dry pockets of blue siltstone.
40	Dark & light grey with grey white bentonitic clay.
40–45	Grey brown. Very hard. Dry.
45–46	Hard black coal.

END of HOLE

NOTE: Water at 23.5' after 18 hours.

MOISTURE CONDITIONS & ATTERBERG LIMITS

MOISTURE CONTENT — % w_p — △ w — ⊙ w_l — ⊡



SOIL SAMPLES

Depth (ft)	Other Tests	Condition	Type	Penetration Resistance	Recovery % Depth-Feet
6	q_u = 4.7, 3.4, 3.4 T/ft²; C (see plate XVII)		U		
11	C (see plate XVIII)		U		
16.5	C (see plate XIX)		DS	14	
21			U		
24			DS	24	
31			DS	91	
40.5			DS	100 / 0.3'	
46			DS	100 / 0.2'	

PLATE X

RMH — 5

R.M. HARDY & ASSOCIATES LTD.
EDMONTON — ALBERTA

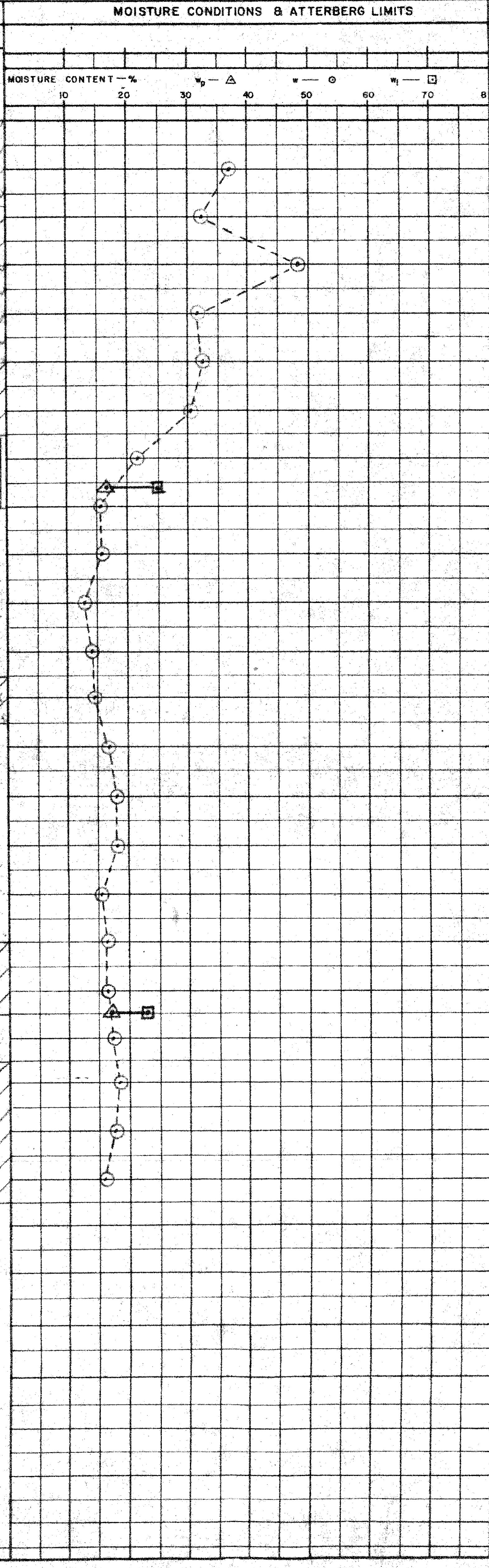
SUMMARY OF SAMPLING & LABORATORY TESTS

PROJECT: LATTA RAVINE ROAD, EDMONTON ALBERTA

DWN.	CK D.	JOB NO.	DATE	HOLE	PLATE
D.L.A.	W.S.F.	931	JANUARY '58	No. 9	XI

DATUM 2208.2

ELEV. DEPTH FEET	SOIL PROFILE — SOIL DESCRIPTION	OTHER TESTS	CONDITION / TYPE	PENETRATION RESISTANCE	RECOVERY % DEPTH-FEET
2	TOPSOIL Black Clayey				
4	CLAY Light brown. Silty Fairly soft Medium High plasticity				
6	TOPSOIL Black. Organic Peat		U		
8	Marshy clay.				
10	CLAY Grey Light brown Fairly Soft. High plastic		U		
12	Grey brown. Fairly stiff High plastic. Silty. Rust streaks.				
14	SILT Light brown Softer Clayey.				
16			U		
18	SAND Brown clayey. Rust. Coal specks				
20	Light grey brown. Clayey. Rust. Coal Small stones.				
22	Light grey brown. Fine to medium. Very dense Dry. Coal specks		DS	100/0.6'	
24	TILL Brown. Sandy clay. Hard.				
26	SAND Light brown. Dense. Dry.				
28					
30	Light brown Clayey. Rust streaks. Small stones. Coal specks		DS	100/0.7'	
32					
34					
36	CLAY Dark brown Very Sandy Stones. Coal Specks. More sandy. Softer. Coal specks.				
38	SAND Light grey. Fine Hard. Dense. Rust streaks.	$q_u = 1.6\ T/ft^2$	U		
40	CLAY Blue Sandy High plastic. Hard Small stones.		DS	75	
42	Sand lenses.				
44	Blue grey. Very sandy. Hard. Coal specks. Small stones. Small blue sandstone specks				
	END of HOLE				



MTL-4

MATERIALS TESTING LABORATORIES LTD.

CONSOLIDATION RESULTS

PROJECT	CITY ROADS
LAB. ORDER	931
SAMPLE	1-U4
LOCATION	LATTA RAVINE
HOLE	1
DEPTH	20' - 21'
TECHNICIAN	RH.
DATE	Jan 27/58

Specific Gravity of Soil Solids G_s = 2.70(est) Height of Soil Solids H_s = 0.458 ins

Void Ratio e (End) = 0.815

Void Ratio e(Start) = 1.063

Void Ratio e (Start Dimensions) = 0.965

$e(End) = W\%(End) \times G_s$ $H_s = \left(\frac{Wt \cdot Soil}{G_s \times Area \times 2.54}\right)$ ins. e = previous $e \pm \frac{Def'l.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	$\frac{Deflection}{H_s}$	Void Ratio e	Pressure Kg/cm² = T/ft²
		9000			1.063	
2499	50	9200	+0.0200	+0.044	1.107	0.074
393	100	9189	+0.0189	+0.041	1.104	0.132
6780	200	9142	+0.0142	+0.031	1.094	0.249
382	400	9060	+0.0060	+0.013	1.076	0.481
1040	800	8885	-0.0115	-0.025	1.038	0.946
304	1500	8686	-0.0314	-0.069	0.994	1.76
1103	3000	8321	-0.0679	-0.148	0.915	3.50
1740	6000	7868	-0.1132	-0.248	0.815	7.00

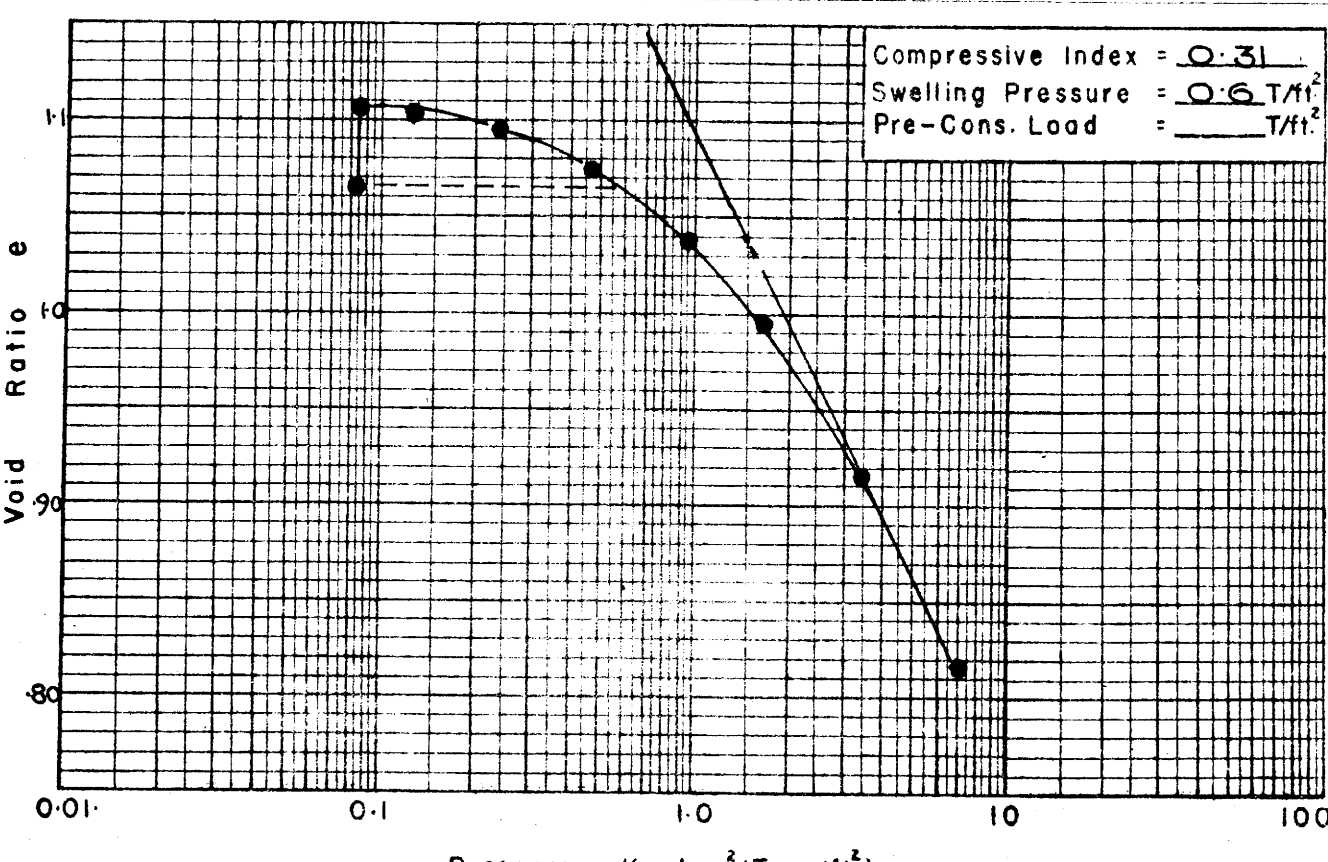


Plate XII

MTL-4

MATERIALS TESTING LABORATORIES LTD.

CONSOLIDATION RESULTS

PROJECT: CITY ROADS
LAB. ORDER: 931
SAMPLE: 1-U6
LOCATION: LATTA RAVINE
HOLE: 1 DEPTH: 30'-31'
TECHNICIAN: RH. DATE: Jan 27/58

Specific Gravity of Soil Solids G_s = 2.65 (est) Height of Soil Solids H_s = 0.445 ins.

Void Ratio e (End) = 0.786

Void Ratio e(Start) = 1.106

Void Ratio e (Start Dimensions) = 1.000

$e(End) = W\%(End) \times G_s$ $\quad H_s = \left(\frac{Wt. Soil}{G_s \times Area \times 2.54}\right)$ ins. $\quad e$ = previous $e \pm \frac{Def'l.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	$\frac{Deflection}{H_s}$	Void Ratio e	Pressure Kg/cm² = T/ft²
		9000			1.106	
1528	50	9020	+0.0020	+0.004	1.110	0.080
1126	100	9003	+.0003	+.000	1.106	0.160
390	200	8968	-.0032	-.007	1.099	0.320
1007	400	8861	-.0139	-.030	1.076	0.640
258	800	8669	-.0331	-.074	1.032	1.28
1135	1500	8369	-.0631	-.142	0.964	2.40
153	3000	8023	-.0977	-.220	0.886	4.80
248	6000	7572	-.1428	-.320	0.786	9.60

Compressive Index = 0.33

Swelling Pressure = 0.004 T/ft²

Pre-Cons. Load = ______ T/ft²

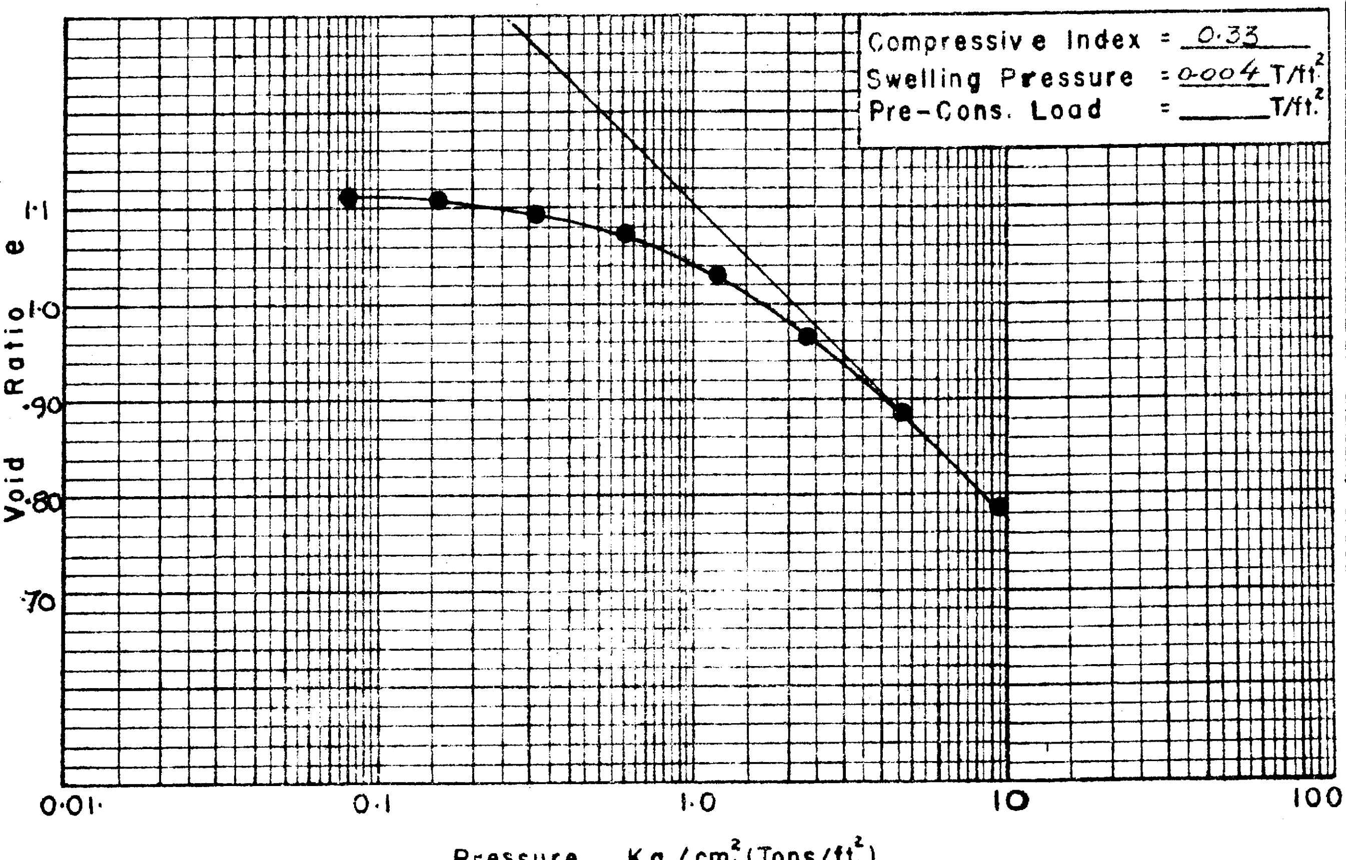


Plate XIII

MTL-4

MATERIALS TESTING LABORATORIES LTD.

CONSOLIDATION RESULTS

PROJECT	CITY ROADS		
LAB. ORDER	931		
SAMPLE	2-U2		
LOCATION	LATTA RAVINE		
HOLE	2	DEPTH	12'-13'
TECHNICIAN	R.H.	DATE	Jan 29/58

Specific Gravity of Soil Solids G_s = 2.70 (est) Height of Soil Solids H_s = 0.450 ins.

Void Ratio e (End) = 0.750

Void Ratio e (Start) = 1.150

Void Ratio e (Start Dimensions) = 1.000

$e(End) = W\%(End) \times G_s$ $H_s = \left(\frac{Wt \cdot Soil}{G_s \times Area \times 2.54}\right)$ ins. $e = \text{previous } e \pm \frac{Def'l.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	Deflection / H_s	Void Ratio e	Pressure Kg/cm² = T/ft²
		7000			1.150	
4228	50	7029	+0.0029	+0.006	1.156	0.080
67	100	7022	+0.0022	+0.005	1.155	0.160
321	200	7002	+0.0002	+0.000	1.150	0.320
1434	400	6929	-0.0071	-0.015	1.135	0.640
2859	800	6772	-0.0228	-0.050	1.100	1.28
252	1500	6543	-0.0457	-0.101	1.049	2.40
1126	3000	6130	-0.0870	-0.193	0.957	4.80
295	6000	5697	-0.1303	-0.290	0.860	9.60
1094	12000	5194	-0.1806	-0.400	0.750	19.19

Compressive Index = 0.38

Swelling Pressure = — T/ft²

Pre-Cons. Load = ______ T/ft²

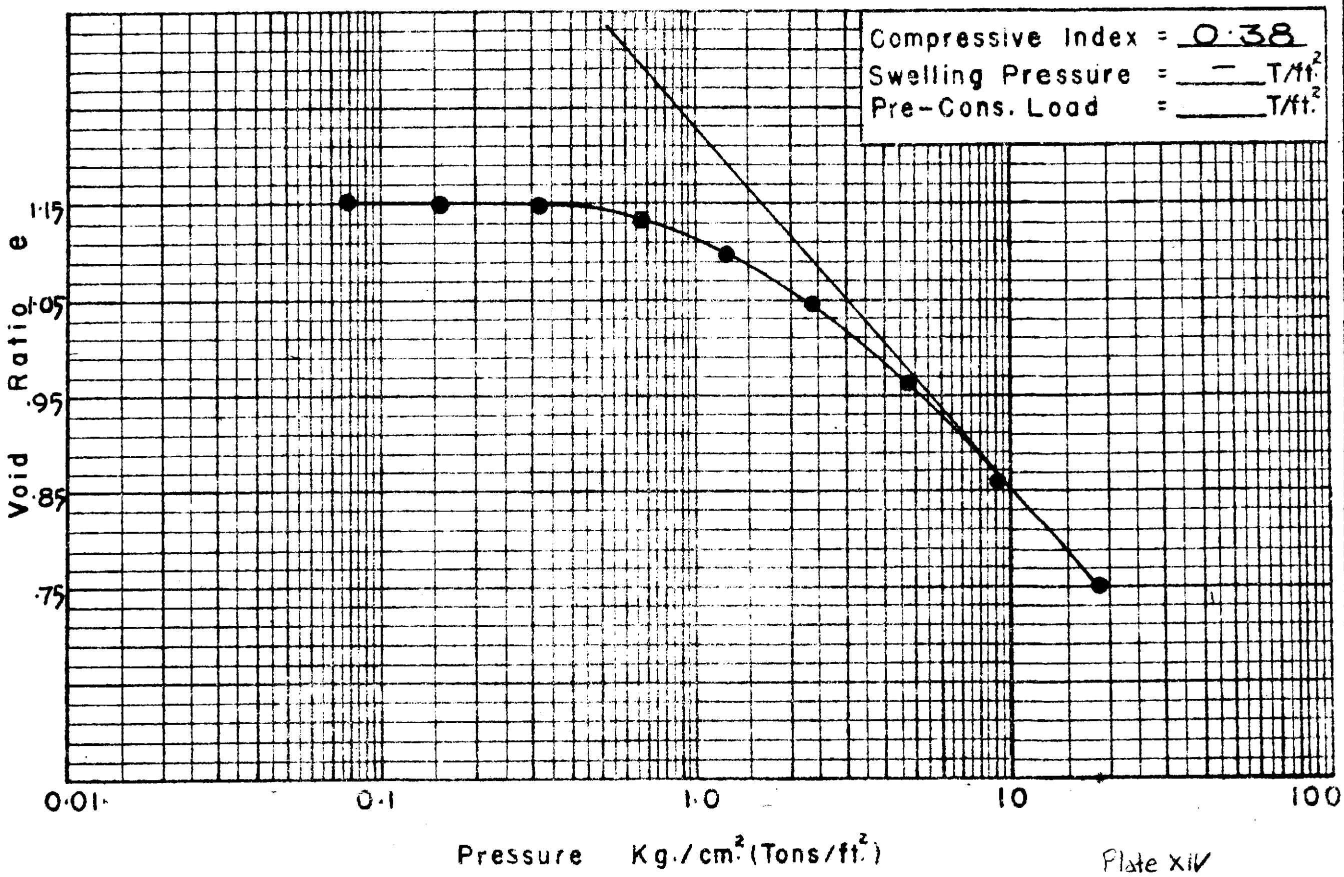


Plate XIV

MTL-4

MATERIALS TESTING LABORATORIES LTD.

CONSOLIDATION RESULTS

PROJECT	CITY ROADS		
LAB. ORDER	931		
SAMPLE	7-U2		
LOCATION	LATTA RAVINE		
HOLE	7	DEPTH	10'-11'
TECHNICIAN	R.H.	DATE	Feb. 6/58

Specific Gravity of Soil Solids G_s = 2.69(est) Height of Soil Solids H_s = 0.522 ins.

Void Ratio e (End) = 0.569

Void Ratio e(Start) = 0.737

Void Ratio e (Start Dimensions) = 0.724

e(End) = W%(End) x G_s $H_s = \left(\frac{\text{Wt. Soil}}{G_s \times \text{Area} \times 2.54}\right)$ ins. e = previous e $\pm \frac{\text{Def'l.}}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	Deflection / H_s	Void Ratio e	Pressure Kg/cm² = T/ft²
—	0	9000	—	—	0.737	—
2490	50	9090	+0.0090	+0.017	0.754	0.074
52	100	9073	+0.0073	+0.014	0.751	0.132
2730	200	9039	+0.0039	+0.007	0.744	0.249
64	400	8998	-0.0002	0.000	0.737	0.481
200	800	8923	-0.0077	-0.015	0.722	0.946
1230	1500	8823	-0.0177	-0.034	0.703	1.76
1422	3000	8672	-0.0328	-0.063	0.674	3.50
260	6000	8461	-0.0539	-0.103	0.634	7.00
1090	12000	8121	-0.0872	-0.168	0.569	14.00

Compressive Index = 0.170

Swelling Pressure = 0.45 T/ft²

Pre-Cons. Load = ______ T/ft²

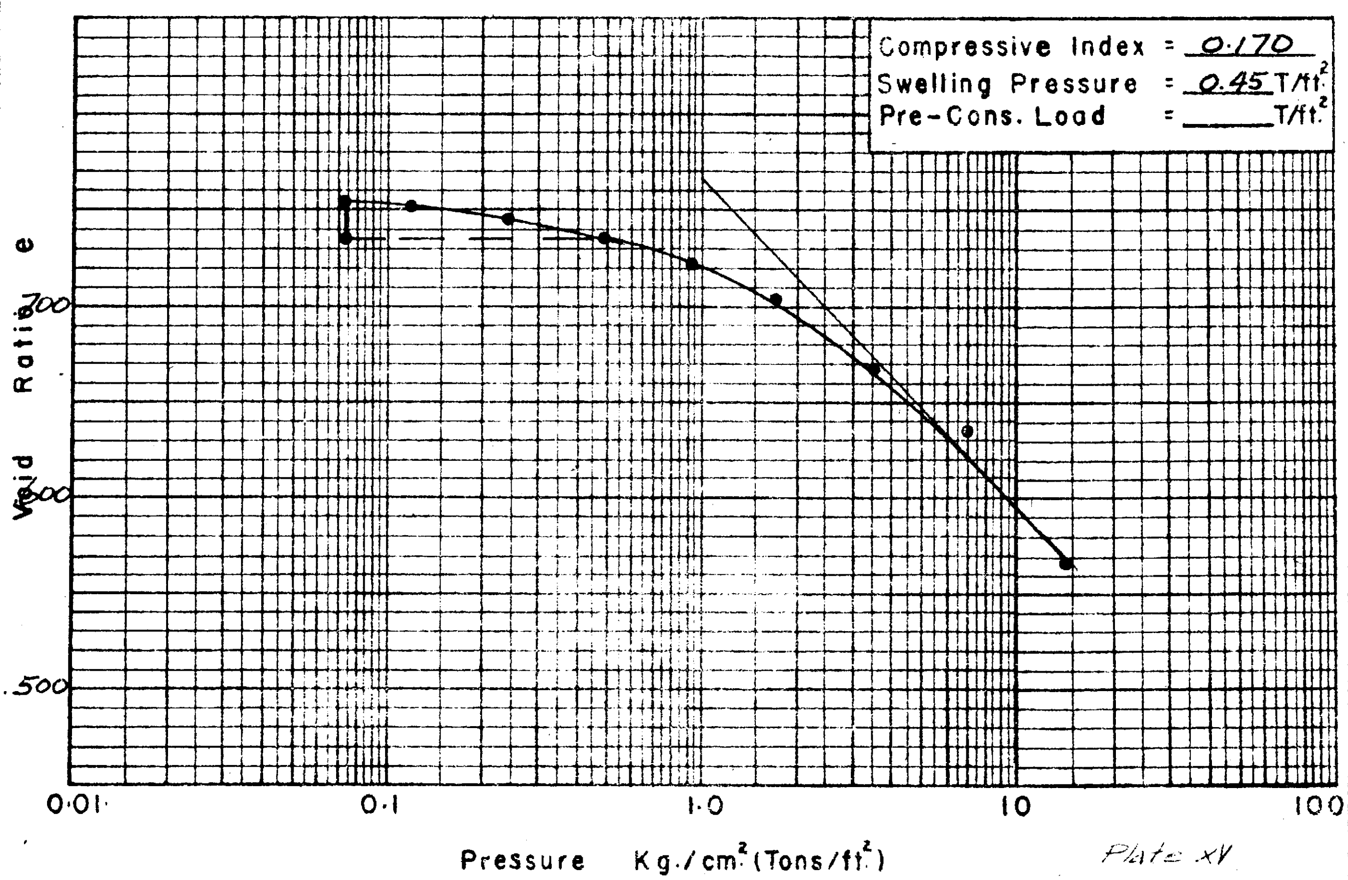


Plate XV

MTL-4

MATERIALS TESTING LABORATORIES LTD.

CONSOLIDATION RESULTS

PROJECT CITY ROADS
LAB. ORDER 931
SAMPLE 7-U4
LOCATION LATTA RAVINE
HOLE 7 DEPTH 25'-26'
TECHNICIAN RS. DATE Feb 10/58

Specific Gravity of Soil Solids G_s = 2·68(est) Height of Soil Solids H_s = 0·515 ins.
Void Ratio e (End) = 0·545
Void Ratio e(Start) = 0·721
Void Ratio e (Start Dimensions) = 0·748

e(End) = W%(End) x G_s $H_s = \left(\frac{Wt \cdot Soil}{G_s \times Area \times 2{\cdot}54}\right)$ins.   e = previous e $\pm \frac{Def'l.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	Deflection / H_s	Void Ratio e	Pressure Kg/cm² = T/ft²
		9000			0·721	
1230	50	9032	+0·0032	+0·006	0·727	0·080
270	100	9017	+0·0017	+0·003	0·724	0·160
70	200	8981	-0·0019	-0·004	0·717	0·320
65	400	8938	-0·0062	-0·012	0·709	0·640
993	800	8853	-0·0147	-0·029	0·692	1·28
252	1500	8751	-0·0249	-0·048	0·673	2·40
64	3000	8597	-0·0403	-0·078	0·643	4·80
1005	6000	8341	-0·0659	-0·128	0·593	9·60
64	12000	8091	-0·0909	-0·176	0·545	19·19

Compressive Index = 0·18
Swelling Pressure = 0·25 T/ft²
Pre-Cons. Load = ______ T/ft²

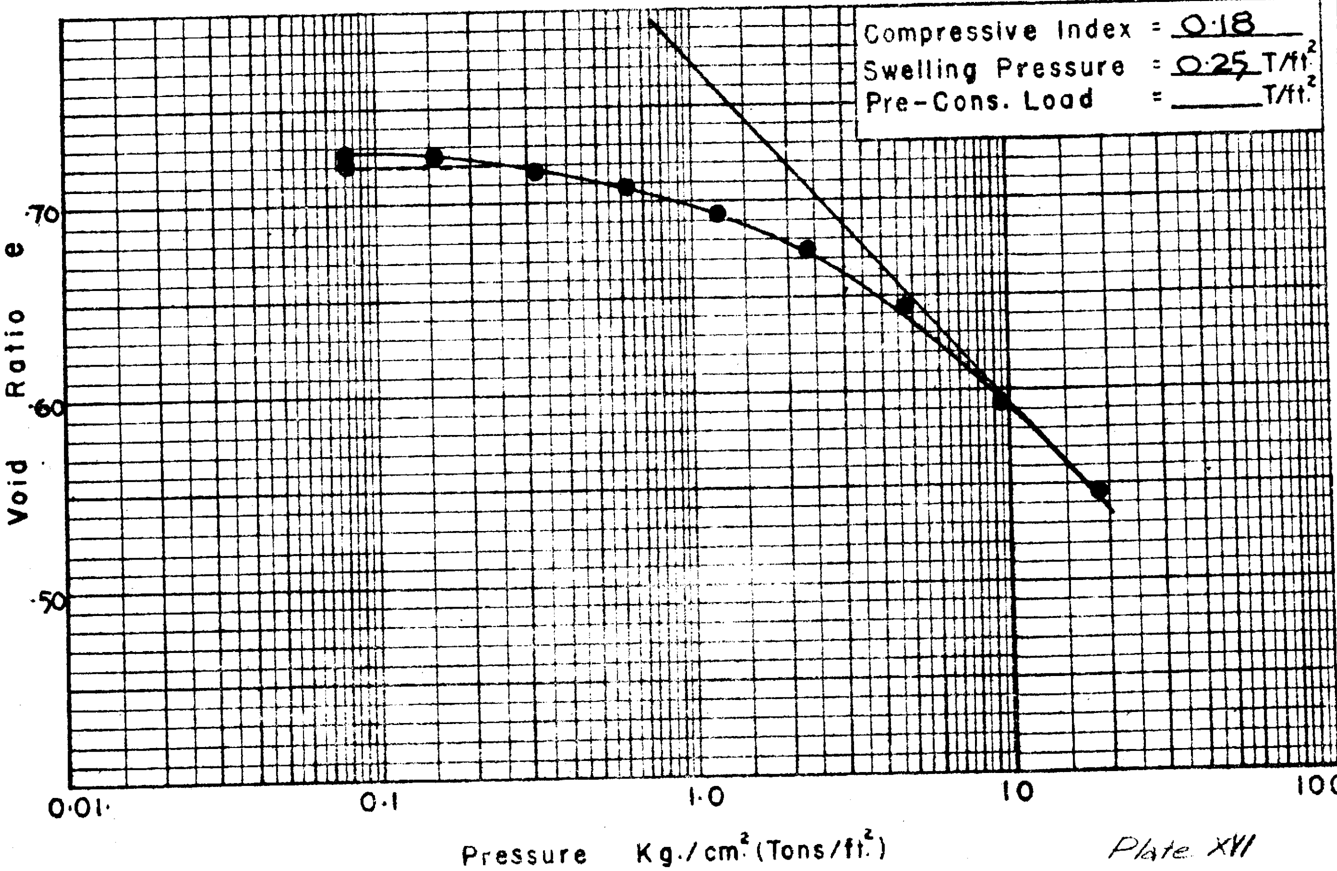


Plate XVI

MTL-4

MATERIALS TESTING LABORATORIES LTD.

CONSOLIDATION RESULTS

PROJECT	CITY ROADS
LAB. ORDER	931
SAMPLE	8-U1
LOCATION	LATTA RAVINE
HOLE	8 DEPTH 5'-6'
TECHNICIAN	R.H. DATE Jan 29/58

Specific Gravity of Soil Solids G_s = 2.70(est) Height of Soil Solids H_s = 0.490 ins.

Void Ratio e (End) = 0.572.

Void Ratio e(Start) = 0.689

Void Ratio e (Start Dimensions) = 0.836

$e(End) = W\%(End) \times G_s$ $H_s = \left(\frac{Wt.\ Soil}{G_s \times Area \times 2.54}\right)$ ins. $e = \text{previous } e \pm \frac{Def'l.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	$\frac{Deflection}{H_s}$	Void Ratio e	Pressure $Kg/cm^2 = T/ft^2$
		9000			0.689	
7086	50	9293	+0.0293	+0.060	0.749	0.074
32	100	9291	+0.0291	+0.059	0.748	0.132
212	200	9258	+0.0258	+0.053	0.742	0.249
1132	400	9179	+0.0179	+0.037	0.726	0.481
89	800	9089	+0.0089	+0.018	0.707	0.946
26	1500	8979	-0.0021	-0.004	0.685	1.76
1292	3000	8822	-0.0178	-0.036	0.653	3.50
145	6000	8683	-0.0317	-0.065	0.624	7.00
1589	12000	8429	-0.0571	-0.117	0.572	14.00

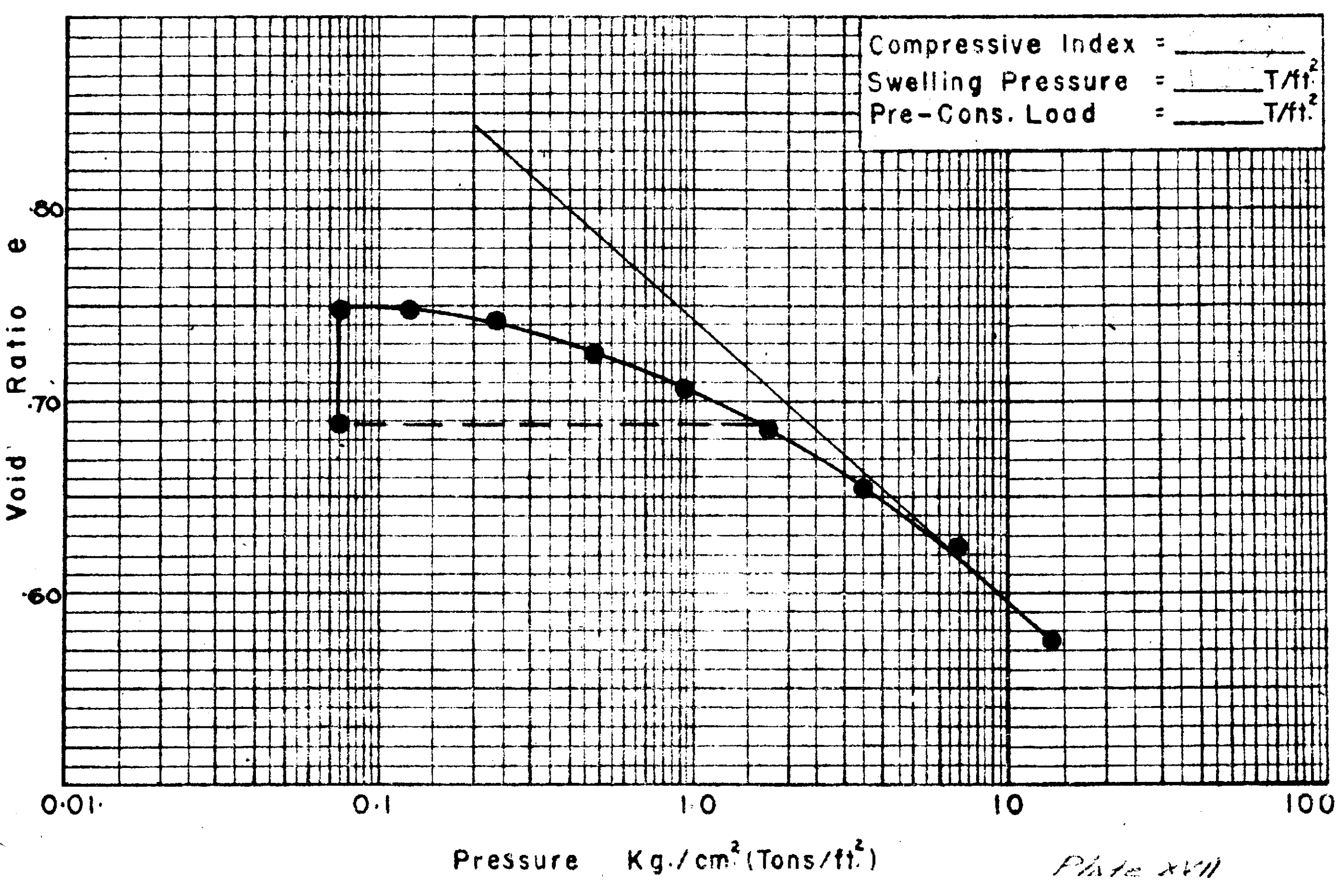


Plate XVII

MTL-4

MATERIALS TESTING LABORATORIES LTD.

CONSOLIDATION RESULTS

PROJECT: CITY ROADS
LAB. ORDER: 931
SAMPLE: 8 - U2
LOCATION: LATTA RAVINE
HOLE: 8 DEPTH: 10'-11'
TECHNICIAN: R.H. DATE: Feb 6/58

Specific Gravity of Soil Solids G_s = 2.65 (est) Height of Soil Solids H_s = 0.516 ins.

Void Ratio e (End) = 0.629

Void Ratio e (Start) = 0.832

Void Ratio e (Start Dimensions) = 0.744

$e(End) = W\%(End) \times G_s$ $H_s = \left(\frac{Wt.\ Soil}{G_s \times Area \times 2.54}\right)$ ins. $e = \text{previous } e \pm \frac{Def'l.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	$\frac{Deflection}{H_s}$	Void Ratio e	Pressure $Kg/cm^2 = T/ft^2$
		9000			0.832	
2216	50	9052	+0.0052	+0.010	0.842	0.074
65	100	9036	+0.0036	+0.007	0.839	0.132
2730	200	8979	-0.0021	-0.004	0.828	0.249
130	400	8909	-0.0091	-0.018	0.814	0.481
143	800	8779	-0.0221	-0.043	0.789	0.946
75	1500	8608	-0.0392	-0.072	0.760	1.76
50	3000	8340	-0.0660	-0.128	0.704	3.50
970	6000	7951	-0.1049	-0.203	0.629	7.00

Compressive Index = 0.25
Swelling Pressure = 0.2 T/ft^2
Pre-Cons. Load = ______ T/ft^2

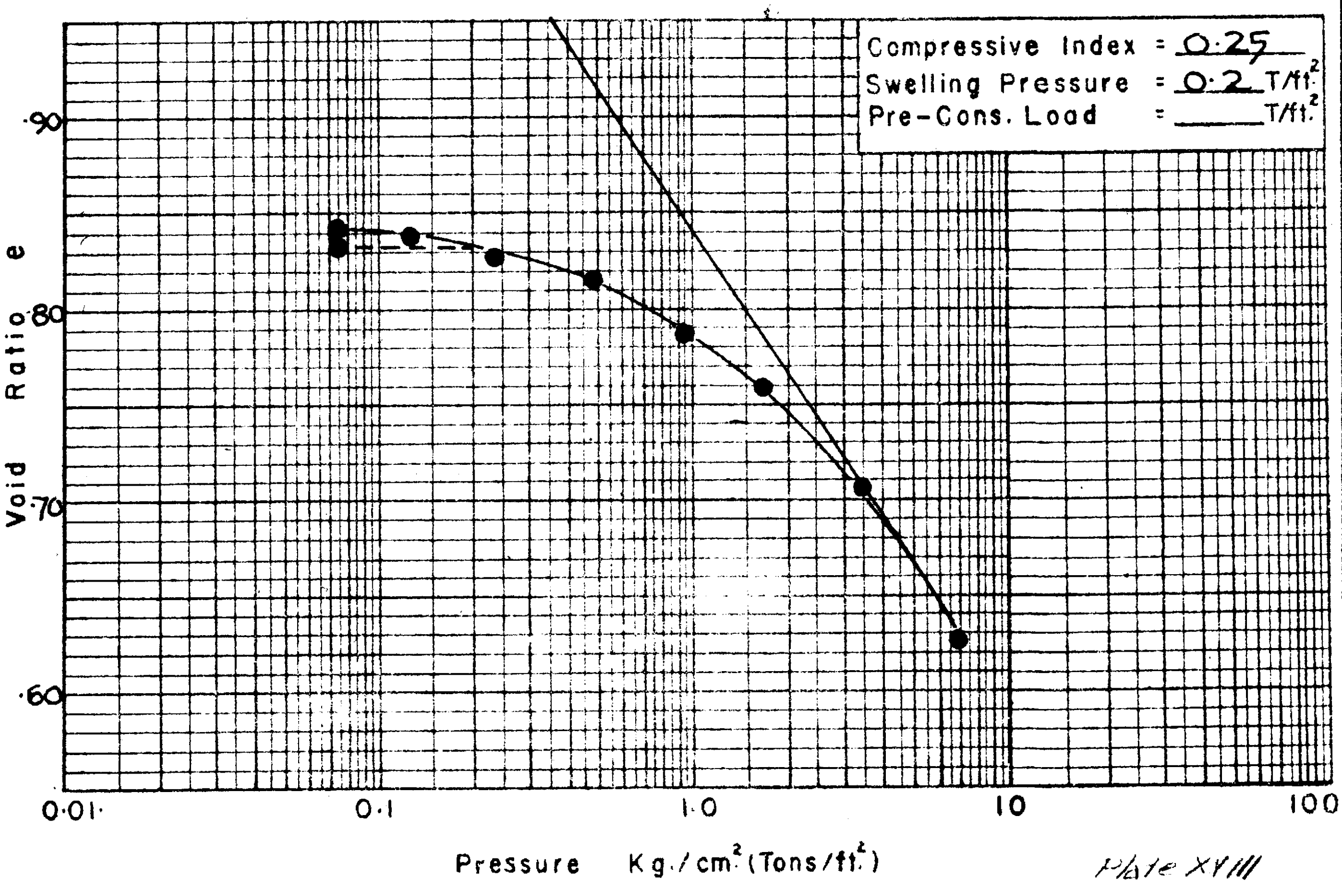


Plate XVIII

MTL-1

MATERIALS TESTING LABORATORIES LTD.

CONSOLIDATION RESULTS

PROJECT CITY ROADS
LAB. ORDER 931
SAMPLE 8-03
LOCATION
HOLE DEPTH
TECHNICIAN DATE

Specific Gravity of Soil Solids G_s = 2.65 (est) Height of Soil Solids H_s = 0.531 ins.
Void Ratio e (End) = 0.538
Void Ratio e(Start) = 0.740
Void Ratio e (Start Dimensions) = 0.695

$e(End) = W\%(End) \times G_s$ $H_s = \left(\frac{Wt\ Soil}{G_s \times Area \times 2.54}\right)$ ins. $e = \text{previous } e \pm \frac{Def'l.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins.)	Deflection (ins.)	$\frac{Deflection}{H_s}$	Void Ratio e	Pressure Kg/cm² = T/ft²
		9000			0·740	
1123	50	8970	-0·0030	-0·006	0·734	0·074
1405	100	8936	-0·0064	-0·012	0·728	0·132
1495	200	8870	-0·0130	-0·024	0·716	0·249
47	400	8797	-0·0203	-0·038	0·702	0·481
2705	800	8648	-0·0352	-0·066	0·674	0·946
35	1500	8546	-0·0454	-0·086	0·654	1·76
32	3000	8362	-0·0638	-0·120	0·620	3·50
32	6000	8161	-0·0839	-0·158	0·582	7·00
70	12000	7928	-0·1072	-0·202	0·538	14·00

Compressive Index = 0·145
Swelling Pressure = 0·12 T/ft²
Pre-Cons. Load = ______ T/ft²

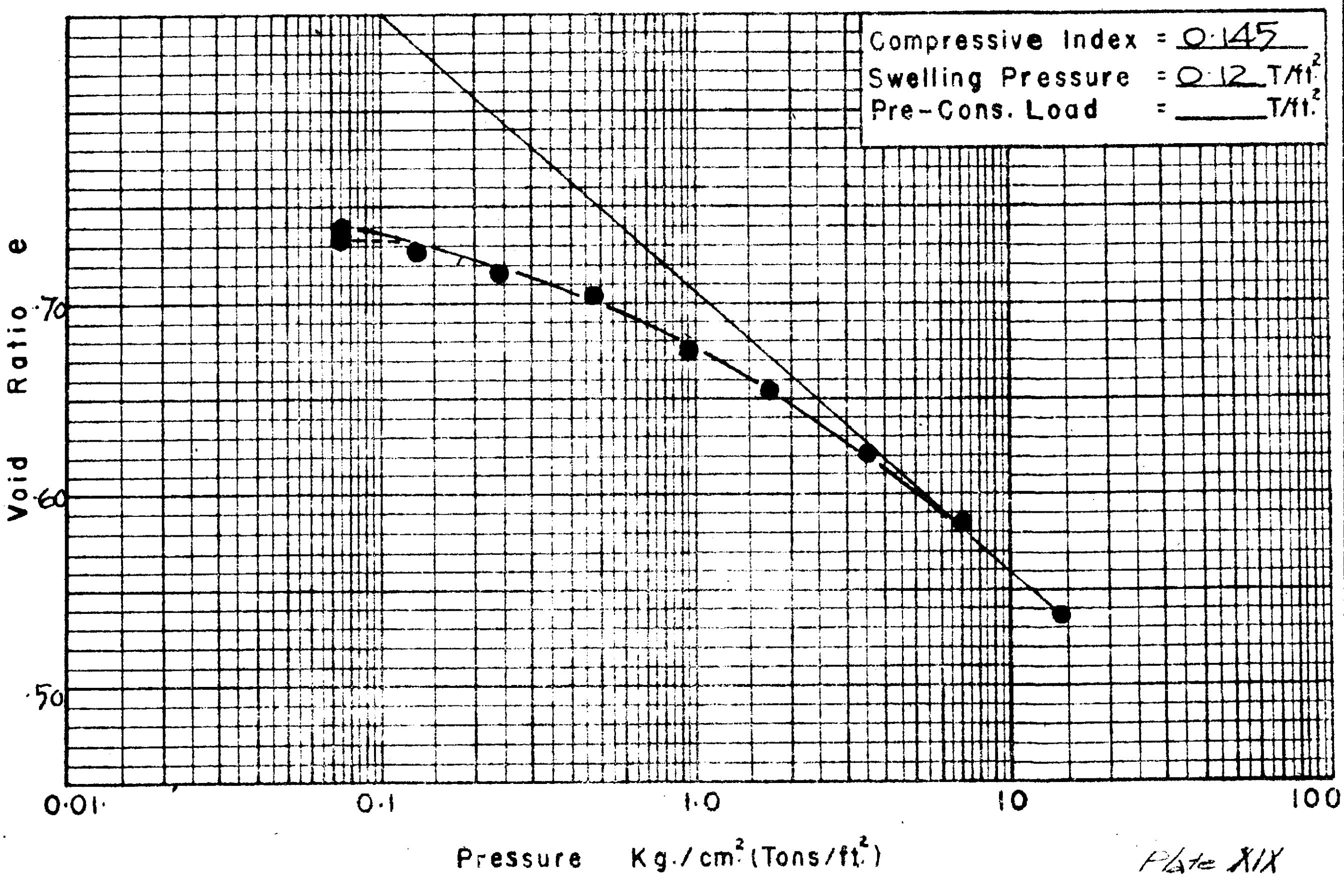


Plate XIX

MTL-4

MATERIALS TESTING LABORATORIES LTD.

CONSOLIDATION RESULTS

PROJECT	CITY ROADS
LAB. ORDER	931
SAMPLE	4 - U3
LOCATION	LATTA RAVINE
HOLE	4 DEPTH 25'-26'
TECHNICIAN	R.S. DATE June 2/58

Specific Gravity of Soil Solids G_s = 2.72 est. Height of Soil Solids H_s = 0.506 ins.

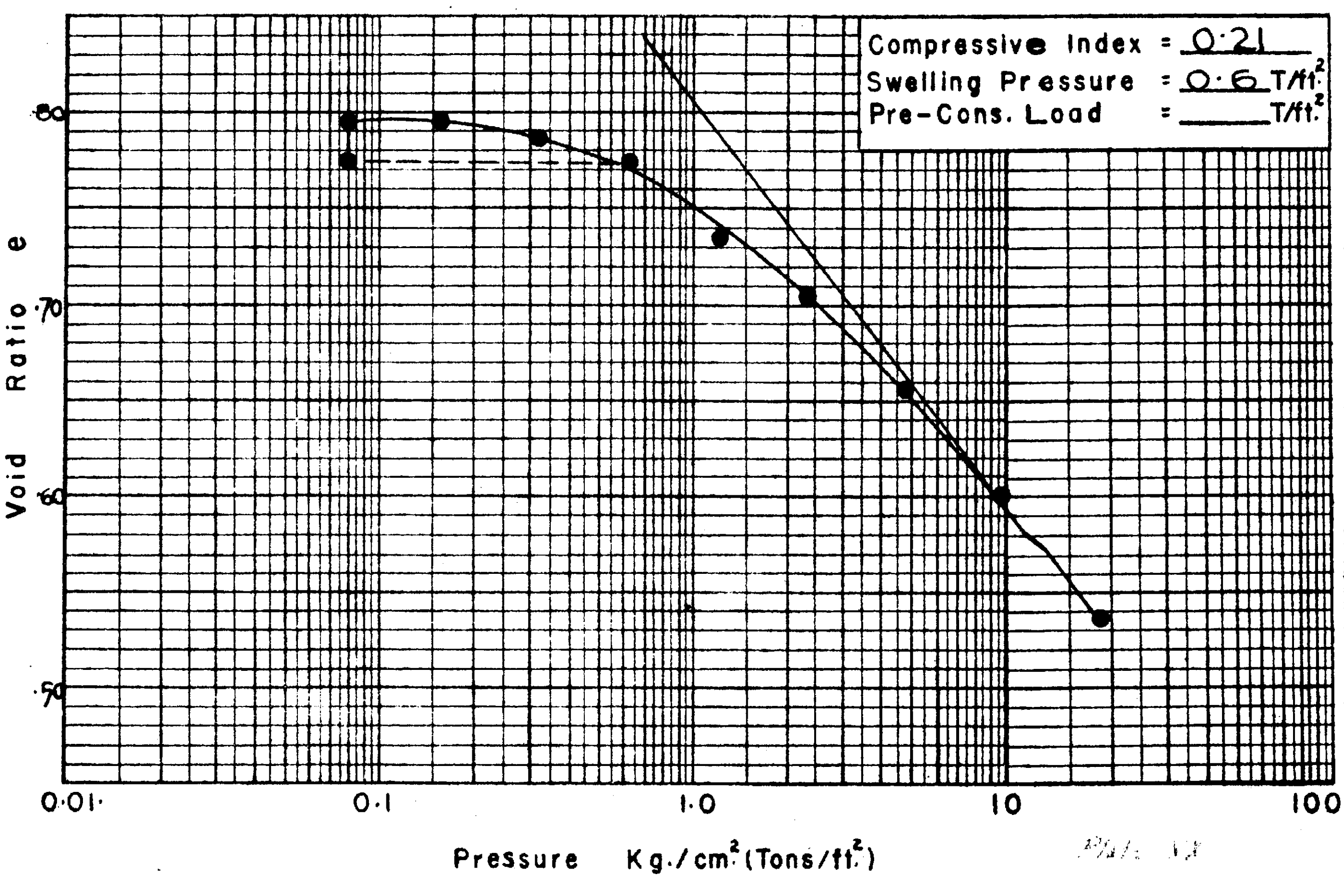
Void Ratio e (End) = 0.538

Void Ratio e(Start) = 0.775

Void Ratio e (Start Dimensions) = 0.778

$e(End) = W\%(End) \times G_s$ $H_s = \left(\frac{Wt.\ Soil}{G_s \times Area \times 2.54}\right)$ ins. $e = \text{previous } e \pm \frac{Def'l.}{H_s}$

Time Interval	Load on Pan (gms)	Corr. Dial Reading (ins)	Deflection (ins.)	Deflection / H_s	Void Ratio e	Pressure Kg/cm² = T/ft²
-	0	9000	-	-	0.775	-
1266	50	9102	+0.0102	+0.020	0.795	0.080
64	100	9091	+0.0091	+0.018	0.793	0.160
133	200	9060	+0.0060	+0.012	0.787	0.320
76	400	8995	-0.0005	-0.001	0.774	0.640
64	800	8861	-0.0199	-0.039	0.736	1.28
943	1500	8648	-0.0352	-0.069	0.706	2.40
131	3000	8411	-0.0589	-0.116	0.659	4.80
119	6000	8112	-0.0888	-0.175	0.600	9.60
140	12000	7802	-0.1198	-0.237	0.538	19.19

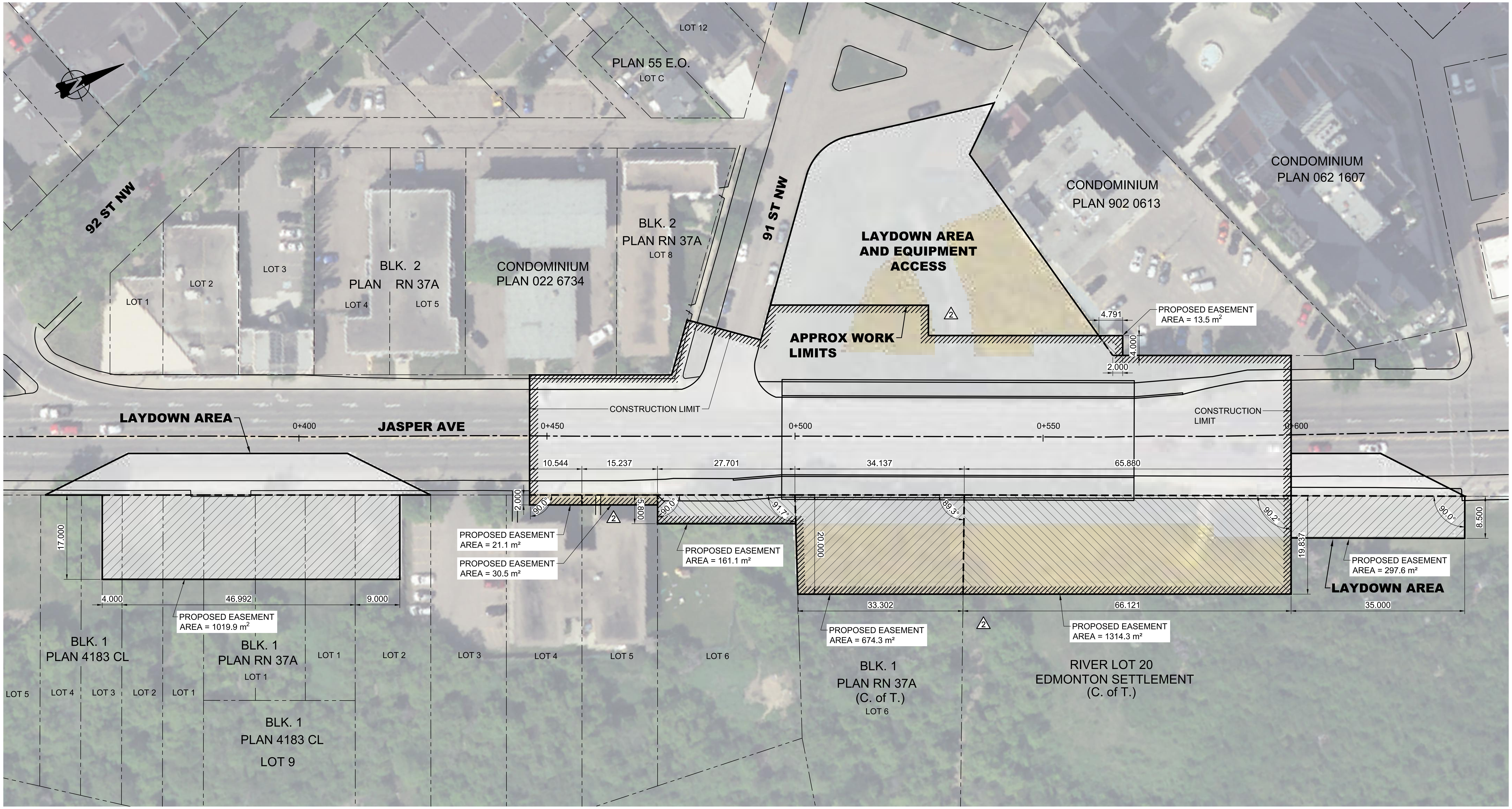


Compressive Index = 0.21

Swelling Pressure = 0.6 T/ft²

Pre-Cons. Load = ______ T/ft²

Appendix C: Proposed Easement Areas (City of Edmonton 2021)



NOTE:
EASEMENT AREAS INCLUDE FINAL RIGHT-OF-WAY
SHOWN ON "RIGHT-OF-WAY REQUIREMENTS" DRAWING

PLAN
1:400

LEGEND:

- APPROXIMATE WORK LIMITS
- PREVIOUS WORK LIMITS, EASEMENTS AND LAYDOWN AREAS
- NEW ADDITIONAL EASEMENT AND LAYDOWN AREA

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2	REVISED WORK LIMITS	JE	2021-05-11	CW
1	ISSUED FOR REVIEW	JE	2021-03-09	CW

PROGRAM NO.
CONTRACT NO.

NO.	ISSUE	BY	DATE
2	AS BUILT / TO GBIS		
1	TENDER AWARD DATE		

CONSTRUCTION RETURN
CONTRACTOR
SURVEYOR
DATE
FILE NUMBER
CONSTRUCTION ENGINEER DATE
GENERAL SUPERVISOR DATE

BPTEC ENGINEERING
Suite 200, 4220-98 Street NW
Edmonton, AB T6E 6A1
(780) 436-5376
www.bptec.ca

PRELIMINARY
NOT FOR
CONSTRUCTION

APPROVED FOR CONSTRUCTION
DATE

DEPARTMENT / BRANCH | APPROVAL | DATE

TRANSPORTATION INFRASTRUCTURE DELIVERY DATE

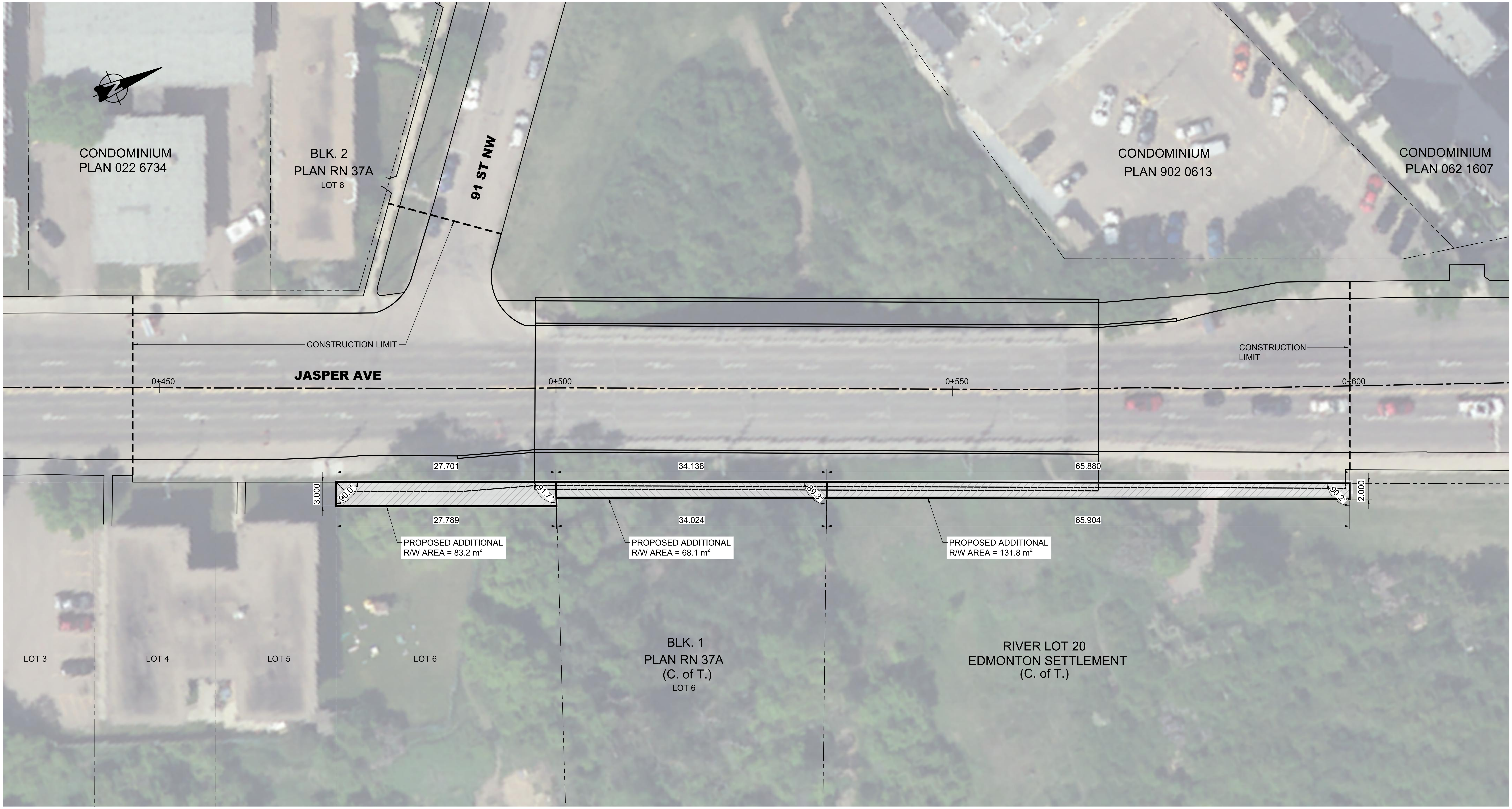
SURVEY
JOB NO. 521-036
SCALE AS NOTED
HOR
VER

DRAWN AD DATE 2021-03-09
DESIGNED JE DATE 2021-03-09
CHECKED CW DATE 2021-03-09

THE CITY OF Edmonton
INTEGRATED INFRASTRUCTURE SERVICES
INFRASTRUCTURE PLANNING AND DESIGN BRANCH

PROJECT
JASPER AVENUE OVER LATTA RAVINE BRIDGE REPLACEMENT
CONSTRUCTION PHASE

DRAWING
EASEMENT REQUIREMENTS



PLAN

1:250

NO.	REVISIONS	BY	DATE	APP'D
7				
6				
5				
4				
3				
2	ADDITIONAL DIMENSIONS	JE	2021-05-11	CW
1	ISSUED FOR REVIEW	JE	2021-03-09	CW

PROGRAM NO.

CONTRACT NO.

NO.	ISSUE	BY	DATE
2	AS BUILT / TO GBIS		
1	TENDER AWARD DATE		

CONSTRUCTION RETURN

CONTRACTOR

SURVEYOR

DATE

FILE NUMBER

CONSTRUCTION ENGINEER DATE

GENERAL SUPERVISOR DATE

BPTEC ENGINEERING

Suite 200, 4220-98 Street NW, Edmonton, AB T6E 6A1 (780) 436-5376 www.bptec.ca

PRELIMINARY
NOT FOR CONSTRUCTION

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DATE

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TRANSPORTATION INFRASTRUCTURE DELIVERY DATE

SURVEY

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THE CITY OF Edmonton

INTEGRATED INFRASTRUCTURE SERVICES

INFRASTRUCTURE PLANNING AND DESIGN BRANCH

PROJECT

JASPER AVENUE OVER LATTA RAVINE BRIDGE REPLACEMENT

FINAL BRIDGE STRUCTURE

DRAWING

RIGHT-OF-WAY REQUIREMENTS

Appendix D: EIA Terms of Reference

Terms of Reference for Latta Bridge Replacement Project Environmental Impact Assessment

Document Purpose

In accordance with the North Saskatchewan River Valley Area Redevelopment Plan, Bylaw 7188, an environmental impact assessment (EIA) is required to be completed and submitted for Council review and approval for the Latta Bridge Replacement Project (the "Project").

This document serves as the terms of reference (TOR) for the EIA required for the Project. This document is based on the standard, generic TOR template for projects in the River Valley, and has been modified to account for site-specific conditions and project-specific considerations.

The TOR have been prepared based on information provided by Integrated Infrastructure Services, including the Latta Bridge Assessment (B027) report, and during scoping meetings attended by representatives from the project team and an ecological planner representing the Urban Growth & Open Space section (Planning & Environment Services branch, Urban Planning & Economy department).

North Saskatchewan River Valley Area Redevelopment Plan

A Guide to Completing Environmental Impact Assessments

Table of Contents

Introduction

The North Saskatchewan River Valley Area Redevelopment Plan (River Valley Area Redevelopment Plan) protects, preserves, and enhances the North Saskatchewan River Valley and Ravine System as Edmonton's greatest asset and mitigates the impacts of development upon the natural functions and character of the river valley and ravine system.

The following guide has been developed to outline the process and content required for completing environmental impact assessments under Section 3.3.3 and Schedule D of the North Saskatchewan River Valley Area Redevelopment Plan. The aim is to provide a consistent approach to assessing impacts, to increase efficiency in report preparation and review, and to improve communication between the agencies and individuals involved.

Please note that policy 3.3.3, policy 3.4.2, policy 3.4.3, and Schedule D of the NSRV ARP apply to the Project. This determination is made with the understanding that the scope of work for the Project represents an upgrade of an existing transportation facility. Preparation of an environmental impact assessment for Administration's review is required. Council approval of the Project is required (the requirement for Council approval of the EIA referenced in policy 3.4.3 is found in an implementation plan associated with the original 1985 NSRV ARP, rather than directly in the NSRV ARP itself). Preparation or approval of a site location study is not a requirement for this Project.

As changes to the scope of work may affect the application of NSRV ARP policies to the Project, please consult with Urban Growth & Open Space should a significant change to the Project design be identified in the future.

This Guide is general in nature, applying to a range of projects including park master plans, park and facility development projects and utility and infrastructure projects.

Environmental Impact Assessment Guide

These guidelines provide a general framework in completing an environmental impact assessment in accordance with the requirements outlined in the North Saskatchewan River Valley Area Redevelopment Plan. Emphasis is placed on early consultation with the City of Edmonton and other review agencies (e.g. Province of Alberta). This helps to improve communication, identify issues and constraints at an early stage, avoid costly delays, and make efficient use of time and resources. On-going dialogue and reporting is expected throughout the process.

Prior to commencing work on the environmental impact assessment report, a pre-consultation scoping and project review with Urban Growth & Open Space is strongly advised.

The pre-consultation meeting for an environmental impact assessment will include staff from Urban Growth & Open Space, other review agency staff where appropriate, the individual(s) preparing the environmental impact assessment, and, if desired, the project proponent. If the applicant has already retained a consultant to complete the environmental report, then the consultant should be included in this meeting. The purpose of the pre-consultation meeting will be to:

- Screen proposed projects to determine the type of environmental review required, and
- Identify preliminary ecological constraints and other issues requiring assessment.

Based on the outcomes of the meeting, a preliminary scope of work for the environmental report will be determined and will depend on the following:

- The scale and the nature of the proposed development or site alteration;
- The character of the natural environment and its associated ecological functions;
- The site’s setting within the landscape and/or watershed;
- The availability of previous studies and information; and,
- Any social or socio-economic considerations.

Some specific study requirements for the environmental report, such as breeding bird surveys or field investigations of potential species at risk and their habitats, may be identified and agreed upon during pre-consultation, based upon the known natural features and ecological functions that could be affected by the proposed project.

Once the preliminary scope of the environmental impact assessment has been determined, the author of the report can proceed to gather information from available background sources and/or original field studies, confirm the scope of the report with the City, conduct the impact assessment and report on the study findings.

Specifications for field investigations are provided in Section Two. In general, however, applicants and their consultants should be aware that at least one site visit is required for every environmental impact assessment report regardless of scope. An environmental impact assessment without direct, personal observations of the site will be considered incomplete. Site visit(s) will occur during the growing season rather than in the winter, when snow cover and normal seasonal dormancy severely limit potential observations. Multiple site visits may be required to provide an adequate understanding of the existing conditions at the site; in these cases, winter site visits may be acceptable for the purpose of investigating seasonal wildlife or locating certain nests more easily seen when the trees are bare of leaves.

The initial site visit for the environmental impact assessment should occur prior to any clearing of natural vegetation, or intrusive site investigations (e.g. installation of test wells or boreholes). If, during this initial site visit, any potential areas of constraints are identified where intrusive surveys could result in negative impacts on significant natural features or ecological functions, recommendations to avoid or minimise these impacts will be required.

Ongoing dialogue between applicants, their consultants and City staff is expected during the completion of the environmental impact assessment. Concerns or questions may be raised with staff at any time. Recommended points of contact with City staff include:

- Following the background information review and field study, to confirm the scope of the environmental impact assessment and discuss any environmental constraints identified; and,
- During the impact assessment, to discuss potential impacts, options for mitigation, and possible monitoring requirements.

In some cases, it may be beneficial to hold such discussions at the site, with other agency staff included where appropriate.

Once the environmental impact assessment report is complete it is submitted to Urban Growth & Open Space. Electronic submission (PDF) of reports is sufficient to facilitate the review process. Applicants should be aware that the environmental impact assessment report, along with other supporting materials, may be posted on the City's website as part of the public consultation process.

Once the report is submitted, Urban Growth & Open Space will coordinate a review of the report and supporting information. A number of civic departments, as well as external agencies may be part of the review depending on the context and potential impacts of the proposed project. A minimum of three weeks is required to complete the review and prepare comments to be forwarded to the proponent. Based on the results of the review, an environmental impact assessment may be accepted as written, or it may require revision to address comments and concerns raised by the reviewers or changes to the proposed project arising during the application review process. The resolution of comments or concerns may be achieved through discussions or meetings, or may in some cases require additional research or field investigations, with subsequent revisions to the report. Open, ongoing communications between the report author and the City during the preparation of the environmental impact assessment should significantly reduce the likelihood of substantial revisions being required.

Section One: The Property

At the outset of the process, existing legislation, plans and studies should be reviewed as a means of understanding the legislative restrictions, land-use history, and ecological landscape of the area in question. Recent and historic air photos for the project area and its surrounding environment should be reviewed and included in the report.

Basic information on the property to be referenced in the environmental report include:

- Land ownership;
- Location of the property (municipal address and legal address);
- Current zoning;
- Description of existing and historic land uses, with reference to current and historic air photos;
- Description of planning context and summary of relevant planning documents for the site and surrounding area, such as master plans, land use plans, and strategic plans;
- Summary of federal, provincial and municipal regulatory requirements that apply to the project area.

Where possible, please provide specific information about how federal, provincial, and municipal regulatory requirements apply to this project, as opposed to general information about the legislation and regulations. Please note that mitigation measures to be applied to the project in order to meet regulatory requirements will be addressed in section 4.3.

In cases where a master plan project is being undertaken, or where a project encompasses multiple properties the Property Description will identify the entire project area.

In some cases, a Phase I Environmental Site Assessment or other applicable environmental assessment may be required. Requirements for Environmental Site Assessments are generally determined through pre-consultation prior to commencing work on the environmental report. If required, approval of the Environmental Site Assessment shall precede environmental approval as per the North Saskatchewan River Valley Area Redevelopment Plan.

Section Two: Environmental Context

The description of the subject site and its environmental context provides the basis for the assessment. This description should consider the lands adjacent to the site, not just the site itself. The level of detail required will vary based on the scale and complexity of the project. It is recognised that lack of access to adjacent lands may result in less detailed information. The environmental report should include an introductory overview that establishes the environmental setting for the proposed project relative to any known significant natural features on or adjacent to the site, followed by more detailed discussions of the various environmental components as outlined below. An environmental sensitivities map that clearly illustrates the key features (assets and threats) associated with the site will be required to accompany the environmental report. The use of photographs to illustrate and accompany the environmental report is encouraged.

If the area in question has been assessed through a previous project/report please reference the project/report and include the relevant information as an appendix.

Depending on the location of the site, City staff may be able to provide background information and/or mapping resources.

2.1. Surface Water, Groundwater and Fish Habitat

Water features connect and contribute to the significance of natural system features and functions. While a detailed description of surface water, groundwater and fish habitat may not be required for all environmental reports, the following information must be identified:

- Delineation of the 1:100 year floodplain;
- Runoff characteristics. Runoff characteristics are relevant to identify locations where the buildup of moisture could potentially cause concern over a long period of time;
- Depth of the water table. Water table depth is an indicator of areas that are developable/undevelopable.

In addition to the above, please identify and describe any ephemeral or permanent streams or wetlands in the project area. Please ensure that subsequent sections of the EIA address impacts (assessment and mitigation) to such features.

2.2. Geology/Geomorphology and Soils

While a brief description of the physical characteristics of the site is always relevant, detailed information on soils and geology may not be required for all environmental reports. The need for this information will be determined through pre-consultation meetings with staff from Urban Growth & Open Space and other city departments as required. For all projects the geomorphological boundary and relevant geomorphological features must be included to highlight the location of steep slopes, floodplains, hills, ravine channels and any other relevant features.

The presence of modifying factors will influence the potential for slope movement and should be considered as part of project development. Modifying factors include:

- Presence of slope failure (active/inactive/recurrent);
- Evidence of river erosion;
- Potential for high water table;
- Previous mining activity;
- Presence of slip-off slope

Where modifying factors are present additional studies may be required in order to adequately inform the assessment of geotechnical risk, potential impacts from erosion, sedimentation and changes in local hydrogeology. Site-specific studies conducted in support of development proposals (e.g. hydrogeological and terrain analyses, geotechnical studies and/or slope stability analyses) should be referenced, when available.

Genetic Class of materials should be included in the site's description as it relates to soil classification. This description should include a brief description of soils on the site and surrounding area and shall include information on the following:

- Potential run-off: Involves the analysis of the slope and the infiltration capacity of the soil unit. Soil that has low or moderate-low runoff characteristics may pose a constraint.
- Erosion potential: Involves the analysis of the slope along with the infiltration capacity and erodibility rating of the soil unit.

If additional site-specific information is required, this background data should be supplemented with further soil characterization resulting from Ecological Land Classification field studies or other investigations (e.g. geotechnical studies). Where relevant, shallow and poorly drained soils should be indicated.

2.3. Vegetation

The report should include a description of the area's vegetation, in order to assess habitat and biodiversity value, develop mitigation/management strategies, and strengthen the post-development ecological network. The need for specific field surveys may be identified during pre-consultation. The environmental report will include:

- Identification of vegetation community types present using classifications consistent with those in use by the City of Edmonton (i.e. Urban Primary Land and Vegetation Inventory). If an alternative classification system is used to provide supplementary information, please reference and describe the system as required.
- Description of native plant diversity (e.g. number of species, evenness, etc.).
- List of rare or unique species or communities. This includes those species that are listed as:
    - Threatened or Endangered under the provincial *Wildlife Act*
    - Sensitive, May be At Risk under the General Status of Alberta Wild Species
    - S1, S2 or S3 by the Alberta Conservation Information Management System (ACIMS).

  Unique species are those that may not be listed as rare but are considered to be ecologically underrepresented in the Edmonton area.
- Description of the presence and distribution of invasive, non-native species or noxious/prohibited weed species.

Rare plant surveys are recommended within the anticipated project footprint (including access and laydown areas) in habitats with a moderate or high likelihood of supporting rare species (if any), as identified by the project biologist, or in areas with historical occurrences of rare species as indicated by database searches. Incidental rare plant observations occurring outside of formal rare plant surveys should be documented and followed up with a formal rare plant survey in the vicinity of the incidental observation.

2.4. Wildlife

As with vegetation cover, a thorough review of available background information on wildlife is expected as part of the environmental review. Incidental observations will be the minimum standard required for fieldwork. The need for specific field studies of taxonomic groups (e.g. breeding bird surveys, etc.) may be identified during pre-consultation. The environmental report will include:

- Lists of species observed, reported or expected to occur on or adjacent to the site, presented in tabular format (as an appendix) with notes on the species'

relative abundance at the site, its residency status (i.e. is it present year-round, seasonally or only periodically; does it live on the property, forage there or use it as part of a movement corridor) and the evidence supporting its inclusion on the list (e.g., sighting, tracks previously reported);
- Description and mapping of any "wildlife trees" (i.e. tree with visible nests, or large trees with cavities) or other features that could provide nesting or den sites;
- An assessment of the site's suitability for any significant species (including species at risk - ANHIC, FWMIS, database research results on the potential presence of listed species at risk, species of special status or rare communities).
- An assessment of whether or not any significant wildlife habitat is present on or adjacent to the site.

In addition to incidental wildlife observations, the following wildlife field surveys are recommended before or during the design phase:

- Breeding bird survey (migratory and non-migratory species)
- Wildlife habitat survey (e.g., nests, dens, hibernacula, etc.)
- Bat maternity roost survey
- Wildlife connectivity ground-truthing / verification of the City of Edmonton's Environmental Sensitivities desktop-based connectivity mapping (mapping of likely wildlife movement corridors based on habitat, topography, adjacent human activity, wildlife observations, etc.)

The purpose of the surveys listed above is to establish the locations of significant wildlife habitat, wildlife populations, and movement corridors to inform the project design (i.e., anticipate avoidance measures and other mitigation measures during concept, preliminary, and detailed design phases).

The outcomes of these surveys should also be used to inform restoration and/or re-naturalization elements of the project design. Incorporating restoration or enhancement of degraded habitat and movement corridors (i.e., reduction or elimination of major pinch points) through project design is highly recommended and would help offset negative impacts of the project.

Please note that pre-construction surveys (breeding birds and other wildlife) will be required to ensure compliance with the federal *Migratory Birds Convention Act* and the provincial *Wildlife Act*. These surveys should be identified as future mitigation measures to be incorporated into construction planning and delivery.

Please include an assessment of wildlife passage considerations, and include relevant design details within the impact assessment and mitigation portions of the EIA, following the City of Edmonton's Wildlife Passage Engineering Design Guidelines (2010). The checklists found within Appendix D of the guidelines can serve as a useful tool for ensuring that wildlife passage requirements are incorporated into the Project design. Please submit completed checklists and/or a standalone wildlife passage assessment report prepared in accordance with the checklists as an appendix to the EIA.

2.5. Historical Resources

The identification of historical/archeological sites within the River Valley and Ravine System does not indicate the existence of an environmental hazard. However, it does provide the location of potential areas to be preserved when future development/redevelopment is being proposed.

In accordance with Section 37(2) of the *Alberta Historical Resources Act*, the Minister of Alberta Culture and Tourism may require that any proposed activity that is likely to threaten the integrity of a historic resource be preceded by a Historic Resources Impact Assessment. In determining whether a Historic Resources Impact Assessment is required the proponent should submit a Historic Resources Application to Alberta Culture.

Historic Resource Impact Assessments and related mitigative strategies are paid for by the person or company (proponent) undertaking or proposing to undertake the project or activity. Professional private-sector archaeologists, paleontologists, historians and traditional use consultants perform the required work.

For additional information visit the Historic Resource Impact Assessments website for the Government of Alberta.

Please submit, as part of the EIA, a copy of any historical resources reporting (or a summary thereof) required by provincial regulations, as well as confirmation of project approval (e.g., letter or memo from the ministry).

2.6. Environmental Sensitivities Map

The environmental sensitivities map illustrating the areas environmental sensitivities and identified development constraints will support the descriptive overview for the subject site. The map will include a key map to show the subject site's location in relation to the surrounding major roads and other landmarks. The use of recent aerial photography as a base for the natural environment is strongly encouraged. The map will:

- Illustrate the property boundary or project area included in the scope of the assessment;
- Be drawn to scale, with standard mapping elements such as a scale bar, north arrow, date and legend;

- Identify all of the aquatic, terrestrial, and geomorphological features, natural ecosystems and vegetation communities on the site as referenced in the descriptive report and identified in Sections 2.1 - 2.5 of this report;
- Identify all of the terrestrial and aquatic natural features, natural ecosystems and vegetation communities in the surrounding area that might be affected by the proposed development or site alteration;
- Include topographic information (i.e. elevation contours) at a level of detail sufficient to show general slope trends and specific topographic features.
- Outline the site-specific Environmental Sensitivity Class based on consideration of environmental assets (vegetation, wildlife, aquatic habitat, unique landforms) and environmental constraints (slope, flood risk and cultural resources) in accordance with City of Edmonton's Environmental Sensitivity Mapping database (Table One).

Table One: Environmental Sensitivity Class

Environmental Sensitivity Class	**Description of Sensitivity**	**Best Practices**	**Ribbon of Green Equivalent**
Extremely high	These sites are mostly found in the River Valley, its tributary ravines and near Big Lake.. Sites are often dominated by native vegetation, and have multiple ecological and physical assets and steep slopes or other physical or cultural constraints that would limit development activities. Threats due to land use or aquatic impacts to these sites are minimal. Many of these sites are already protected, particularly in the River Valley and at Big Lake, but will require management of surrounding lands to ensure connectivity, and buffer from adjacent land use.	Planning for building infrastructure in these areas is not recommended due to the abundance of assets. These areas should be protected from future development. Buffering such sites through conservation or restoration of lower sensitivity sites will help sustain their assets, and minimize impacts due to adjacent land use. Opportunities to maintain or enhance connectivity of these sites to other sensitive sites should be assessed across the City and implemented through the development and planning process. Develop strategic initiatives to engage developers or residents in conservation, restoration and stewardship of these sites and adjacent lands, to promote broader awareness and support for their conservation.	Protection
Very high	These areas are found in the River Valley, in and near its tributary ravines and at Big Lake.. They too are often dominated by native vegetation and have multiple ecological assets and/or cultural or physical constraints, and less likely to be affected by land use or aquatic threats.	Planning for building infrastructure in these areas is not recommended due to the abundances of assets. Limiting land use to passive recreation and development to low impact infrastructure will best protect the resources in these areas. Buffering these sites by conserving or restoring adjacent sensitive sites and maintaining connectivity, as recommended for extremely high sensitive sites will be important to sustain ecological function.	Protection

		Similarly, strategic initiatives to raise awareness of the need for conservation and stewardship of these areas, as recommended above, will help develop community support and cooperation in conservation and site stewardship.	
High	High sensitivity sites are found across the City and range in size from relatively small sites up to larger sites found in the River Valley, Big Lake, Beaver Hills moraine and Devon Dunes areas. These sites have various combinations of ecological and physical assets, and may also be affected by threats. Vegetation could include some non-native vegetation communities, but would mainly comprise native communities. In the River Valley, these sites could contain any one or a combination of ecological or physical and/or cultural or development constraints.	Conservation and protection of these sites can add to the ecological network. These areas require the greatest scrutiny and study at the site level, as combinations of assets may vary and sites may be contiguous with those of other sensitivities. Detailed evaluation is needed to ensure appropriate planning and land use for the assets at a given site. Limited development may be possible at some sites in the river valley, depending on the assets present. Where threats exist, management may reduce their effect. Explore opportunities to buffer these sites, enhance connectivity or restore key ecological functions within the site and in adjacent sensitive sites. This could include stewardship activities on private lands, encouraged through engagement programs targeting local residents and businesses.	Conservation
Moderate	These sites are the most abundant type of sensitive site in the City and are distributed across the City. They support fewer assets than higher sensitivity sites, and are more likely to include non-native vegetation. They are located in areas that are influenced by human land use. Larger sites lie within unique landscapes that may have limited development in the past. Such sites may contain ecological assets that are limited distribution or are easily disturbed by development (e.g., sandy soils, wetlands). These areas often have strong restoration potential that can benefit surrounding ecological assets, as well as sustaining their own ecological value. They also often lie within connective habitat and play a role in linking other sensitive areas.	Retention or enhancement of these sites can add to the ecological network, by buffering higher sensitivity sites or enhancing connectivity. Opportunities to conserve all or part of these sites should be explored during the land development or redevelopment planning process, or as part of open space planning. Where public lands will be dedicated or retaining (in the case of development) and the proposed land use is compatible with conservation of natural areas, site specific conservation or restoration may be possible. Where these sites lie within existing developed lands under private ownership, City-sponsored habitat enhancement and stewardship programs could enhance ecological functions (e.g. planting native trees or shrubs, managing weedy species, minimizing pesticide or herbicide use).	Conservation Restoration/ Stewardship
Low	These sites are also found across the City, and range from moderately large to quite small sites. They may include both native and non-native vegetation communities, which may be their sole environmental asset. Such sites can play an important role in ecological	Development and redevelopment proposals should consider how to retain or enhance the contributions of these sites to the ecological network. Appropriate recommendations will require site survey and site-specific plans that consider site context, site assets and local connectivity.	Conservation Restoration/ Stewardship

	connectivity or in buffering adjacent higher sensitivity lands, despite a lack of other ecological or physical assets. They are likely affected by land use or aquatic threats, an effect that can be reversed through land management and appropriate stewardship. Some sites are located in public lands such as the Transportation Utility Corridor and other transportation or utility rights-of-way, and have some level of protection through limitations on land development.	As noted above, options to maintain, restore or enhance natural areas may existing on private and public land. Depending on the site, opportunities to buffer other higher sensitivity sites, or enhance connectivity may exist. City sponsored habitat enhancement and stewardship programs could help to retain ecological function of these sites, as well as adjacent lands. Some low sensitivity sites include naturalized stormwater facilities and associated upland areas, as well as naturalized parks. Consider how creation of such features might be incorporated into development and redevelopment plans, to add to the ecological network.	
Intensive Use	Existing developed areas, with land uses ranging from open space/recreational area to transportation, commercial, industrial and residential.	Intensive use areas are private or public lands adjacent to or surrounding many of the sensitive sites identified above, and can influence the ecological health of those sites. Stewardship options to reduce threats will be critical to long term sustainability of sensitive sites. Programs targeting City corporate operations (e.g., drainage, transportation, parks) and the public can help reduce the impact of key threats by promoting naturalization, minimal use of herbicides and pesticides, and removal of invasive species.	Intensive Use

2.7 Spatial Data Delivery

If requested at the pre-consultation, scoping and project review stage, spatial information collected during the production of the environmental impact assessment is to be delivered electronically to the City, and shall consist of a series of export files in ArcGIS or GeoMedia format (with associated metadata). The projection of the data for Edmonton is 3TM, NAD83.

Please submit spatial data associated with all maps and figures created for the EIA. If preparation of this data is found to be particularly resource-intensive, please discuss the scope of this requirement with Urban Growth & Open Space.

Spatial outputs requested may include shape files associated with the requirements outlined above which could include, but not be limited to:

- Study Area and area of construction impact (Section 1.0);
- Delineation of 1:100 year floodplain (Section 2.1);
- Geomorphic features of the site (Section 2.2);

- Homogeneously mapped vegetation community types updated to the most recent year of available aerial photography (Section 2.3)
  - Note: The City's urban Primary Land and Vegetation Inventory (uPLVI) was last updated for the entire City (plus a 3.2 km buffer) in 2015
  - These uPLVI base files are available for use by the applicant from which to update vegetation mapping, increase resolution to an appropriate size for the study area, and align vegetation mapping with the City's existing data sets;
  - For more information, please see the following:
    - Greenlink, 2016. *Primary land and vegetation inventory for urban environments (Urban PLVI). 2015 edition*. Prepared for: The City of Edmonton, Alberta –Parks and Biodiversity, Sustainable Development. Prepared by: Greenlink Forestry Inc. Edmonton Alberta.
    - Greenlink, 2016. *Primary land and vegetation inventory for urban environments (Urban PLVI). Interpretation Manual.* Third edition. Prepared for: The City of Edmonton, Alberta –Parks and Biodiversity, Sustainable Development. Prepared by: Greenlink Forestry Inc. Edmonton Alberta;
- Locations (points and routes) of vegetation community types and weed locations that were verified in the field (Section 2.3);
- Locations (points) of wildlife observed (include date of observation and common and scientific name in spatial file) (Section 2.4); and/or
- Environmental Sensitivities Map (Section 2.5)
  - Note: In 2016, Urban Growth & Open Space completed a City-wide Environmental Sensitivities Mapping Project
  - These Environmental Sensitivity spatial files are available for use by the applicant from which to update the Environmental Sensitivity Mapping, increase resolution to an appropriate level for the study area in question, and align environmental sensitivity analysis with the City's existing work.
  - For more information, please see the following:
    - Solstice, 2016. *Environmental Sensitivity Project, Model data.* Prepared for: The City of Edmonton, Alberta –Parks and Biodiversity, Sustainable Development. Prepared by: Solstice Canada. Edmonton Alberta.
    - Solstice, 2016. *Environmental Sensitivity Project, draft final report.* Prepared for: The City of Edmonton, Alberta –Parks and Biodiversity, Sustainable Development. Prepared by: Solstice Canada. Edmonton Alberta.

As part of any geodatabase compilation, the applicant is requested to ensure that the data is cleaned and corrected for:

- overlapping polygons
- over-/under shoots
- dangling arcs
- duplicates or near duplicates removed

- short spikes removed
- polygons are closed
- sliver polygons
- gaps/holes
- no polygons without attributes

The applicant may submit preliminary datasets for examination. All requested spatial files are to be submitted to Urban Growth & Open Space together with the first submission of the Environmental Impact Assessment.

Section Three: The Project

In order to assess the environmental impacts of the proposed project on the identified natural features and functions on and adjacent to the site, a clear understanding of the project is required. ***Environmental sensitivities should be identified prior to beginning concept design, to the extent possible, to ensure the project is designed to avoid existing environmentally sensitive areas.***

The project description must include information about all phases of the project, including site preparation, construction, landscaping and intended use of the property once the construction work is completed, and (in some cases) decommissioning, if this information is available. Any related off-site works by the proponent should also be included in the project description and impact assessment. This section of the report should also describe how any environmental constraints identified in Section 2 have been considered and mitigated. Consideration of project alternatives justifying why a location within the boundaries of the North Saskatchewan River Valley Area Redevelopment Plan is essential shall be submitted as part of a Site Location Study (Appendix One).

The level of detail should reflect the size and complexity of the development or site alteration. The description must be accompanied by one or more graphical representations of the project.

3.1. Concept Plans and Drawings

The use of actual concept plans, development plans, site plans or other figures to illustrate and support the project description is required. At a minimum, the environmental report must include one or more plans showing the proposed development, park master plan or site alteration as an overlay applied to the environmental sensitivities map. The following information should be included in the plan(s), to the extent possible:

- Location of all existing and proposed lot lines, building envelopes and structures, fences, driveways, parking areas, roads, trails and pathways and any other park amenities;
- Services, including stormwater management facilities and drainage systems, public infrastructure and utilities;
- Erosion and sediment control measures;
- Grading limits and post grading contours; and,
- Natural features and areas of vegetation that will be removed.

Where vegetation impacts are anticipated including construction or project activity within five meters of a City-owned tree a Tree Protection Plan shall be required. The Tree Protection Plan will outline how project work will be accomplished while protecting public trees. Urban Foresters with the City of Edmonton can provide assistance in drafting the necessary tree protection plans.

It is recognized that this level of detail will not be available nor appropriate for all projects and that additional information may still be in development. The results of the environmental review will (and should) inform and be incorporated into the final plans for the project.

Section Four: Project Impacts and Mitigation Measures

Once an understanding of both the existing environment and the proposed project has been established, the identification and assessment of impacts can begin. Assessing impacts and recommending appropriate mitigation measures is the most difficult and important task of the environmental impact assessment. In some cases Provincial and Federal approvals may be required in addition to City approval as part of Bylaw 7188. This section should also highlight any relevant Provincial and Federal approval requirements.

It is important to provide a clear assessment methodology that will lead to specific recommendations. Tools should be employed that will provide demonstrable rationale for recommending specific mitigation measures. Examples include but are not limited to matrix evaluation, checklist evaluation, ecological land classification and valued ecosystem components. Assessment methodology should include the following:

- Approach to the assessment;
- Scoping the assessment;
- Spatial and temporal extents;
- Assessment of effects;
- Determining the significance of effects; and
- Cumulative effects Assessment: A description of potential positive and negative environmental, social, economic and cultural impacts of the proposed activity, including cumulative, regional, temporal and spatial considerations.

4.1. Assessing Impacts

This section further describes the project, the associated impacts and related mitigation. Details on the interactions between the specific project components identified and elements of the environment where there is a potential to result in an impact (positive or negative) should be identified.

The proponent will classify the potential environmental effects into negative impacts and positive environmental effects, and characterise them using standard criteria, including, but not limited to:

- Nature of Impact: Is it direct, such as the loss of a feature, or indirect, such as an increase in downstream sedimentation?
- Magnitude: What is the severity of the impact, especially as compared with available benchmarks or targets?
- Geographic extent: How large an area will be affected?
- Duration and timing: Is the impact temporary or permanent? Is it seasonal?
- Likelihood: What is the probability that the impact will occur?
- Potential for cumulative impacts: What is the potential for interacting impacts as a result of previous or future development or site alteration?

Please ensure that any project impacts to off-site Valued Ecosystem Components are identified and addressed. In addition, please ensure that impacts occurring during construction and operation are identified and addressed (e.g., temporary/short-term and long-term/permanent disruptions to wildlife movement).

4.2. Identifying Cumulative Impacts

Cumulative impacts are compound environmental effects that may result due to multiple or successive development or site alteration activities (e.g. implementation of a park master plan which includes multiple elements). Cumulative impacts may affect natural features or their ecological functions, water quality or quantity, sensitive surface or groundwater features, and their related hydrologic functions. They are an important consideration in any environmental review.

Potential cumulative impacts are estimated by considering project effects within an expanded geographic area as well as a longer timeframe. For example, a cumulative impacts analysis should consider a reasonable and ecologically relevant area within which the proposed development is located. Development in the recent past and probable development activities in the future should be described, and if relevant, mapped.

4.3. Mitigation Measures

Mitigation measures must be identified for each potential negative impact, to eliminate or reduce the impact to the extent possible. Preferred mitigation measures avoid or minimise impacts, and may be supported by compensatory measures such as site rehabilitation or restoration.

Avoiding or eliminating impacts through design (or redesign where necessary) is the preferred approach, and should always be considered as a first step. Designing around the feature is the only option when significant wetlands or significant habitat for endangered and threatened species occur within a proposed project's boundaries. Recommendations for the preservation of natural features within or adjacent to the project area must be accompanied by recommendations regarding appropriate setback distance(s) and any buffer required to protect the feature and its ecological functions from impact.

Minimising impacts to the extent possible is expected when avoidance is not feasible. Examples include the establishment of strict limits on the extent of vegetation clearing, or the use of specific timing windows for construction to reduce impacts on wildlife by avoiding sensitive life stages such as breeding seasons or hibernation. The supporting rationale for these measures is to be included in the environmental report.

Compensation may be required in circumstances where impacts cannot be avoided or minimised. This includes consideration for the City of Edmonton's Corporate Tree Management Policy (C456A). Restoration and enhancement may also be recommended in the absence of such legal requirements, to support the long-term conservation of the City's natural systems.

In proposing mitigation measures, the environmental report should refer to recent science and/or guidelines, where necessary, to demonstrate that the measures will be sufficient to minimise impacts or replace lost habitat. The environmental report will include the following:

- A full description of proposed mitigation measures, including recommendations for timing windows or other specifications for implementation, for all potential negative impacts;
- For each negative impact, an indication of whether there will be any residual impact following implementation of the recommended mitigation measure(s);
- A description of proposed restoration or enhancement plans to compensate for impacts that cannot be avoided or minimised;
- Maps and/or drawings (if relevant) depicting the location, extent, and design details of proposed mitigation measures.

Within section 4 or as an appendix to the EIA, please include a list or table of recommendations to be carried forward and implemented during future project stages. These stages can include, but are not limited to: concept design, preliminary design, detailed design, construction phase, and operation phase. This will allow Project Managers to differentiate between mitigation that is to be carried out through project design (e.g., choosing alignments that avoid sensitive vegetation), those to be carried out as part of construction (e.g., installation of standard erosion and sediment control measures), and those to be carried out as part of operation (e.g., ongoing weed management). Please differentiate, where applicable, between non-mandatory and mandatory recommendations (i.e., those that allow the project to meet guidelines and standards versus those that allow the project to meet legal and regulatory requirements).

Section Five: Environmental Monitoring

Where impacts have been avoided or minimised through the environmental review process, monitoring may not be needed. In cases where negative impacts have not been eliminated, or where innovative solutions are being used, monitoring may be required to measure impacts over time. The environmental report must identify any monitoring needs associated with the project, and should provide recommendations regarding the design and implementation of the required monitoring program. Consultation with City staff will be required to establish the scope of all monitoring programs, and to ensure that recommendations are feasible and appropriate.

Monitoring will usually be site-specific and may be required during the pre-construction, construction, and/or post-construction periods. The environmental report should:

- Clearly differentiate between monitoring recommendations aimed at ensuring effectiveness of mitigation, and any monitoring required for legal compliance (e.g. to meet conditions of a Certificate of Approval);
- Specify the appropriate stage(s), schedule and duration for the monitoring program;
- Propose appropriate thresholds or benchmarks for monitoring purposes;
- Identify who will be responsible for monitoring, and the reporting structure required to ensure that results are acted upon as needed; and,
- Outline contingency plans if an impact is detected or if the proposed thresholds are not met.

Section Six: Public, Indigenous, and Stakeholder Engagement

Open and transparent public, Indigenous, and stakeholder involvement is recommended for all projects. The onus is on the proponent to identify the appropriate level of engagement to be undertaken for a given project in alignment with City policies, standards, and best practices related to engagement.

The EIA should summarize the engagement opportunities provided as part of the project, the feedback heard through engagement, and how feedback was incorporated into Project design and delivery. Where available, existing documentation, such as public involvement plans and “what we heard” reports, can be provided as appendices to the report.

Section Seven: Conclusions and Supporting Information

The environmental report must include a concise summary that addresses major points and highlights any issues of concern. Limitations of the study should be clearly identified (e.g. assumptions, timing, context).

This section must include a conclusion based on the results of the impact analysis. The report author's professional opinion must be stated, responding to the following questions:

- Provided that the recommended mitigation measures are implemented as planned, will there be any residual negative impacts on natural features or ecological functions as a result of the proposed project?
- What is the significance of any such residual negative impacts to ecological function(s)?
- Can the proposed project be accepted as planned, or should it be (further) revised to prevent, eliminate or reduce impacts? If so, what specific changes are recommended to the proposal?

If the environmental report concludes that the project will have a residual negative impact on one or more of the values or functions of the triggering feature(s), then a recommendation to proceed with the project must be accompanied by a rationale for proceeding that is based upon the provisions of the existing City of Edmonton statutory plans, policies etc. Projects with residual negative impacts to significant natural features or ecological functions may not be supported.

Supporting Information

Supporting information may include:

- Literature cited;
- A list of subject matter experts or other individuals contacted during the study, along with their title and agency affiliation, where applicable, and the subject(s) on which they were consulted;
- Species lists;
- Geotechnical reports;
- Public Involvement Plan;
- Previous studies or reports that may apply to the subject site.

Appendix E: Draft EIA City Review Concordance Table

City of Edmonton Bylaw 7188 Review Comments Summary
AA21-52 Latta Bridge Replacement Project EIA
Environmental Impact Assessment – DRAFT Report
Finalized 08 October 2021

City of Edmonton—Initial Circulation Comments (September 2021)

Review Comment*	Response	EIA Report Section Reference
EPCOR Drainage		
I did have concerns about the increased flows due to the larger road ROW, has this been approved by anybody at Drainage?	The runoff from the bridge is (and will be) directed to the 250 to 300 mm combined sewer just northwest of the bridge. The increased flows as a result of the wider bridge were estimated and EPCOR's combined sewer hydraulic model was run to confirm that the slightly larger runoff from the wider road makes an insignificant impact on sewer performance. This analysis can be provided to EPCOR Drainage for review if requested.	N/A
EPCOR Water and Sewer		
No comments	N/A	N/A
Urban Growth and Open Space Strategy (Urban Planning and Environment)		
I have reviewed the Latta Bridge Replacement Project EIA report. In general, the EIA report identified major environmental impacts and appropriate approaches for mitigation measures. However, there were gaps identified that will need further evaluation and assessment upon completion of the detailed design including landscaping and bank stabilization plan.	N/A	N/A
We do not have major comments or concerns and support this project but expect further clarification with few items at this stage. • The details of bank stabilization activities were not provided in the absence of the detailed design. The impact scenario and required mitigation measures should be evaluated and supplemented to an EIA report. The detailed landscaping plan and bank armoring/stabilization plan will be reviewed separately once available. Please consider integration of a nature-based solution for bank armoring as	• There appears to be a misunderstanding. No watercourse is present under the Latta Bridge, therefore, no bank stabilization, armouring, etc. is required. • The Landscaping Plan has been developed during detailed design (currently under 90% review) and includes native vegetation and will be planted/seeded in the project area to maintain and/or improve existing ecological connectivity in the very short Latta Ravine in Central Edmonton.	N/A

Review Comment*	Response	EIA Report Section Reference
compared to the hard infrastructure (it was a preferred option) considering the project location is within the Key Wildlife and Biodiversity Zone. It will promote ecological connectivity through improved natural landscaping through new development.		
• We would recommend the project team to explore green infrastructure (e.g. bioengineering) for the potential landscaping and reduce the footprint of hardscaping features as identified for the shadow areas of the bridge. The project team could explore options to establish shade tolerant species that can potentially improve the slope stability as well as provide additional ecological function.	Bioengineering approaches are not appropriate for use under the bridge. Vegetation will not establish in this area due to a lack of moisture and to a lesser degree, shade. No vegetation currently grows beneath the current bridge structure, which demonstrates its inability to support vegetation (even the caragana and other invasive species in the adjacent areas won't grow there).	Section 4.5.4
• The project team will explore opportunities to retain native vegetation including heritage tree species identified in the neighborhood. The detailed design could be explored further to see if the SUP alignment could be adjusted to avoid removal of the heritage tree species. The project team should ensure provincial approval (Historic Resource Act) if applicable, to deal with the designated heritage species.	Whether the current heritage tree can be retained is currently under review between the consulting design team, City project team and Urban Forestry. Design alternatives (ie. narrowing the SUP, etc) are being considered, however, there is no way to completely avoid impacts to the tree. We will rely on the judgement of Urban Forestry to provide mitigation recommendations if the tree is to be retained. Should the heritage tree require removal, the project team will seek guidance from the City on the historical resource deaccession process. The team will also rely on the City to confirm whether the tree is provincially protected by the Historical Resources Act, considered a Municipal Historic Resource (Policy C-450B), or listed on the City's Inventory of Heritage Resources (not legally protected beyond Corporate Tree Policy).	Sections 5.2.3.2 and 8.1
• Please attach public engagement outcomes and ensure whether the public were informed of the potential impact of this project in particular to the potential removal of the heritage Manitoba Tree.	Minutes of the stakeholder engagement meetings will be added as an appendix to the final EIA. It was discussed with stakeholders that the Manitoba Maple tree could be impacted.	Appendix N
• We will recommend the project team to consider appropriate native vegetation through a landscaping plan if the project required removal of non native species	The area to the north of the bridge that contains non-natives (mostly caragana) are being removed for laydown and access. This area is being planted with a high number of	Section 4.5.4

Review Comment*	Response	EIA Report Section Reference
including caragana. The replaced vegetation could be a mix of herb/shrub/tree species to complement the root reinforcement to the different soil zones to enhance the bank stabilization.	young tree and shrub plant stock. Approximately 80% are tree species and 25% are shrub species. Species have been selected for their ability to stabilize soil, to sucker and root out easily, and to establish on steep slopes. The entire area is being seeded with native seed mix.	
• Thank you for providing a separate analysis to ensure the City's Wildlife Passage Engineering Design Guidelines for new bridge structure. We would like to understand why the new bridge project should not require any mitigation measures. The new bridge will not be different to the existing one but we should be able to provide updated guidelines and BMP given the fact that the construction is happening in 2022 and we have advanced understanding on how we could improve the engineering design in favor of wildlife, which was not available previously. It includes but not limited to: o Landscaping, including road right-of-way and riparian channel landscaping, intended to restore natural habitat and encourage use of the crossing by small terrestrial, and medium terrestrial EDGs;	• There appears to be a misunderstanding. No watercourse is present under the Latta Bridge, therefore, there is no riparian area present. • The bridge replacement project does not require mitigation measures with respect to wildlife passage because the new bridge, like the existing bridge, does not provide a barrier to wildlife passage under the bridge. • As noted above, the Landscaping Plan will include replacement of exotic species (e.g., caragana) with native species, however, over time, the horizontal and vertical habitat structure present in the ravine under the bridge will ultimately be the same as the existing condition. Replacing exotic species with native species benefits native plant ecological diversity and could provide some additional natural food sources for some wildlife species (e.g., birds, rodents). • All EDG's are expected to be able to pass under the bridge if they choose to. • The ravine is very short and deeply incised and ends immediately west of the bridge. It is expected that if urban-adapted animals, such as coyote or deer, choose to travel west and out of the ravine into the developed residential area, they would need to navigate the urban matrix including the busy, 4-lane arterial Jasper Avenue as they currently do.	N/A
• Landscaping and design features intended to facilitate safe and effective passage of aerial species (birds and bats) above grade;	• The proposed new bridge will cross the ravine at the top of the ravine as the existing bridge does and will be approximately 8 m high above the ravine bottom. The ravine is deeply incised meaning the	N/A

Review Comment*	Response	EIA Report Section Reference
	bridge deck is actually above the tree canopy in the ravine. • Bats detected at the bridge during the bat survey were flying and foraging above the tree canopy, which was below the bridge deck. • Birds observed flying around the project area were utilizing manicured habitat on the tablelands adjacent Jasper Avenue to cross Jasper Avenue or they were utilizing the habitat under and adjacent the bridge in the ravine and downslope into the river valley proper. • Landscaping the adjacent slopes to the new bridge will provide additional habitat for birds and bats to utilize adjacent the bridge or under the bridge.	
○ Please consider further information to be prepared at the design details of the roadway itself (including median and boulevards) that will minimize the visual and acoustic impacts of the roadway on wildlife, including, but not limited to: Curb improvements; Lighting; Landscaping;	• As noted in the EIA in Section 4.5.4. spacing, style, and heights of the new light poles are proposed to match existing conditions and lighting levels will meet current City standards. • The existing lighting is LED, downward casting and focused on the roadway and bridge surface to promote traffic and pedestrian safety. The habitat in the deep ravine under the bridge, particularly on the east side of the bridge and towards the river valley proper, was observed to be very dark and relatively undisturbed by adjacent urban lighting during the bat surveys. It is anticipated that that dark condition will not change after the new bridge is constructed. • Existing topography and the height of the bridge deck over the ravine mitigates any adverse impacts from traffic and city noise under the bridge. Ambient urban noise including traffic at road level will remain as it is now when the bridge is replaced. Jasper Avenue is a major, 4-lane arterial roadway through central Edmonton and ambient urban noise	N/A

Review Comment*	Response	EIA Report Section Reference
	would be difficult to mitigate in this heavily developed area on the table lands. • See above notes re: landscaping and wildlife passage in the area.	
• Please ensure proper alternatives for public access to both trials/roads and proper notification to the public with alternative plans and timelines of the project work.	Public access will be provided across the bridge through the SUP on the proposed south side of the bridge and a sidewalk on the north side of the bridge. There is currently only a maintenance vehicle trail access from Dawson Park under the bridge and this will be maintained. There is no provision for a formal trail under the bridge, however; it is our understanding that COE may incorporate a more formal trail tie into Dawson Park in the future.	N/A
• It was not clear how the proposed relocation of CSO is feasible given the project construction will begin early 2022. Please provide detailed information on potential drainage/sewer management plans and confirmation from EPCOR Drainage.	The City is actively collaborating with EPCOR regarding adjustment of the combined sewer located northwest of the bridge and associated infrastructure. It has been determined that the manholes will be modified (due to new grading) but the sewer will remain in place and EPCOR Drainage has stated that they are comfortable with the clearance (between bridge abutment/piles and sewer) that is proposed. The BPTEC/Stantec team is collaborating with EPCOR Drainage to develop specifications for protection of the combined sewer during soil grouting and bell pile construction, as well as to determine an emergency/contingency plan should the combined sewer be damaged during construction. EPCOR Drainage is actively working on the design of combined sewer modifications at the south end of Latta Bridge to resolve the conflict at that location. These modifications are expected to be completed by EPCOR Drainage (under the franchise agreement) in late 2021 or in early spring 2022. Section 4.1 of the EIA will be updated to reflect this information.	Section 4.1
Planning Coordination (Urban Planning and Environment)		

Review Comment*	Response	EIA Report Section Reference
The noted project had an EIA and Phase II ESA conducted, and there is a Construction Site Management plan (Contaminated Soil Management Plan) in place. The Phase II ESA indicated possible further environmental work delineating impacts under the bridge. Please forward any further environmental sampling information as a result of the delineation for review. There are no other additional requirements from Environmental Planning for the project.	N/A	N/A
Planning Coordination – Development Services (Urban Planning and Environment)		
I have reviewed AA21-52 (Latta Bridge Replacement Project EIA-Initial Circulation) from the perspective of ensuring safe on-going operation and maintenance of oil/gas facilities. Based on my search, there are no abandoned wells, active high-pressure pipelines, or other oil and gas facilities (such as a battery site) within the subject area. Therefore, I have no comments on this circulation.	N/A	N/A
Infrastructure Planning & Design (Engineering Services)		
Engineering Services has reviewed the information provided for the proposed Latta Bridge Replacement Project. This information included a Draft Environmental Impact Assessment (EIA) dated August 25, 2021, prepared by Spencer Environmental Management Services Ltd. (Spencer). The EIA included a geotechnical assessment prepared by Thurber Engineering Ltd., dated January 12, and a Draft Phase II ESA, dated January 21, 2021, prepared by Thurber Engineering Ltd. The proposed project includes replacement of the aging Latta Bridge, which carries Jasper Avenue over Latta Ravine near 91 Street.	N/A	N/A
The geotechnical report included in the EIA documented a review of existing geotechnical information for the area as well as a site- and development-specific field drilling investigation, and interpretation, analysis and engineering assessment of the relevant site and subsurface (soil and groundwater). Overall, the report documented a suitably thorough investigation and assessment to provide geotechnical design and construction recommendations for the proposed bridge replacement. The assessment provided site	N/A	N/A

Review Comment*	Response	EIA Report Section Reference
characterization and outlined geotechnical aspects for the proposed project. In addition to the conventional design issues for bridge replacement, the consultant addressed unique design and construction challenges posed at this site including the impacts of former underground coal mine workings and requirements for potential slope stabilization measures. As a consequence of such geotechnical risks, it must also be recognized that a higher level of involvement by the geotechnical engineering consultant will be essential to continue to support this development from design through to construction completion.		
Based on review of the EIA information provided, it appears that the proposed work may be completed with acceptable geotechnical risk to the river valley lands. Provided that the recommendations included in the EIA and appended geotechnical report are adhered to and that the geotechnical engineering consultant is involved in future phases of the development. It appears that the geotechnical aspects of the project have been addressed for the current stage. Geotechnical risk associated with this project should also be mitigated through the ongoing involvement of the geotechnical engineering consultant throughout the design and construction phases of the project. If you have any questions regarding these comments, please contact me at (780) 868-3951	N/A	N/A
Infrastructure Planning & Design (Engineering Services)		
I have reviewed the Latta Bridge (B057) Replacement, Environmental Impact Assessment Pursuant to Bylaw 7188, Draft Report dated August 2021 by Spencer Environmental Management Services Ltd. I have the following comments: 1. Section 2.2: historical aerial photographs and Google Earth imagery were reviewed for the period of 2002 to 2020. Why were the pre-2002 years excluded?	• The quality of Google Earth historical imagery is extremely poor for earlier years up to 2002 for the City of Edmonton and cannot be easily interpreted.	N/A
2. Section 2.3.2: Crimson Environmental recently conducted a Soil Quality Assessment program (in draft), once it is finalized in a few days, its results can be incorporated into the subject EIA.	• We will incorporate findings of the FINAL SQA report into Section 2.3 of the final EIA and add the report to the EIA appendices.	Section 2.3, Appendix H

Review Comment*	Response	EIA Report Section Reference
3. Section 2.3.3 and Appendix F: the Construction Management Plan was finalized on July 9, 2021.	• Comment noted and date added to Section 2.3.3 of the final EIA.	Section 2.3.3
Community and Recreation Facilities (River Valley Parks and Facilities)		
Please contact Braeden Holmstrom prior to work commencing if any trail closures are anticipated so that detours and information can be updated on the caution/closures webpage.	Comment noted.	N/A
Civic Event and Festivals		
The Edmonton Marathon uses this bridge as part of its route. When the event returns safely, we would ask that the construction accommodate the marathon as a requirement into its schedule. The Marathon will occur on August 21, 2022.	Jasper Avenue and the bridge will be closed to pedestrian and vehicular traffic from March 2022 to October of 2023. Vehicle and pedestrian traffic will need to follow detour routes around the crossing during this time. There will be no opportunity to accommodate the marathon and alternative marathon routes will need to be considered/implemented.	N/A
Partnership and Event Attraction Strategy		
No comment.	N/A	N/A
Parks and Roads Services (Natural Areas Operations)		
The project should consider planting trees along the top of bank, particularly around the NW corner of Latta Bridge. There is a large amount of tree removals for this project and it would be great to see trees going back in, not just a naturalized seed mix. Otherwise there is a significant amount of tree asset value that will be charged to the project and a lot of canopy cover lost.	Two street trees are being removed by the project and are being replaced with new caliper trees of same species (elm). Additional top of bank tree plantings were considered but currently have not been included in the plans since the views to the river valley are highly valued by the residential community. Additional top of bank plantings would block these views and may not be well received by the public. The landscape plan has been further developed since the previous submission. The landscape plan includes a high number of native tree/shrub plantings within the ravine area, densely planted to outcompete invasive species and account for plant mortality over time.	N/A

Review Comment*	Response	EIA Report Section Reference
Surrounding residents will need to be notified of the vegetation removals and be provided 5 business days to provide any comments prior to removals occurring. They will need to be coordinated by the project and should follow our Live Tree Removal Guidelines.	The COE Forrester and internal forces will be undertaking tree and vegetation removals in the winter of 2021/2022. COE TID and the COE Forrester will provide notice to surrounding residents and completed in accordance with Live Tree Removal Guidelines.	N/A
It is strongly recommended that a Weed Management Plan be developed for this area as there are noxious weeds in the project boundaries. Weed mitigation measures and management will be an important component of the restoration process	This requirement, and monitoring, is noted in the EIA in Sections 5.2.3.1 and 6.0. The landscape construction contract will include requirements for weed management.	Sections 5.2.3.1 & 6.0
Fencing after restoration should be used to keep citizens out of the area until the naturalized grass seed has established. It will be difficult to establish grass along the current walking path unless the area is fenced and access is not permitted. Restoration signage should also be used to help educate the public about why access is not permitted in the area.	This can be added to the contract requirements. However, fencing placement will need to consider maintenance of wildlife passage through the project area. The City will need to consider the pro and cons of fencing and direct the project team on how to proceed.	N/A
Please ensure the landscape plans are circulated and reviewed by naturalareaoperations@edmonton.ca prior to approval.	Comment noted.	N/A

City of Edmonton—Second Circulation Comments (October 2021)

Review Comment*	Response	EIA Report Section Reference
Natural Area Operations		
Please be aware that the CoE Urban Forester will not be providing notice of the tree removals to surrounding residents. The urban forester may review the notice letter, but we will not be involved in mailing them. This will be the responsibility of the project team.	Comment noted.	N/A
- With regards to planting trees on the top of bank, smaller canopy trees can be chosen so that they will not impede any views. Thank you for the confirmation that trees and shrubs will be planted on the slope. Please ensure the landscape plan is circulated for review prior to approval.	Comment noted.	N/A

Review Comment*	Response	EIA Report Section Reference
- Our teams will discuss internally about fencing the restoration area and ensuring wildlife passage. Please include fencing in the contract requirements.	Requirement for fencing noted in final EIA.	Section 4.5.4
EPCOR Drainage		
No further concerns as long as the team continues to work with the other EPCOR Drainage team to address any issues.	N/A.	N/A
Infrastructure Planning & Design (Engineering Services)		
Thank you for forwarding the second circulation for the Latta Bridge Replacement EIA to me. I have no further comments.	N/A	N/A
Civic Event and Festivals		
Thank you for your reply. We understand that the Edmonton Marathon route will need to be detoured in order to support this work.	N/A	N/A

*CoE standard conditions/advisements included in the circulation comments are not included here.

Appendix F: Environmental Site Assessments (Thurber 2021b)

ENVIRONMENTAL OVERVIEW AND
PHASE II ENVIRONMENTAL SITE ASSESSMENT
LATTA BRIDGE (B027) REPLACEMENT PROJECT
EDMONTON, ALBERTA

THURBER ENGINEERING LTD.

THURBER ENGINEERING LTD.

ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT LATTA BRIDGE (B027) REPLACEMENT PROJECT EDMONTON, ALBERTA

Report

to

BPTEC Engineering Ltd. & The City of Edmonton

Sabinus Okafor, M.Sc., P.Chem., P. Eng.
Environmental Engineer

Date: January 21, 2021
File: 29532

Neal Fernuik, M.Sc., P.Biol., P.Eng.
Review Principal

EXECUTIVE SUMMARY

Thurber Engineering Ltd. (Thurber) was retained by BPTEC Engineering Ltd. (BPTEC) on behalf of the City of Edmonton (CoE) to conduct an Environmental Overview (EO) and Phase II Environmental Site Assessment (ESA) for the proposed Latta Bridge Replacement Project (the “bridge”). Thurber understands that the Latta Bridge Replacement project will be conducted within the existing road allowance, except for crossing under three titled parcels within the Latta Ravine, municipally described as 10336-89 Street NW, 9075 Jasper Avenue NW and 9131 Jasper Avenue NW, Edmonton, Alberta. Collectively, the bridge and immediately surrounding areas (including the three titled adjacent properties) is referred to as the “the Site”.

The bridge has been developed as a city street and an arterial roadway crossing through the Latta Ravine since at least early 1990’s. Historical coal mining operations at the Site area was reported to have been started in 1910 and continued until the mid-1920’s The bridge was replaced with the current five-span steel structure in 1936. The bridge has been rehabilitated twice, once in 1977 and again in 2004.

The bridge is currently surrounded by Latta Ravine, pedestrian sidewalks, city streets, access trails, road allowances and residential lands since at least 1950’s to present.

Based on the information reviewed, historical evidence did not indicate that the Site was contaminated, , however, areas of potential environmental concern (APECs) were lead-based paint on the bridge coating material, fill material of an unknown origin as well as refuse material in the vicinity of the Site. A Phase II ESA was conducted to assess these APECs and to establish baseline soil and groundwater conditions. The Phase II ESA findings are summarized as follows:

Soil

The Phase II ESA identified lead concentrations in a fill sample from TH20-6 (at 0.75 m bgs) and petroleum hydrocarbons (PHC) fractions F2 to F4 and polycyclic aromatic hydrocarbons (PAHs) in a fill sample from TH20-6 (at 1.5 m bgs) at the bottom of the Latta Ravine that did not meet Alberta Environment and Parks (AEP) 2019 Tier 1 residential/parkland fine-grained guidelines. The extent of lead exceedance in soil fill at TH20-6 was vertically assessed at depth of 1.5 m bgs. The extent of PHC fractions F2 to F4 and PAHs in surficial soil fill at TH20-6 was vertically assessed at a depth of 3.0 m bgs. Evidence of salts impacts likely related to winter roadway maintenance activities were also identified in some surficial fill samples collected from TH20-4 and TH20-5 (near the bridge abutments) based on elevated concentrations of key salinity parameters including electrical conductivity (EC) and sodium adsorption ratio (SAR), which were rated as “poor and unsuitable”.

The soil assessment identified lead and zinc concentrations not meeting AEP 2019 Tier 1 residential/parkland fine-grained soil in several surficial samples that were collected in the vicinity of the Site. The lead and/or zinc exceedances extended to a depth of at least 0.5 m (the maximum depth limit of the investigation) except for baseline surficial locations at 5 m and

10 m step-outs from the bridge on the west side where the vertical extent of lead exceedance in surficial soil was assessed at depth of 0.3 to 0.5 m bgs and zinc exceedances were not identified at depth of 0 - 0.15 m bgs.

If the vertical and/or lateral extents of the soil lead, zinc, PHC fractions F2 to F4 and PAHs in the vicinity of the Site needs to be assessed Thurber recommends a Phase III ESA be undertaken.

Groundwater

Groundwater samples from wells MW20-4 and MW20-5 installed on the roadway near the bridge abutments met the applied guidelines for BTEX (benzene, toluene, ethylbenzene, and xylene), PHC F1 and F2 fractions and PAHs. Concentration of some dissolved metals and routine parameter in groundwater including uranium, sodium, manganese, chloride, sulfate, and TDS did not meet AEP Tier 1 guidelines but were observed to be similar to elevated concentrations commonly encountered in groundwater in Edmonton area. Depth to groundwater ranged between 9.2 m bgs to 9.3 m bgs and groundwater flow direction was assessed to be southeast, towards the North Saskatchewan River.

As well MW20-6 was dry when attempted to be sampled on October 24, 2020 a groundwater monitoring program could be conducted in the spring of 2021.

Surface Coating Material

Lead concentrations not meeting federal guidelines were identified in three of the five paint samples collected from bridge surface coating material. Thurber therefore recommends that the following measures be taken during construction to reduce the potential human health and environmental risks associated with lead-based paint on the bridge surface coating material:

- The lead paint must be captured and fully contained during coating removal and dismantling operations to ensure that it is not released to the surrounding environment.
- Lead paint must be securely contained while it is awaiting proper disposal and then conveyed by a licensed hazardous waste transporter to a licensed waste disposal facility.

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.

THURBER

TABLE OF CONTENTS

THURBER

APPENDICES

APPENDIX A

Drawing

APPENDIX B

Public Database Search Results

APPENDIX C

Historical Air photos

APPENDIX D

Hand Auger and Test Hole Logs

APPENDIX E

Tables

APPENDIX F

Laboratory Reports

THURBER

1. INTRODUCTION

Thurber Engineering Ltd. (Thurber) was retained by BPTEC Engineering Ltd. (BPTEC) on behalf of the City of Edmonton (CoE) to conduct an Environmental Overview (EO) and Phase II Environmental Site Assessment (ESA) for the proposed Latta Bridge Replacement Project (the "bridge"). Thurber understands that the bridge construction will be conducted within the existing road allowance, except for crossing under three titled parcels within the Latta Ravine, municipally described as 10336-89 Street NW, 9075 Jasper Avenue NW and 9131 Jasper Avenue NW, Edmonton, Alberta. The legal description of 10336-89 Street NW is Lot 20, Plan EDMONTON. The legal description of 9075 and 9131 Jasper Avenue NW is Lot 6, Block 1, Plan RN37A. Collectively, the bridge and immediately surrounding areas (including the three titled adjacent properties) will be referred as the "Site".

Authorization to proceed with the EO and Phase II ESA was provided by Mr. Chuck Wiltzen, P.Eng. of BPTEC.

Thurber also carried out a geotechnical investigation in conjunction with this environmental assessment. The geotechnical report is issued under separate cover.

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. SCOPE OF WORK

The scope of work originally consisted of a Phase I ESA and Phase II ESA, as outlined in Thurber's June 8, 2020 proposal to BPTEC. However, the Phase I ESA was changed to an EO midway through the Phase I ESA. This report is in two parts: Part 1 is the EO while Part 2 is the Phase II ESA. Details for each part of the assessment are outlined below.

The EO was conducted in general accordance to the CoE *Environmental Site Assessment Guidebook* (March 2016) to identify areas of potential environmental concerns (APECs) on the Site and adjacent properties. The EO scope of work generally included the following:

- Review of Site history
- Site reconnaissance
- Assessment and report preparation.

The Phase II ESA was undertaken in general accordance with CSA Standards Z769-01(reaffirmed in 2013). The Phase II ESA scope of work consisted of:

- Advance 21 hand-augured test holes (TP20-1 through TP20-21) beneath the bridge, at the bridge drip lines, at the 5 m and 10 m step-outs from the bridge
- Drill three test holes (TH20-4, TH20-5, and TH20-6) respectively at the north and south abutments of the bridge and in the middle of the Latta Ravine to depths ranging from 12.2 m bgs to 13.1 m below ground surface (bgs)

- Install three groundwater monitoring wells MW20-4, MW20-5 and MW20-6 in test holes TH20-4, TH20-5, and TH20-6, respectively
- Submit selected soil samples and field duplicates for chemical analyses of BTEX (benzene, toluene, ethylbenzene, and xylene) and petroleum hydrocarbons (PHC) F1 to F4 fractions, polycyclic aromatic hydrocarbons (PAHs), metals, soil salinity and grain size
- Measure depth to groundwater and collect water samples for analyses of BTEX, PHC fractions F1 and F2, PAHs, dissolved metals, and routine chemistry parameters
- Collect five paint samples from the bridge surface coating and submit them for lead chemical analyses
- Prepare a report for the EO and Phase II ESA in relation to provincial and federal guidelines.

The scope of work was increased to assess an additional 22 soil samples from beneath the bridge for lead, zinc, and full metal scan.

3. PART 1 – ENVIRONMENTAL OVERVIEW

3.1 Bridge Description

The bridge is located along Jasper Avenue NW; northeast of 91 and southwest of 90 Street NW, in Edmonton, Alberta, as shown on Drawing 29532-1 in Appendix A. The bridge was originally constructed as a trestle bridge over Latta Ravine in 1911. Coal mine subsidence in the 1920's was reported to have caused significant settlement of the bridge structure. An attempt was made in 1928 to fill in the ravine to eliminate the need for a bridge; however, ongoing subsidence from collapsing coal mines prevented this effort. The bridge was subsequently replaced with the current five-span steel structure in 1936. The bridge was rehabilitated in 1977 and again in 2004. The bridge was also reportedly built on pile foundations consisting of steel and concrete.

3.2 Surrounding Areas

Latta Bridge is bound by residential land to the northwest, south and southwest, as shown on Drawing 29532-1. Surrounding areas to the east (including the three titled parcels), southeast and northeast of the bridge is Latta Ravine comprising of trees, shrubs, access trails (which provides further access to Dawson Park), pedestrian sidewalks, and additional river valley pathways. Further southeast and east of the Site are residential lands and Dawson Park.

3.3 Geological Setting

The Site surficial geology is comprised of glaciolacustrine bedded silt and clay and minor sand that can be varved (Kathol and McPherson, 1975). Surficial glaciolacustrine deposits are approximately 6 m thick and are underlain by clay till approximately 15 m thick. The clay till is underlain with bedrock of interbedded bentonitic shales and sandstones with numerous coal seams known as Edmonton Formation (Prior et al, 2013).

The subsurface stratigraphy based on test holes drilled as part of the Phase II ESA (Section 4.2) generally consisted of gravel fill overlying clay fill between ground surface and 7 m bgs. Underlying the gravel fill/clay fill was clay or clay till interbedded with minor sand layers between 1.8 m and 13.1 m bgs (maximum depth of the Phase II ESA).

3.4 Hydrogeological Setting

The North Saskatchewan River is located approximately 300 m east of the Site. The regional groundwater flow direction was assessed to be southeast, towards the North Saskatchewan River. Groundwater yields in vicinity of the Site are expected to be in the order of 0.08 L/s to 0.38 L/s (Bibby, 1974).

Depth groundwater (Section 4.3) as measured on October 24, 2020 ranged between 9.2 m and 9.3 m bgs one of the wells were also dry.

3.5 Records Review

Information on historical conditions and land use of the Site was obtained from a review of historical aerial photographs and regulatory and third-party agencies. Information from these sources are compiled in Appendix B and are summarized in the following sections.

3.5.1 Aerial Photographs

Historical air photos were reviewed from 1950, (oldest available), 1962, 1967, 1972, 1977, 1983, 1987, 1992, 2001, and 2008 at AEP Air Photo Distribution Centre. An air photo from 2019 (most recent available) was obtained from CoE Department of Transportation and Streets Mapping. The 2019 air photo was used as the base for Drawing 29532-1. Historical air photographs are in Appendix C.

The 1950 air photo shows the bridge, ravine, and treed area on the adjacent lands to the east, southeast, west, and southwest, as well as buildings and road allowances on the remaining adjacent lands. In the 1950 air photo, a building was also visible southwest of the bridge at adjacent parcels (9131 Jasper Avenue NW) and other titled adjacent parcels (9075 Jasper Avenue NW and 10336 – 89 Street NW) were vacant and undeveloped.

The 1962 air photo shows a building on 10336 – 89 Street NW and additional buildings on the surrounding areas located within 100 m west, southwest, northwest, southeast and northeast of the Site. In the 1967 air photo, the building previously identified on the 10336 – 89 Street NW was no longer visible, and signs of ground disturbance was visible on the surrounding properties located east of the Site.

In the 1972, and 1977 air photos, additional buildings were visible on surrounding areas located within 100 m west, and southwest of the Site.

The 1983 air photo shows additional buildings on the surrounding areas located within 100 m west, southwest and northwest of the Site. In the 1983 air photo, a building was also visible on existing Dawson Park further east of the Site. In the 1987 air photo, a building previously observed on the 9131 Jasper Avenue NW was no longer visible and additional parkland-like developments were visible on the existing Dawson Park located east of the Site. The 1992 air photo is similar in appearance to the 1987 air photo.

The 2001 air photo shows additional buildings and unknown facilities on the surrounding areas located within 100 m northwest and east of the Site. The 2008 and 2019 air photos show the Site and the surrounding areas in their approximate current configurations.

3.5.2 Alberta Land Titles

The records from Alberta Land Titles indicate that the three titled parcels within the Site are currently owned by CoE. The CoE's ownership of the titled parcels (municipally described as 9075 and 9131 Jasper Avenue NW) started in 1913 and no historical land titles were available for these two properties before this period. The CoE's ownership of the other titled parcel (municipally described as 10336 - 89 Street NW) started in 1964 and before this period, this parcel was owned by the Montreal Trust Company and private individuals dating back to the 1900s.

3.5.3 Alberta Energy Regulator (AER)

Information held by the AER was accessed via the Abacus Datagraphics Ltd. (AbaData). AbaData database (current to October 31, 2020) did not have records of pipelines or environmental releases (spills and complaints) or other oil and gas activity (wells, leases, battery sites, directional drilling or pipelines) on the Site or within 500 m of the Site.

The AbaData database also includes information from AEP Groundwater Information Centre (GIC). There are records of three groundwater wells within 500 m of the Site. Two groundwater wells are located approximately 110 m east and 220 m northeast of the Site are used for observatory and domestic/stock purposes. The other groundwater well is located approximately 380 m southwest of the Site and its proposed use is unknown.

3.5.4 Coal Mine Maps

Thurber reviewed the *Atlas: Coal-mine Workings of the Edmonton Area* (Spence, 1971) for information regarding coal mines and underground works in proximity to the Site. There were three potential coal mines in the vicinity of Site. Mine No. 632 was an extensive underground mine and was reported to have been located beneath the Latta Ravine. According to available records, the coal mining activities were started at the Site area in 1915 using room-and-pillar extraction methods and were reportedly closed in 1930.

3.5.5 Geotechnical Information

Thurber completed a preliminary geotechnical investigation, slope stability assessment and coal mine workings evaluation at the Site in May 2020 (Thurber, 2020). Imported subsurface fill material of unknown origin was encountered during that investigation.

3.5.6 AEP Environmental Site Assessment Repository (ESAR) Database

A search of the AEP Environmental Site Assessment Repository (ESAR) database did not identify environmental reports on the Site or within 100 m of the Site.

3.5.7 Municipal and Provincial Regulatory Searches

3.5.7.1 City of Edmonton

The CoE's 2020 property assessment, as published on their on-line map page, identifies the Site as road allowance except for the section of the Site located within the three titled parcels. These parcels are zoned as Metropolitan Recreation Zone.

The CoE's Fire Rescue Services, and Fire Prevention Branch did not identify records in their files pertaining to petroleum underground storage tanks (USTs), leaks or contamination for the three titled parcels within the Site.

The CoE's Waste Management Branch carried out a search of their files and their records show that during previous excavation activity in the vicinity of the Site the presence of subsurface refuse material was noted. Information was not provided as to the type, volume, or exact location of this waste material or how and when the waste material was deposited.

A response from CoE's Drainage Services, as provided by EPCOR, did not identify records pertaining to non-compliance with CoE Sewers Use Bylaws, Sewers Bylaw, Drainage Bylaws, EPCOR Drainage Services Bylaw or EPCOR Water Services and Wastewater Treatment Bylaws for the three titled parcels located within the Site.

The CoE's Geotechnical and Environmental Services provided a list of available reports of previous geotechnical and environmental investigations in the same cadastral (934-36-12) as the Site. However, none of these previous environmental investigations were conducted on the Site or on surrounding properties within 100 m of the Site.

3.5.7.2 Alberta Health Services

Alberta Health Services examined their files and indicated they did not find records of hazardous waste sites, abandoned landfills, contamination constituting a public health nuisance, outstanding orders or information pertaining to the three titled parcels located within the Site.

3.5.7.3 Alberta Safety Codes Authority (ASCA)

The ASCA responded that they did not have any records of active or abandoned petroleum storage tanks on the three titled parcels located within the Site.

3.5.7.4 Environmental Law Centre (ELC)

The ELC maintains a database of history of enforcement actions taken against companies or individuals under the Alberta Environmental Protection and Enhancement Act, and its predecessor legislation, the Hazardous Chemicals Act, Agriculture Chemicals Act, Clean Water Act and Clean Air Act, dating back to 1971, and/or pursuant to the Water Act from 1999 onwards.

A search of the ELC database indicated several historical enforcement actions that have been taken against the CoE, but none of these actions are in relation to the Site or surrounding properties located within a 100 m of the Site.

3.6 Interviews

Personnel interview was not conducted as part of the EO as Thurber was unable to locate individuals with specific, long term knowledge about the Site or the vicinity of the Site.

3.7 Assessment

The assessment was based on researched history of the Site and surrounding properties, documentation from various regulatory and third-party agencies, background information from BPTEC and site reconnaissance carried out by Mr. Sabinus Okafor, M.Sc., P.Chem., P.Eng. of Thurber on October 20, 2020. Snow was not present during Thurber's site reconnaissance.

3.7.1 Past / Present Operations – Bridge and Surrounding Areas

The bridge has been developed as a city street and an arterial roadway crossing through Latta Ravine since the early 1990's. Historical coal mining operations at the Site area was reported to have been started in 1910 and continued until the mid-1920's. The bridge was replaced with the current five-span steel structure in 1936 and has been rehabilitated twice in 1977 and again in 2004. The bridge is currently surrounded by Latta Ravine, pedestrian sidewalks, city streets, access trails, road allowances and residential lands since at least 1950's to present.

3.7.2 Underground or Aboveground Storage Tanks

Evidence of above ground storage tanks (ASTs) or UST filler pipes, vent pipes or clean-outs was not observed within the Site or adjacent properties at the time of site reconnaissance.

3.7.3 Polychlorinated Biphenyls (PCBs)

Multiple pole-mounted transformers on the surrounding properties to the Site visually appeared to be in good condition with no obvious signs of leakage and included marking for PCB testing.

3.7.4 Soil Stockpiles/Fill Material

Soil stockpiles were not evident in historical aerial photographs reviewed nor observed at the time of site reconnaissance. Based on previous geotechnical information reviewed and observations made during the Phase II ESA, fill material of unknown origin is present within the Site.

THURBER

3.7.5 Oil and Gas Facilities

The AbaData database (current to October 31, 2020) do not have records of oil and gas activity (wells, leases, battery sites, directional drilling, or pipelines) on the Site or within 500 m of the Site.

3.7.6 Odours and Emissions

Pungent or noxious odours or air emissions were not observed during Thurber's site reconnaissance.

3.7.7 Pesticides and Herbicides

Thurber did not see visual evidence of distressed vegetation from pesticides or herbicides during the site reconnaissance.

3.7.8 Environmental Overview Conclusions

Based on the information reviewed, historical information was not found that the Site had been impacted by contaminants. However, APECs for the Site are as outlined below:

- Given the 1911 and 1977 bridge construction the paint may contain lead (APEC – A)
- Significant fill material of unknown origin is present at the Site at depths of up to approximately 4 m bgs (APEC- B)
- Presence of subsurface refuse material in the vicinity of the Site (APEC C; exact location is unknown).

Thurber undertook a Phase II ESA to assess these APECs and to establish baseline soil and groundwater conditions prior to construction phase of the Latta Bridge Replacement Project. The Phase II ESA is outlined in Section 4: Part 2.

4. PART 2 - PHASE II ENVIRONMENTAL SITE ASSESSEMENT

4.1 Field Investigation

4.1.1 Ground Disturbance

Thurber retained Alberta Traffic Safety Supply to develop and to implement a Traffic Accommodation Strategy to allow for safe completion of field drilling and groundwater monitoring activities near the bridge south and north abutments on the Jasper Avenue NW roadway. Prior to commencing ground disturbance, Thurber submitted to the CoE and obtained an On-Street Construction and Maintenance and Utility Line Alignment permits. Thurber also contacted Alberta One-Call, Shaw Cable, and private utility locator to assess potential conflicts between the proposed hand augured/test holes locations and underground utilities.

4.1.2 Hand Augering, Drilling and Soil Sampling

Between October 10 and 11, 2020, twenty-one hand augured test holes (TP20-1 through TP20-21) were advanced to depths of up to 0.5 m bgs to assess surficial baseline soil quality conditions in the vicinity of the Site, as shown on Drawing 29532-1. Hand augured test hole TP20-4 was advanced to the depth of 0.3 m bgs as opposed to 0.5 m bgs due to auger refusal. Three test holes (TH20-4 through TH20-6) were drilled on October 10 and 12, 2020, using a track-and rubber-tired truck mounted auger drill rig under the full-time observation of Thurber personnel. Test holes TH20-4 and TH20-5 were drilled respectively at the north and south abutments of the Site to depths ranging from approximately 12.2 m to 13 m bgs. Test hole TH20-6 was drilled in the middle of ravine near the Site to a depth of approximately 12.4 m bgs. These three test holes were completed as groundwater monitoring wells (MW20-4 to MW20-6). The hand auger and test hole logs are presented in Appendix D.

Soil samples were collected directly from the augers with smeared or loose soil along the exterior soil sample was removed to reduce the potential for cross-contamination. Soil that was not in direct contact with the sampling device was placed into plastic bags for field screening and placed in laboratory supplied, glass containers. Soil in subsamples was also collected by Terra Core samplers and stored in Volatile Organics Analysis glass vials with methanol preservative. Field duplicates were also collected. Sampling personnel wore new disposable, nitrile gloves during sample collection. Soil samples were stored in ice-chilled coolers for transit and storage in Thurber's cooler.

Field screening was completed on the bagged soil samples using an RKI Eagle II organo-vapour analyzer (OVA) calibrated to hexane and a photoionization detector (PID) calibrated to an isobutylene standard. The OVA readings of the soil samples ranged from less than the detection limit of the instrument to 45 parts per million vapour (ppmv). The PID readings of the soil samples ranged from less than the detection limit of the instrument to 10 ppmv. The field headspace readings are summarized on the test pit and test hole logs in Appendix D.

Select soil samples were submitted for chemical analyses of BTEX, PHC fractions F1 through F4, PAHs, metals, and soil salinity parameters. Surficial soil samples from the hand auger test holes that include field duplicates were selected and submitted for chemical analysis of lead or zinc or a full metal scan. Grain size analyses was also performed on select soil samples.

Monitoring wells were constructed with 50 mm diameter Schedule 40 machine slotted polyvinyl chloride (PVC) screens and solid PVC riser pipe. The annulus of the test hole was backfilled with silica sand around the screened portion of the well, while the remaining portion was backfilled with hydrated bentonite chips. A stick-up protective metal casing protector was installed at MW20-6 and flush mounted casing protectors at MW20-4 and MW20-5. Well completion details are shown on test hole logs in Appendix D. Excess soil cuttings generated from field drilling activities were placed into soil disposal bags and temporarily stored in the landscaped area near the south abutment of the bridge. One composite soil sample was collected from soil cuttings for landfill characterization chemical analyses.

4.1.3 Bridge Surface Coating Material Sampling

Five paint samples (PA20-1 through PA20-5) were collected from surface coating of the bridge material using hand tools and submitted for laboratory lead chemical analyses. The PA20-1 and PA20-2 samples were collected from the bridge piers on the southwest and southeast sides, respectively in the bottom of the Latta Ravine. The PA20-3 and PA20-4 samples were collected from the bridge girders at the north abutment. The PA20-5 was collected from the bridge girder at the south abutment.

4.1.4 Groundwater Monitoring and Sampling

On October 24, 2020, approximately two weeks after well installation, depth to groundwater in each well location was measured using a water level meter and and the monitoring well (MW20-6) installed at the bottom of the ravine was dry. Wells MW20-4 and MW20-5 had water and were purged prior to sampling of two well casing volumes or until field pH, temperature, and electrical conductivity (EC) readings had stabilized to within 10 percent of previous measurements. Groundwater samples were then collected using dedicated bailers and laboratory-supplied bottles. Groundwater samples were placed into an ice chilled cooler and transported under chain-of custody to Element in Edmonton for chemical analyses of BTEX, PHC fractions F1 and F2, PAHs, dissolved metals, and routine water chemistry parameters.

4.1.5 Surveying

Thurber surveyed wells MW20-4 through MW20-6 for geodetic northing, easting, and ground surface using a Hemisphere Total Station Model S320. The survey results are presented on the test hole logs in Appendix D. Test pit locations were surveyed using a handheld GPS instrument.

4.2 Subsurface Stratigraphy

The subsurface stratigraphy encountered at TH20-4 and TH20-5 near the bridge north and south abutments generally consisted of asphalt / concrete and granular fill overlying clay fill layer extending up to a depth of 1.8 m bgs, overlying clay till containing sand layers and extending up to depths ranging from 12.2 m to 13.1 m bgs, the maximum depth of these test holes. The subsurface stratigraphy encountered at TH20-6 at the bottom of the Latta Ravine consisted of clay fill (ground surface to 0.7 m bgs); loose gravel fill (0.7 m bgs to 2.8 m bgs); clay fill (2.8 m bgs to 7.0 m bgs); clay till (7.0 m bgs to 10 m bgs) and sand and gravel layer, which extended to the depth of 12.4 m bgs, the maximum test hole depth.

Waste materials such as bricks, glass and debris were noted in gravel fill at TH20-6 (bottom of the Latta Ravine) at the depths ranging from 0.6 m to 2.7 m bgs. Detailed stratigraphy is included on the test hole logs in Appendix D.

4.3 Groundwater Monitoring

Depth to groundwater as measured on October 24, 2020 in wells MW20-4 and MW20-5 is summarized in Table 1, Appendix E and were ranged between 9.2 m and 9.3 m bgs. Groundwater elevations ranged from 651.75 metres below sea level (masl) to 652.12 masl. Even though only two wells had groundwater, groundwater flow direction in the vicinity of the Site was assessed to be southeast, towards the North Saskatchewan River.

4.4 Regulatory Guidelines

Thurber used Alberta Environment and Parks (AEP) 2019 Alberta Tier 1 Soil and Groundwater Remediation Guidelines (Tier 1) residential/parkland fine-grained soil guidelines (AEP, 2019) to assess the Site. These guidelines were selected based on the parkland land use of the Site and residential land use of the surrounding properties, as well as the dominant soil texture encountered at the hand augured and test hole locations.

Soil salinity parameters were compared to the Salt Contamination Assessment and Remediation Guidelines (SCARG) for unrestricted land use published by Alberta Environment (now AEP) in May 2001 (SCARG, 2001) and encompassed within the AEP Tier 1 Guidelines.

The Government of Canada, 2016. “Surface Coating Materials Regulation” (SCMR, for lead paint assessment) was used to assess lead content in the bridge surface coating material (SCMR, 2016).

4.5 Chemical Analyses

4.5.1 Soil – Hand Auger Holes

Results of the soil laboratory analyses from the hand auger locations, as summarized in Table 2 in Appendix E, show that the analyzed samples met the AEP 2019 Tier 1 metals and soil salinity residential/ parkland fine-grained soil guidelines except the following:

Lead and/or zinc concentrations did not meet the applied guidelines in 15 samples that were collected at depths of 0 - 0.15 m bgs at following locations:

- Near bridge south abutment (TP20-1)
- Bridge drip lines on the east and west sides (TP20-2, TP20-5, TP20-8, and TP20-11)
- 5 m step-outs from the bridge on the east and west sides (TP20-3, TP20-6, TP20-9, TP20-12, and TP20-18)
- 10 m step-outs from the bridge on the east and west sides (TP20-4, TP20-7, TP20-10, TP20-13, and TP20-19).

Based on the above initial soil results, an additional 22 deeper (at 0.3 – 0.5 m bgs) samples were submitted for chemical analysis of lead and zinc to further assess the vertical extents of these analytes in surficial soil in and around the bridge. The additional sample chemical analyses results are summarized as follows:

- The vertical extents of lead and/or zinc exceedances were assessed at 0.3 – 0.5 m bgs at the 5 m step-outs from the bridge on the west side (TP20-12 and TP20-18); the 10 m step-outs from the bridge on the east side (TP20-7 and TP20-10) and the 10 m step-outs from the bridge on the west side (TP20-13 and TP20-19).

- The vertical extents of lead and/or zinc exceedances were not assessed at 0.3 – 0.5 m bgs at the bridge drip line on the east side (TP20-2, TP20-5 and TP20-8); the bridge drip line on the west side (TP20-11); the 5 m step-outs from the bridge on the east side (TP20-3, TP20-6 and TP20-9) and the 10 m step-outs from the bridge on the east side (TP20-4 at 0.15 – 0.3 m bgs) as exceedances were still present at the maximum sampling depth. .

The laboratory reports, as provided by Elements are included in Appendix F. Drawing 29532-1 shows the hand augured test holes that do not meet applied AEP 2019 Tier 1 guidelines.

4.5.2 Soil – Test Holes

Results of the soil laboratory analyses from the test hole locations, as summarized in Tables 3 in Appendix E, show that the analyzed samples met the AEP 2019 Tier 1 BTEX, PHC fractions F1 to F4, PAHs, metals and soil salinity residential/ parkland fine-grained soil guidelines except for the following:

- The concentrations of PHC fractions F2 to F4 and some PAHs (specifically naphthalene, acenaphthene, fluorene, phenanthrene, fluoranthene, benzo(a)pyrene, B[a]P total potency equivalents and index of addictive cancer risk [fine/coarse]) in a soil fill sample from TH20-6 (at 1.5 m bgs) exceeded the guidelines. The extent of these soil PHC and PAH impacts was vertically assessed at 3.0 m bgs.
- The lead concentrations in analyzed soil fill samples from TH20-6 (at 0.75 m) and its field duplicate (DUP 20-1) exceeded the guidelines. The extent of this soil fill lead impacts at this test hole location was vertically assessed at 0.75 m bgs.
- Based on the SCARG guidelines, the concentrations of key salinity parameters including EC and sodium adsorption ratio (SAR) were rated "poor to unsuitable" in soil surficial fill samples collected from at TH20-4 (at 0.5 m and 0.75 m bgs) and TH20-5 (at 0.5 m, 0.75 m, 1.5 m and 2.25 m bgs).The elevated SAR and EC, as well as elevated soluble sodium and chloride concentrations in observed in these fill samples indicate that there are potential salt impacts

The laboratory reports, as provided by Elements are included in Appendix F.

4.5.3 Groundwater

Results of the groundwater laboratory analyses, as summarized in Table 4 in Appendix E, show that the groundwater samples from MW20-4, MW20-5 and DUP1 (duplicate of MW20-4 sample) met AEP Tier 1 residential/parkland fine-grained guidelines for BTEX, PHC fractions F1 and F2 and PAHs.

Sodium, sulfate, total dissolved solids (TDS), manganese and uranium did not meet AEP 2019 Tier 1 guidelines in both monitoring wells samples. Chloride also did not meet the applied AEP guidelines from MW20-5. All remaining parameters met the applied guidelines.

Elevated manganese and TDS are common in groundwater in the Edmonton area and the elevated sulfate concentrations in all samples suggest that this is a naturally occurring substance in this area.

The laboratory reports, as supplied by Elements are included in Appendix F.

4.5.4 Bridge Surface Coating Material

Results of the bridge coating material laboratory analyses, as summarized in Table 5 in Appendix E, show lead concentrations exceeding the SCMR guidelines (90 mg/kg) in three samples (PA20-1, PA20-2 and PA20-5) with concentrations ranging from 472 mg/kg to 38,600 mg/kg.

4.5.5 Quality Assurance and Quality Control

Thurber's quality assurance (QA)/quality control (QC) program included submitting three blind duplicate soil samples (DUP20-1, DUP20-5 and DUP20-6) and one blind water sample (DUP 1) for chemical analyses and comparing the blind duplicates to the original sample results by calculating the relative percent difference (RPD) between the two results. The blind duplicate samples are described below:

- DUP20-1 (TH20-6 at 0.75 m) – submitted for metals and soil salinity parameters.
- DUP20-5 (TP20-5 at 0-0.15 m) – submitted for lead and zinc.
- DUP20-6 (TP20-10 at 0-0.15 m) – submitted for metals.

The calculated soil RPD blind field soil duplicates ranged between 0 and 48 percent and was considered to be within an acceptable range of variance. The calculated groundwater RPD blind field duplicates ranged from 0 to 19 percent and was also considered to be within an acceptable range of variance. The RPD could not be assessed for all parameters as some results were below the reportable laboratory detection limits. Tables 6 and 7 in Appendix E includes the field samples / blind duplicates and RPD values in soil and groundwater, respectively while copies of Element's reports are included in Appendix F.

5. ASSESSMENT AND RECOMMENDATIONS

5.1 Soil

The Phase II ESA identified lead concentrations in a fill sample from TH20-6 (at 0.75 m bgs) and PHC fractions F2 to F4 and PAHs in a fill sample from TH20-6 (at 1.5 m bgs) at the bottom of the Latta Ravine that did not meet AEP 2019 Tier 1 residential/parkland fine-grained guidelines. The extent of lead exceedance in soil fill at TH20-6 was vertically assessed at depth of 1.5 m bgs. The extent of PHC fractions F2 to F4 and PAHs in surficial soil fill at TH20-6 was vertically assessed at depth of 3.0 m bgs. Evidence of salts impacts likely related to winter roadway maintenance activities were also identified in some surficial fill samples collected from test holes TH20-4 and TH20-5 (near the bridge north and south abutments) based on elevated concentrations of key salinity parameters including EC and SAR, which were rated as “poor and unsuitable”.

The soil assessment identified lead and zinc concentrations not meeting AEP 2019 Tier 1 residential/parkland fine-grained soil in several surficial samples that were collected in the vicinity of the Site. The lead and/or zinc exceedances extended to a depth of at least 0.5 m (the maximum depth limit of the investigation) except for baseline surficial locations at 5 m and 10 m step-outs from the bridge on the west side where the vertical extent of lead exceedance in surficial soil was assessed at depth of 0.3 to 0.5 m and no zinc exceedances were identified at depth of 0 - 0.15 m bgs.

If the vertical and/or lateral extents of the soil lead, zinc, PHC fractions F2 to F4 and PAHs in the vicinity of the Site needs to be assessed Thurber recommends a Phase III ESA be undertaken.

5.2 Groundwater

Groundwater samples from wells MW20-4 and MW20-5 installed on the roadway near the bridge abutments met the applied guidelines for BTEX, PHC fractions F1 and F2 and PAHs. Concentration of some dissolved metals and routine parameter in groundwater including uranium, sodium, manganese, chloride, sulfate, and TDS did not meet AEP Tier 1 guidelines but were observed to be similar to elevated concentrations commonly encountered in groundwater in Edmonton area. Depth to groundwater ranged between 9.2 m bgs to 9.3 m bgs and groundwater flow direction was assessed to be southeast, towards the North Saskatchewan River.

As well MW20-6 was dry when attempted to be sampled on October 24, 2020 a groundwater monitoring program could be conducted in the spring of 2021.

5.3 Surface Coating Material

Lead concentrations not meeting federal guidelines were identified in three of the five paint samples collected from bridge surface coating material. Thurber therefore recommends that the following measures be taken during construction to reduce the potential human health and environmental risks associated lead-based paint on the bridge surface coating material:

- The lead paint must be captured and fully contained during coating removal and dismantling operations to ensure that it is not released to the surrounding environment.
- Lead paint must be securely contained while it is awaiting proper disposal and then conveyed by a licensed hazardous waste transporter to a licensed waste disposal facility.

6. REFERENCES

Alberta Environment and parks (WP). 2019. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land Policy Branch, Policy and Planning Division. 198 pp.

Alberta Environment (now AEP). 2001. Salt Contamination Assessment and Remediation Guidelines. Former Environmental Sciences Division. Publication Number. T/606. 88pp.

Bibby, 1974. Hydrogeology of the Edmonton Area (Northwest Segment), Alberta, Report 74-10, Alberta Research Council.

Kathol, C.P. and McPherson, R.A. 1975. "Urban Geology of Edmonton." Bulletin 32. Alberta Research Council. Edmonton, Alberta.

Prior, G.J., Hathway, B., Glombick, P.M., Pană, D.I., Banks, C.J., Hay, D.C., Schneider, C.L., Grobe, M., Elgr, R., and Weiss, J.A. 2013. Bedrock Geology of Alberta, Energy Resources Conservation Board, ERCB/AGS Map 600, scale 1:1 000 000.

Thurber Engineering Ltd. (Thurber, 2020), May 7, 2020. Latta Bridge Preliminary Geotechnical Investigation and Slope Stability Assessment, Jasper Avenue Near 91 Street NW, Edmonton, Alberta. File: 28330.

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.

THURBER

APPENDIX A

Drawing

H:\29000\29532 Latta & Kinnaird Phase I and II ESA\Drafting\29532-1 JANUARY 15, 2021.dwg - 1 - Jan. 15, 2021

N
W E
S

LEGEND

- TEST HOLE AND MONITORING WELL LOCATION
- SURFICIAL BASELINE SOIL SAMPLE LOCATION
- SOIL EXCEEDS AEP 2019 APPLIED GUIDELINES
- APPROXIMATE BOUNDARY OF LATTA BRIDGE
- APPROXIMATE BOUNDARY OF TITLED ADJACENT PROPERTIES TO THE EAST OF LATTA BRIDGE
- APEC A - LEAD-BASED PAINT IN THE BRIDGE SURFACE COATING MATERIAL
- APEC B - FILL MATERIAL OF UNKNOWN QUALITY

APEC C - SUBSURFACE REFUSE IN THE VICINITY OF THE BRIDGE SITE (EXACT LOCATION IS UNKNOWN)

1. LATTA BRIDGE
2. RAVINE
3. PEDESTRIAN TRAIL

UNDEVELOPED PROPERTIES

4. 9131 JASPER AVENUE NW
5. 9075 JASPER AVENUE NW
6. 10336 - 89 STREET NW

0 10 20 30 40 50m

SCALE 1:800

2019 AIR PHOTO FROM THE CITY OF EDMONTON

BPTEC ENGINEERING

LATTA BRIDGE (B027) REPLACEMENT, ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT JASPER AVENUE, EDMONTON, ALBERTA

SITE PLAN

DWG No. 29532-1

DRAWN BY	ML
DESIGNED BY	SIO
APPROVED BY	ENG
SCALE	1:800
DATE	JANUARY 2021
FILE No.	29532

THURBER ENGINEERING LTD.

THURBER

APPENDIX B

Public Database Search Results

LAND TITLE CERTIFICATE

S

LINC	SHORT LEGAL	TITLE NUMBER
0015 263 304	RN37A;1;6	170P78

LEGAL DESCRIPTION

PLAN RN37A (XXXVIIA)
BLOCK ONE (1)
ALL THAT PORTION OF LOT SIX (6) IN RIVER LOT TWENTY (20)
DESCRIBED AS FOLLOWS: COMMENCING AT THE NORTH WEST CORNER OF
SAID LOT; THENCE SOUTH EASTERLY ALONG THE NORTHERLY BOUNDARY
THREE HUNDRED AND SIXTY FOUR AND NINE TENTHS (364.9) FEET TO
THE NORTH EAST CORNER OF SAID LOT; THENCE SOUTHERLY ALONG THE
EASTERN BOUNDARY SIXTY TWO AND FOUR TENTHS (62.4) FEET TO THE
SOUTH EAST CORNER OF SAID LOT; THENCE WESTERLY ALONG THE
SOUTHERLY BOUNDARY TWO HUNDRED AND SIX AND TWENTY FIVE
HUNDREDTHS (206.25) FEET TO A POINT; THENCE WESTERLY IN A STRAIGHT
LINE TO A POINT ON THE WESTERN BOUNDARY OF SAID LOT; ONE
HUNDRED AND TWELVE (112) FEET FROM THE SAID NORTH WEST CORNER
THENCE NORTHERLY ALONG THE WESTERN BOUNDARY TO THE POINT OF
COMMENCEMENT
EXCEPTING THEREOUT ALL MINES AND MINERALS

ATS REFERENCE: 4;24;53;20;RL
ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF EDMONTON

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
170P78	15/07/1933		$425	

OWNERS

THE CITY OF EDMONTON.
OF EDMONTON
ALBERTA

(CONTINUED)

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
7411PG	14/02/1968	UTILITY RIGHT OF WAY GRANTEE - EPCOR WATER SERVICES INC. (DATA UPDATED BY: TRANSFER OF UTILITY RIGHT OF WAY 202122324)

TOTAL INSTRUMENTS: 001

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 16 DAY OF JULY, 2020 AT 01:18 P.M.

ORDER NUMBER: 39717965

CUSTOMER FILE NUMBER:

END OF CERTIFICATE

1542U 24

CANCELLED

I Certify that the within Instrument is duly Entered and Registered in the Land Titles Office for the N.A. Alberta Land Registration District at Edmonton, in the Province of Alberta, at 11.35 o'clock a.m., on the 18 day of March A. D. 1913
Number 129 Book A.P. Fol. 160.
W. I. Coome D. Registrar A.L.R.D.

CANADA

Certificate of Title.

LAND TITLES ACT, Sec. 43.—The land mentioned in any certificate of title granted under this Act shall by implication and without any special mention therein, unless the contrary is expressly declared, be subject to—
(a) Any subsisting reservations or exceptions contained in the original grant of the land from the Crown;
(b) All unpaid taxes;
(c) Any public highway or right-of-way or other public easement, howsoever created up[illegible], over or in respect of the land;
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the same;
(e) Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
(f) Any right of expropriation which may by statute or ordinance be vested in any person, body corporate, or His Majesty;
(g) Any right-of-way or other easement granted or acquired under the provisions of any Act or l[illegible]w in force in the Province.

Refer Cert. No. 218U 23

Last Value $ 8000.00

NORTH ALBERTA Land Registration District.

This is to Certify that Emelia Latta, of the City of Edmonton in the Province of Alberta Dominion of Canada wife of David G. Latta, Blacksmith, of the same place

is now the owner of an estate in fee simple

of and in Lot numbered Six (6) in Block numbered One (1) River Lot Twenty (20) as shown on a plan of subdivision of part of the said River Lot, in the City of Edmonton aforesaid of record in the Land Titles Office for this Land Registration District as Plan XXXVII A.

CANCELLED

This Certificate of Title is cancelled as to remainder and in full
and a NEW CERTIFICATE OF TITLE No. 203 I 23
Issued this 23 day of August 1948
to William B. Latta
D. B. No. 5932HC
F. Barclay
A.D.R. Registrar

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof I have hereunto subscribed my name and affixed my official seal this eighteenth day of March A.D. 1913

W. I. Coome as Registrar,
NORTH ALBERTA Land Registration District.

P.O. Address Edmonton Alta

This Certificate of Title is cancelled ao to
pt as desc

and a NEW CERTIFICATE OF TITLE No. 170 P 78
issued this 15 day of July 1933
to City of Edmonton
D. R. No. 6521 EK

R McLeod
GD Registrar.

The Title of Within Pt. Lot 6 BCK 1
subject to a C.V. [illegible] of the
City of Edm[illegible] 1932
dated 12 [illegible] 37 [illegible] 2 [illegible] 37 [illegible]
No. 6373 G 71
Folio 38

W Ally
a.g. Registrar.

The above mentioned Caveat [illegible] No. 6373 G 71
is dis[illegible] 31 day
of Aug 38 [illegible]
[illegible] 1 [illegible] Sept 38 [illegible]
No. [illegible]

W Ally
[illegible] Registrar.

The Title of Within Pt Lot 6 Bek 1 is
subject [illegible] of the
City [illegible] (1922)
[illegible] 12 [illegible] 40 [illegible] 2 [illegible] 40 [illegible]
No. 3900 G P
Folio 122

[illegible]
Registrar.

The above mentioned T. Caveat No. 3900 GP
is discharged by instrument [illegible] 9 day
of May 1945 [illegible] 11^{01} [illegible]
the 12 day of May 1945, as D. R.
No. 5177 GM

R Murphy
GP Registrar.

CANCELLED

170-P-78

170

LAND TITLES ACT, Sec. 52.—The land mentioned in any certificate of title granted under this Act shall by implication and without any special mention therein, unless the contrary is expressly declared, be subject to—
(a) Any subsisting reservations or exceptions contained in the original grant of the land from the Crown;
(b) All unpaid taxes, including irrigation or drainage district rates;
(c) Any public highway or right-of-way or other public easement, howsoever created upon, over or in respect of the land;
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the same;
(e) Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
(f) Any right of expropriation which may by statute or ordinance be vested in any person, body corporate, or His Majesty;
(g) Any right-of-way or other easement granted or acquired under the provisions of any Act or law in force in the Province.

M

GOVERNMENT OF THE PROVINCE OF ALBERTA

Issued on instrument registered at 10.30 o'clock A m on the 15 day of JULY A.D. 19 33
Number 6521 Book EK Folio 204
Registrar N.A.L.R.D.

Certificate of Title.

North Alberta Land Registration District.

Assce Fund Value $425 Unearned Inc Value $425 Refer Cert No. 184-U-24

This is to Certify that THE CITY OF EDMONTON IN THE PROVINCE OF ALBERTA DOMINION OF CANADA

is now the owner of an estate in fee simple

of and in ALL THAT PORTION OF LOT SIX (6) IN BLOCK ONE (1) IN RIVER LOT TWENTY (20) SUBDIVISION OF THE CITY OF EDMONTON ON RECORD IN THE LAND TITLES OFFICE FOR THIS LAND REGISTRATION DISTRICT AS PLAN XXXVII.A, DESCRIBED AS FOLLOWS:-

COMMENCING AT THE NORTH WEST CORNER OF SAID LOT; THENCE SOUTH EASTERLY ALONG THE NORTHERLY BOUNDARY THREE HUNDRED AND SIXTY FOUR AND NINE TENTHS (364.9) FEET TO THE NORTH EAST CORNER OF SAID LOT; THENCE SOUTHERLY ALONG THE EASTERN BOUNDARY SIXTY TWO AND FOUR TENTHS (62.4) FEET TO THE SOUTH EAST CORNER OF SAID LOT; THENCE WESTERLY ALONG THE SOUTHERLY BOUNDARY TWO HUNDRED AND SIX AND TWENTY FIVE HUNDREDTHS (206.25) FEET TO A POINT; THENCE WESTERLY IN A STRAIGHT LINE TO A POINT ON THE WESTERN BOUNDARY OF SAID LOT; ONE HUNDRED AND TWELVE (112) FEET FROM THE SAID NORTH WEST CORNER; THENCE NORTHERLY ALONG THE WESTERN BOUNDARY TO THE POINT OF COMMENCEMENT.

(M)

TITLE CANCELLED In full under renewal on this 17 day of May 1976 J.C. Knowles A. D. Registrar MS

TITLE CANCELLED In full under renewal on this 11 day of Jan. 1978 J.A. Knowles A. D. Registrar JG

M Ex M & M

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof I have hereunto subscribed my name and affixed my official seal this FIFTEENTH day of JULY A.D. 19 33

[signature] Registrar
North Alberta Land Registration District.

(K)

P.O. Address EDMONTON, ALTA.

The title of Alcan land (# 14,742.28) is subject to a MECHANIC'S LIEN filed by Bertram G. Powell et al ... 18 ... 1:30 ... day of Feb 49 ... 3089 HG
[signature] Registrar

The title of Within + other land
is subject to an Easement in favor
of The City of Edmonton
dated the 7 day of Feb 1968
Registered at 11:56 A.M., the 14 day of
Feb 1968 as D. D. No. 7441 P.G.

Registrar.

M

M

LAND TITLE CERTIFICATE

B

LINC	SHORT LEGAL	TITLE NUMBER
0028 934 959	EDMONTO;;20	012 225 219 +1

LEGAL DESCRIPTION

EDMONTON SETTLEMENT
ALL THAT PORTION OF RIVER LOT TWENTY (20) DESCRIBED AS FOLLOWS
COMMENCING AT THE SOUTH EAST CORNER OF THAT PARCEL OF LAND OWNED BY
ELIZABETH J. IRWIN AND DESCRIBED IN CERTIFICATE OF TITLE NO. 162Q2
THENCE NORTH NINETEEN (19) DEGREES SEVEN (7) MINUTES EAST THREE (3) CHAINS
AND TWENTY FOUR (24) LINKS, THENCE NORTH SIXTY EIGHT (68) DEGREES
NINETEEN (19) MINUTES WEST TWO (2) CHAINS AND FIFTY THREE AND ONE HALF
(53 1/2) LINKS, THENCE NORTH TWENTY NINE (29) DEGREES FIFTY EIGHT (58)
MINUTES EAST, TWO (2) CHAINS AND SIXTEEN AND ONE HALF (16 1/2) LINKS
THENCE NORTH TWENTY FIVE (25) DEGREES SEVENTEEN (17) MINUTES EAST, TWO
(2) CHAINS AND SEVENTY FIVE (75) LINKS, THENCE NORTH SEVENTY FOUR (74)
DEGREES FORTY ONE (41) MINUTES WEST, THREE (3) CHAINS TWELVE AND ONE HALF
(12 1/2) LINKS, THENCE SOUTH EIGHT (8) DEGREES TWENTY SEVEN (27) MINUTES
WEST, THREE (3) CHAINS AND FORTY FOUR AND ONE HALF (44 1/2) LINKS, THENCE
SOUTH FIFTY ONE (51) DEGREES FIFTY (50) MINUTES EAST, EIGHTY SIX (86)
LINKS, THENCE SOUTH THIRTY NINE (39) DEGREES NINE (9) MINUTES WEST
SEVENTY TWO (72) LINKS, THENCE SOUTH ZERO (0) DEGREES TWELVE (12) MINUTES
EAST, THREE (3) CHAINS AND TWENTY EIGHT AND ONE HALF (28 1/2) LINKS
THENCE SOUTH SIXTY (60) DEGREES TWENTY FOUR (24) MINUTES EAST, TWO (2)
CHAINS AND SEVENTY ONE (71) LINKS TO THE POINT OF COMMENCEMENT
EXCEPTING THEREOUT: A ROADWAY TWENTY FIVE (25) LINKS IN WIDTH ADJOINING
ON THE EASTERLY SIDE OF THE LAST TWO (2) ABOVE MENTIONED COURSES AS SHOWN
ON A SKETCH ATTACHED TO DB3078I

ATS REFERENCE: 4;24;53;20;RL
ESTATE: FEE SIMPLE

MUNICIPALITY: CITY OF EDMONTON

REFERENCE NUMBER: 72H206

REGISTERED OWNER(S)

REGISTRATION	DATE(DMY)	DOCUMENT TYPE	VALUE	CONSIDERATION
012 225 219	26/07/2001	AMENDMENT-LEGAL DESCRIPTION		

OWNERS

(CONTINUED)

THE CITY OF EDMONTON.
OF #1 SIR WINSTON CHURCHILL SQUARE, EDMONTON
ALBERTA T5J 2R7

ENCUMBRANCES, LIENS & INTERESTS

REGISTRATION NUMBER	DATE (D/M/Y)	PARTICULARS
7411PG	14/02/1968	UTILITY RIGHT OF WAY GRANTEE - EPCOR WATER SERVICES INC. (DATA UPDATED BY: TRANSFER OF UTILITY RIGHT OF WAY 202122324)

TOTAL INSTRUMENTS: 001

THE REGISTRAR OF TITLES CERTIFIES THIS TO BE AN ACCURATE REPRODUCTION OF THE CERTIFICATE OF TITLE REPRESENTED HEREIN THIS 16 DAY OF JULY, 2020 AT 01:18 P.M.

ORDER NUMBER: 39717965

CUSTOMER FILE NUMBER:

REGISTRAR OF LAND TITLES

END OF CERTIFICATE

72

LAND TITLES ACT, Sec. 64 —The land mentioned in any certificate of title granted under this Act shall by implication and without any special mention therein, be subject to—
(a) Any subsisting reservations or exceptions including royalties contained in the original grant of the land from the Crown;
(b) All unpaid taxes, including irrigation and drainage district rates;
(c) Any public highway or right-of-way or other public easement, howsoever created upon, over or in respect of the land;
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the same;
(e) Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
(f) Any right of expropriation which may by statute be vested in any person, body corporate, or Her Majesty;
(g) Any right-of-way or other easement granted or acquired under the provisions of any Act or law in force in the Province.

72-H-206

GOVERNMENT OF THE PROVINCE OF ALBERTA

CANCELLED

Issued on instrument registered at 2.47 o'clock
P. m. on the 26 day of MAY
A.D. 19 64
Number 3421 Book N.S. Folio 105
L.A. DUHAMEL
Registrar, N.A.L.R.D.

Certificate of Title

M

26 MAY 1964

Assce. Fund Value $7,000.00

Refer Cert. No. 235-K-203

North Alberta Land Registration District

This is to Certify that THE CITY OF EDMONTON

IN THE PROVINCE OF ALBERTA, CANADA.

is now the owner of an estate in fee simple

of and in ALL THAT PORTION OF RIVER LOT TWENTY (20) IN THE CITY OF EDMONTON, IN THE PROVINCE OF ALBERTA,CANADA, DESCRIBED AS FOLLOWS--

COMMENCING AT THE SOUTH EAST CORNER OF THAT PARCEL OF LAND OWNED BY ELIZABETH J.IRWIN AND DESCRIBED IN CERTIFICATE OF TITLE NO. 162-Q-2, THENCE NORTH NINETEEN (19) DEGREES SEVEN (7) MINUTES EAST THREE (3) CHAINS AND TWENTY FOUR (24) LINKS, THENCE NORTH SIXTY EIGHT (68) DEGREES NINETEEN (19) MINUTES WEST TWO (2) CHAINS AND FIFTY THREE AND ONE HALF (53 1/2) LINKS, THENCE NORTH TWENTY NINE (29) DEGREES FIFTY EIGHT (58) MINUTES EAST, TWO (2) CHAINS AND SIXTEEN AND ONE HALF (16 1/2) LINKS, THENCE NORTH TWENTY FIVE (25) DEGREES SEVENTEEN (17) MINUTES EAST, TWO (2) CHAINS AND SEVENTY FIVE (75) LINKS, THENCE NORTH SEVENTY FOUR (74) DEGREES FORTY ONE (41) MINUTES WEST, THREE (3) CHAINS TWELVE AND ONE HALF (12 1/2) LINKS, THENCE SOUTH EIGHT (8) DEGREES TWENTY SEVEN (27) MINUTES WEST, THREE (3) CHAINS AND FORTY FOUR AND ONE HALF (44 1/2) LINKS, THENCE SOUTH FIFTY ONE (51) DEGREES FIFTY (50) MINUTES EAST, EIGHTY SIX (86) LINKS,THENCE SOUTH THIRTY NINE (39) DEGREES NINE (9) MINUTES WEST, SEVENTY TWO (72) LINKS, THENCE SOUTH ZERO (0) DEGREES TWELVE (12) MINUTES EAST, THREE (3) CHAINS AND TWENTY EIGHT AND ONE HALF (28 1/2) LINKS, THENCE SOUTH SIXTY (60) DEGREES TWENTY FOUR (24) MINUTES EAST, TWO (2) CHAINS AND SEVENTY ONE (71) LINKS TO THE POINT OF COMMENCEMENT.

EXCEPTING THEREOUT---A ROADWAY TWENTY FIVE (25) LINKS IN WIDTH ADJOINING ON THE EASTERLY SIDE OF THE LAST TWO (2) ABOVE MENTIONED COURSES AS SHOWN ON A SKETCH ATTACHED TO D.B.3078 I.

THE LAND HEREBY DESCRIBED CONTAINING ONE AND EIGHTY FIVE HUNDREDTHS (1.85) ACRES MORE OR LESS.

TITLE CANCELLED No Under Renewal
In Full
on this 28 day of Aug 1979
WITHOUT DCT A.D. Registrar WL

M

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof I have hereunto subscribed my name and affixed my official seal this TWENTY SIXTH day of MAY A.D. 19 64

RSR

Registrar,
North Alberta Land Registration District

P.O. Address EDMONTON,ALBERTA.

CANCELLED

OVER

The title of Within + other land
is subject to an Easement in favor
of The City of Edmonton
dated the 7 day of Feb 1968
Registered at 11:56 A.M., the 14 day of
Feb. 1968 as D. B. No. 7411.P.G.

[signature]
Registrar.

CEL

RESTRICTED DEVELOPMENT AREA
REG. NO. 782027572 8-FEB-78
SUBJECT TO A RESTRICTED DEVELOPMENT
AREA REGULATION

Mkevett

A.D.REG./IMM

M

CANCELLED

235-K-203

LAND TITLES ACT, Sec. 64 —The land mentioned in any certificate of title granted under this Act shall by implication and without any special mention therein, be subject to—
a) Any subsisting reservations or exceptions including royalties contained in the original grant of the land from the Crown;
(b) All unpaid taxes, including irrigation and drainage district rates;
(c) Any public highway or right-of-way or other public easement, howsoever created upon, over or in respect of the land;
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the same;
(e) Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
(f) Any right of expropriation which may by statute be vested in any person, body corporate, or Her Majesty;
(g) Any right-of-way or other easement granted or acquired under the provisions of any Act or law in force in the Province.

Government of the Province of Alberta

Issued on payment registe. J at 10.52 o'clock A. m. on the 23 day of DEC. A.D. 19 63

Number 7278 Book N.H. Folio 225

L.A. DUHAMEL
Registrar, N.A.L.R.D.

Certificate of Title

Assce. Fund Value $7,000.00 *Refer Cert. No.* 162-N-201

31 DEC 1963

North Alberta Land Registration District.

This is to Certify *that* SYLVESTER C. SCHMIDT

OF MARYSVILLE, IN THE STATE OF KANSAS, ONE OF THE UNITED STATES OF AMERICA.

COMMITTEE OF THE ESTATE OF ANN MARTIN KEY

is now the owner of an estate in fee simple

of and in ALL THAT PORTION OF RIVER LOT TWENTY (20) IN THE CITY OF EDMONTON, IN THE PROVINCE OF ALBERTA, CANADA, DESCRIBED AS FOLLOWS;--

COMMENCING AT THE SOUTH EAST CORNER OF THAT PARCEL OF LAND OWNED BY ELIZABETH J. IRWIN AND DESCRIBED IN CERTIFICATE OF TITLE NO. 162-Q-2, THENCE NORTH NINETEEN (19) DEGREES SEVEN (7) MINUTES EAST THREE (3) CHAINS AND TWENTY FOUR (24) LINKS, THENCE NORTH SIXTY EIGHT (68) DEGREES NINETEEN (19) MINUTES WEST TWO (2) CHAINS AND FIFTY THREE AND ONE HALF (53 1/2) LINKS, THENCE NORTH TWENTY NINE (29) DEGREES FIFTY EIGHT (58) MINUTES EAST, TWO (2) CHAINS AND SIXTEEN AND ONE HALF (16 1/2) LINKS, THENCE NORTH TWENTY FIVE (25) DEGREES SEVENTEEN (17) MINUTES EAST, TWO (2) CHAINS AND SEVENTY FIVE (75) LINKS, THENCE NORTH SEVENTY FOUR (74) DEGREES FORTY ONE (41) MINUTES WEST, THREE (3) CHAINS TWELVE AND ONE HALF (12 1/2) LINKS, THENCE SOUTH EIGHT (8) DEGREES TWENTY SEVEN (27) MINUTES WEST, THREE (3) CHAINS AND FORTY FOUR AND ONE HALF (44 1/2) LINKS, THENCE SOUTH FIFTY ONE (51) DEGREES FIFTY (50) MINUTES EAST, EIGHTY SIX (86) LINKS, THENCE SOUTH THIRTY NINE (39) DEGREES NINE (9) MINUTES WEST, SEVENTY TWO (72) LINKS, THENCE SOUTH ZERO (0) DEGREES TWELVE (12) MINUTES EAST, THREE (3) CHAINS AND [illegible] EIGHT AND ONE HALF (28 1/2) LINKS, THENCE SOUTH SIXTY (60) DEGREES TWENTY FOUR (24) MINUTES EAST, TWO (2) CHAINS AND SEVENTY ONE (71) LINKS TO THE POINT OF COMMENCEMENT.

EXCEPTING THEREOUT-- A ROADWAY TWENTY FIVE (25) LINKS IN WIDTH ADJOINING ON THE EASTERLY SIDE OF THE LAST TWO (2) ABOVE MENTIONED COURSES AS SHOWN ON A SKETCH ATTACHED TO D.B. 3078 I.

THE LAND HEREBY DESCRIBED CONTAINING ONE AND EIGHTY FIVE HUNDREDTHS ([illegible]) ACRES MORE OR LESS.

CANCELLED

THIS CERTIFICATE OF TITLE IS CANCELLED IN ACCORDANCE WITH THE TRANSFER SUBJECT TO ANY [illegible] RESERVATIONS [illegible] CT TITLE NO. 72-H-206 [illegible] THIS 26 DAY OF May 1964 TO The City of Edmonton DB 3421 NS.

A.D. REGISTRAR

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof *I have hereunto subscribed my name and affixed my official seal this* TWENTY THIRD *day of* DECEMBER *A.D. 19* 63.

DT

Registrar

North Alberta Land Registration District

P.O. Address MARYSVILLE, MARSHALL COUNTY, KANSAS, U.S.A.

OVER

162-N-201 CANCELLED

LAND TITLES ACT, Sec. 64 —The land mentioned in any certificate of title granted under this Act shall by implication and without any special mention therein, be subject to—
(a) Any subsisting reservations or exceptions including royalties contained in the original grant of the land from the Crown;
(b) All unpaid taxes, including irrigation and drainage district rates;
(c) Any public highway or right-of-way or other public easement, howsoever created upon, over or in respect of the land;
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the same;
(e) Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
(f) Any right of expropriation which may by statute be vested in any person, body corporate, or Her Majesty;
(g) Any right-of-way or other easement granted or acquired under the provisions of any Act or law in force in the Province.

GOVERNMENT OF THE PROVINCE OF ALBERTA

Issued on instrument registered at 12.30 o'clock P m. on the 11 day of SEPTEMBER A.D. 19 63
Number 7217 Book NF Folio 222
L. A. DUHAMEL
Registrar, N.A.L.R.D.

162

Certificate of Title

35-J-201
40-J-201

Assce. Fund Value $3033.00 Refer Cert. No. 146-E-67

North Alberta Land Registration District

13 SEP 1963

This is to Certify that ANN MARTIN KEY,

OF MARYSVILLE, IN THE STATE OF KANSAS, ONE OF THE UNITED STATESOF MERICA.

CANCELLED

is now the owner of an estate in fee simple

of and in A.. THAT PORTION OF RIVER LOT TWENTY (20) SUBDIVISION OF THE CITY OF EDMONTON IN THE PROVINCE OF ALBERTA, CANADA, DESCRIBED AS FOLLOWS--- COMMENCING AT THE SOUTH EAST CORNER OF THAT PARCEL OF LAND OWNED BY ELIZABETH J. IRWIN AND DESCRIBED IN CERTIFICATE OF TITLE NO. 162-Q-2, THENCE NORTH NINETEEN (19) DEGREES SEVEN (7) MINUTES EAST THREE (3) CHAINS AND TWENTY FOUR (24) LINKS, THENCE NORTH SIXTY EIGHT (68) DEGREES NINETEEN (19) MINUTES WEST TWO (2) CHAINS AND FIFTY THREE AND ONE HALF (53 1/2) LINKS, THENCE NORTH TWENTY NINE (29) DEGREES FIFTY EIGHT (58) MINUTES EAST, TWO (2) CHAINS AND SIXTEEN AND ONE HALF (16 1/2) LINKS, THENCE NORTH TWENTY FIVE (25) DEGREES SEVENTEEN (17) MINUTES EAST, TWO (2) CHAINS AND SEVENTY FIVE (75) LINKS, THENCE NORTH SEVENTY FOUR (74) DEGREES FORTY ONE (41) MINUTES WEST, THREE (3) CHAINS TWELVE AND ONE HALF (12 1/2) LINKS, THENCE SOUTH EIGHT (8) DEGREES TWENTY SEVEN (27) MINUTES WEST, THREE (3) CHAINS AND FORTY FOUR AND ONE HALF (44 1/2) LINKS, THENCE SOUTH FIFTY ONE (51) DEGREES FIFTY (50) MINUTES EAST, EIGHTY SIX (86) LINKS, THENCE SOUTH THIRTY NINE (39) DEGREES NINE (9) MINUTES WEST, SEVENTY TWO (72) LINKS, THENCE SOUTH ZERO (0) DEGREES TWELVE (12) MINUTES EAST, THREE (3) CHAINS AND TWENTY EIGHT AND ONE HALF (28 1/2) LINKS, THENCE SOUTH SIXTY (60) DEGREES TWENTY FOUR (24) MINUTES EAST, TWO (2) CHAINS AND SEVENTY ONE (71) LINKS TO THE POINT OF COMMENCEMENT, EXCEPTING THEREOUT -- A ROADWAY TWENTY FIVE (25) LINKS IN WIDTH ADJOINING ON THE EASTERLY SIDE THE LAST TWO (2) ABOVE MENTIONED COURSES AS SHOWN ON A SKETCH ATTACHED TO D.B. 3078 I, THE SAID PARCEL OF LAND CONTAINING AN AREA OF ONE AND EIGHTY FIVE HUNDREDTHS (1.85) ACRES MORE OR LESS.

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof I have hereunto subscribed my name and affixed my official seal this ELEVENTH day of SEPTEMBER A.D. 19 63

CANCELLED

GF

THIS CERTIFICATE OF TITLE IS CANCELLED
In full Under Judges' Order.
IN ACCORDANCE WITH THE TRANSFER SUBJECT TO ANY EXCEPTIONS AND/OR RESERVATIONS THEREIN AND A NEW CERTIFICATE OF TITLE NO. 234 to 236-K-203
ISSUED THIS 23 DAY OF Dec 19 63
TO Sylvester G. Schmidt
DB 7278 NH
A.D. REGISTRAR

Registrar, North Alberta Land Registration District

R.F.D. MARYSVILLE,
P.O. Address MARSHALL COUNTY, KANSAS, U.S.A.

OVER

LAND TITLES ACT, Sec. 64 —The land mentioned in any certificate of title granted under this Act shall by implication and without any special mention therein, be subject to—

a) Any subsisting reservations or exceptions including royalties contained in the original grant of the land from the Crown;
(b) All unpaid taxes, including irrigation and drainage district rates;
(c) Any public highway or right-of-way or other public easement, howsoever created upon, over or in respect of the land;
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the same;
(e) Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
(f) Any right of expropriation which may by statute be vested in any person, body corporate, or His Majesty;
(g) Any right-of-way or other easement granted or acquired under the provisions of any Act or law in force in the Province.

40-J-201

GOVERNMENT OF THE PROVINCE OF ALBERTA

CANCELLED

Issued on instrument registered at 12.40 o'clock P m. on the 29 day of AUG. A.D. 19 63 Number 5248 Book N.G. Folio 161

L.A. DUHAMEL
Registrar, N.A.L.R.D.

40

Certificate of Title

Assce. Fund Value $1500.00 *Refer Cert. No.* 36-J-201

North Alberta Land Registration District.

This is to Certify *that* ANN MARTIN KEY,

OF MARYSVILLE, IN THE STATE OF KANSAS, ONE OF THE UNITED STATES OF AMERICA

CANCELLED

is now the owner of an estate in fee simple AS TO AN UNDIVIDED ONE-HALF (1/2) INTEREST.

of and in ALL THAT PORTION OF RIVER LOT TWENTY (20) SUBDIVISION OF THE CITY OF EDMONTON IN THE PROVINCE OF ALBERTA, CANADA, DESCRIBED AS FOLLOWS--COMMENCING AT THE SOUTH EAST CORNER OF THAT PARCEL OF LAND OWNED BY ELIZABETH J. IRWIN AND DESCRIBED IN CERTIFICATE OF TITLE NO. 162-Q-2, THENCE NORTH NINETEEN (19) DEGREES SEVEN (7) MINUTES EAST THREE (3) CHAINS AND TWENTY FOUR (24) LINKS, THENCE NORTH SIXTY EIGHT (68) DEGREES NINETEEN (19) MINUTES WEST, TWO (2) CHAINS AND FIFTY THREE AND ONE HALF (53 1/2) LINKS, THENCE NORTH TWENTY NINE (29) DEGREES FIFTY EIGHT (58) MINUTES EAST, TWO (2) CHAINS AND SIXTEEN AND ONE HALF (16 1/2) LINKS, THENCE NORTH TWENTY FIVE (25) DEGREES SEVENTEEN (17) MINUTES EAST, TWO (2) CHAINS AND SEVENTY FIVE (75) LINKS, THENCE NORTH SEVENTY FOUR (74) DEGREES FORTY ONE (41) MINUTES WEST, THREE (3) CHAINS TWELVE AND ONE HALF (12 1/2) LINKS, THENCE SOUTH EIGHT (8) DEGREES TWENTY SEVEN (27) MINUTES WEST, THREE (3) CHAINS AND FORTY FOUR AND ONE HALF (44 1/2) LINKS, THENCE SOUTH FIFTY ONE (51) DEGREES FIFTY (50) MINUTES EAST, EIGHTY SIX (86) LINKS, THENCE SOUTH THIRTY NINE (39) DEGREES NINE (9) MINUTES WEST, SEVENTY TWO (72) LINKS, THENCE SOUTH ZERO (0) DEGREES TWELVE (12) MINUTES EAST, THREE (3) CHAINS AND TWENTY EIGHT AND ONE HALF (28 1/2) LINKS, THENCE SOUTH SIXTY (60) DEGREES TWENTY-FOUR (24) MINUTES EAST, TWO (2) CHAINS AND SEVENTY ONE (71) LINKS TO THE POINT OF COMMENCEMENT, EXCEPTING THEREOUT,-- A ROADWAY TWENTY FIVE (25) LINKS IN WIDTH ADJOINING ON THE EASTERLY SIDE THE LAST TWO (2) ABOVE MENTIONED COURSES AS SHOWN ON A SKETCH ATTACHED TO D.B. 3078 I, THE SAID PARCEL OF LAND CONTAINING AN AREA OF ONE AND EIGHTY FIVE HUNDREDTHS (1.85) ACRES MORE OR LESS.

THIS CERTIFICATE OF TITLE IS CANCELLED

In full under consolidation

IN ACCORDANCE WITH THE TRANSFER SUBJECT TO ANY EXCEPTIONS AND RESERVATIONS THEREIN AND A NEW CERTIFICATE OF TITLE NO. 161 & 163 N-201

ISSUED THIS 11 DAY OF Sept. 1963

TO Self

DR 7217 NE

REGISTRAR

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof *I have hereunto subscribed my name and affixed my official seal this* TWENTY NINTH *day of* AUGUST *A.D. 19* 63

RK

Registrar

P.O. Address R.F.D. MARYSVILLE, MARSHALL COUNTY, KANSAS, U.S.A.

North Alberta Land Registration District

NO ENDORSEMENTS

(OVER)

36-J-201

LAND TITLES ACT, Sec. 64 —The land mentioned in any certificate of title granted under this Act shall by implication and without any special mention therein be subject to—
a) Any subsisting reservations or exceptions including royalties contained in the original grant of the land from the Crown;
(b) All unpaid taxes, including irrigation and drainage district rates,
(c) Any public highway or right-of-way or other public easement, howsoever created upon, over or in respect of the land;
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the same;
(e) Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
(f) Any right of expropriation which may by statute be vested in any person, body corporate, or Her Majesty;
(g) Any right-of-way or other easement granted or acquired under the provisions of any Act or law in force in the Province.

GOVERNMENT OF THE PROVINCE OF ALBERTA

Issued on instrument registered at 12.36 o'clock P m. on the 29 day of AUG. A.D. 19 63
Number 5246 Book N.G. Folio 161
L.A. DUHAMEL
Registrar, N.A.L.R.D.

36

Certificate of Title

35-J-201

Assce. Fund Value $1033.00 TRANSMISSION Refer Cert. No. 146-E-67

North Alberta Land Registration District

This is to Certify that MONTREAL TRUST COMPANY

ADMINISTRATOR OF THE ESTATE OF JOSEPH KEY, (DECEASED)

is now the owner of an estate in fee simple AS TO AN UNDIVIDED ONE-HALF (1/2) INTEREST.

of and in ALL THAT PORTION OF RIVER LOT TWENTY (20) SUBDIVISION OF THE CITY OF EDMONTON IN THE PROVINCE OF ALBERTA, CANADA, DESCRIBED AS FOLLOWS,-- COMMENCING AT THE SOUTH EAST CORNER OF THAT PARCEL OF LAND OWNED BY ELIZABETH J. IRWIN AND DESCRIBED IN CERTIFICATE OF TITLE NO. 162-Q-2, THENCE NORTH NINETEEN (19) DEGREES SEVEN (7) MINUTES EAST THREE(3) CHAINSAND TWENTY-FOUR (24) LINKS, THENCE NORTH SIXTY EIGHT (68) DEGREES NINETEEN (19) MINUTES WEST TWO (2) CHAINS AND FIFTY THREE AND ONE-HALF (53 1/2) LINKS, THENCE NORTH TWENTY NINE (29) DEGREES FIFTY EIGHT (58) MINUTES EAST, TWO (2) CHAINS AND SIXTEEN AND ONE HALF (16 1/2) LINKS, THENCE NORTH TWENTY FIVE (25) DEGREES, SEVENTEEN (17) MINUTES EAST, TWO (2) CHAINS AND SEVENTY FIVE (75) LINKS, THENCE NORTH SEVENTY FOUR (74) DEGREES FORTY ONE (41) MINUTES WEST, THREE (3) CHAINS TWELVE AND ONE HALF (12 1/2) LINKS, THENCE SOUTH EIGHT (8) DEGREES TWENTY SEVEN (27) MINUTES WEST, THREE (3) CHAINS AND FORTY FOUR AND ONE HALF (44 1/2) LINKS, THENCE SOUTH FIFTY ONE (51) DEGREES FIFTY (50) MINUTES EAST EIGHTY SIX (86) LINKS, THENCE SOUTH THIRTY NINE (39) DEGREES NINE (9) MINUTES WEST, SEVENTY TWO (72) LINKS, THENCE SOUTH ZERO (0) DEGREES TWELVE (12) MINUTES EAST, THREE (3) CHAINS AND TWENTY EIGHT AND ONE HALF (28 1/2) LINKS, THENCE SOUTH SIXTY (60) DEGREES TWENTY-FOUR (24) MINUTES EAST, TWO (2) CHAINS AND SEVENTY ONE (71) LINKS TO THE POINT OF COMMENCEMENT, EXCEPTING THEREOUT,-- A ROADWAY TWENTY FIVE (25) LINKS IN WIDTH ADJOINING ON THE EASTERLY SIDE THE LAST TWO (2) ABOVE MENTIONED COURSES AS SHOWN ON A SKETCH ATTACHED TO D.B. 3078 I, THE SAID PARCEL OF LAND CONTAINING AN AREA OF ONE AND EIGHTY FIVE HUNDREDTHS (1.85) ACRES MORE OR LESS.

IN FULL

40-J-201
29 AUG. 63
ANN MARTIN KEY
5248 N.G. (E. NAHIRNAK)

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof I have hereunto subscribed my name and affixed my official seal this TWENTY NINTH day of AUGUST A.D. 19 63

RK

Registrar

P.O. Address EDMONTON, ALBERTA. North Alberta Land Registration District

NO ENDORSEMENTS ON BACK OF TITLE

OVER

CANCELLED

35-J-201

LAND TITLES ACT, Sec. 64 —The land mentioned in any certificate of title granted under this Act shall by implication and without any special mention therein, be subject to—
(a) Any subsisting reservations or exceptions including royalties contained in the original grant of the land from the Crown;
(b) All unpaid taxes, including irrigation and drainage district rates;
(c) Any public highway or right-of-way or other public easement, howsoever created upon, over or in respect of the land;
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the same;
(e) Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
(f) Any right of expropriation which may by statute be vested in any person, body corporate, or His Majesty;
(g) Any right-of-way or other easement granted or acquired under the provisions of any Act or law in force in the Province.

GOVERNMENT OF THE PROVINCE OF ALBERTA

Issued on instrument registered at 12.34 o'clock P m on the 29 day of AUGUST A.D. 19 63
Number 5245. Book N.G. Folio 161
L.A. DUHAMEL
Registrar, N.A.L.R.O.

35

Certificate of Title

Assoc. Fund Value $1000.00 Refer Cert. No. 32-J-201

North Alberta Land Registration District.

This is to Certify that JOSEPH KEY AND ANN MARTIN KEY, BOTH OF MARYSVILLE, IN THE STATE OF KANSAS, ONE OF THE UNITED STATES OF AMERICA

CANCELLED

is now the owner of an estate in fee simple AS TO EACH AN UNDIVIDED ONE-SIXTH (1/6) INTEREST

of and in ALL THAT PORTION OF RIVER LOT TWENTY (20) SUBDIVISION OF THE CITY OF EDMONTON, IN THE PROVINCE OF ALBERTA, CANADA, DESCRIBED AS FOLLOWS,--- COMMENCING AT THE SOUTH EAST CORNER OF THAT PARCEL OF LAND OWNED BY ELIZABETH J. IRWIN AND DESCRIBED IN CERTIFICATE OF TITLE NO. 162-Q-2, THENCE NORTH NINETEEN (19) DEGREES SEVEN (7) MINUTES EAST THREE (3) CHAINS AND TWENTY FOUR (24) LINKS, THENCE NORTH SIXTY EIGHT (68) DEGREES NINETEEN (19) MINUTES WEST TWO (2) CHAINS AND FIFTY THREE AND ONE-HALF (53 1/2) LINKS, THENCE NORTH TWENTY NINE (29) DEGREES FIFTY EIGHT (58) MINUTES EAST, TWO (2) CHAINS AND SIXTEEN AND ONE HALF (16 1/2) LINKS, THENCE NORTH TWENTY FIVE (25) DEGREES, SEVENTEEN (17) MINUTES EAST, TWO (2) CHAINS AND SEVENTY FIVE (75) LINKS, THENCE NORTH SEVENTY FOUR (74) DEGREES FORTY ONE (41) MINUTES WEST, THREE (3) CHAINS TWELVE AND ONE HALF (12 1/2) LINKS, THENCE SOUTH EIGHT (8) DEGREES TWENTY SEVEN (27) MINUTES WEST, THREE (3) CHAINS AND FORTY FOUR AND ONE HALF (44 1/2) LINKS, THENCE SOUTH FIFTY ONE (51) DEGREES FIFTY (50) MINUTES EAST EIGHTY SIX (86) LINKS, THENCE SOUTH THIRTY NINE (39) DEGREES NINE (9) MINUTES WEST, SEVENTY TWO (72) LINKS, THENCE SOUTH ZERO (0) DEGREES TWELVE (12) MINUTES EAST, THREE (3) CHAINS AND TWENTY EIGHT AND ONE HALF (28 1/2) LINKS, THENCE SOUTH SIXTY (60) DEGREES TWENTY FOUR (24) MINUTES EAST, TWO (2) CHAINS AND SEVENTY ONE (71) LINKS TO THE POINT OF COMMENCEMENT, EXCEPTING THEREOUT:-- A ROADWAY TWENTY FIVE (25) LINKS IN WIDTH ADJOINING ON THE EASTERLY SIDE THE LAST TWO (2) ABOVE MENTIONED COURSES AS SHOWN ON A SKETCH ATTACHED TO D.B. 1078 T, THE SAID PARCEL OF LAND CONTAINING AN AREA OF ONE AND EIGHTY FIVE HUNDREDTHS (1.85) ACRES MORE OR LESS.

THIS CERTIFICATE OF TITLE IS CANCELLED
as to interest of Ann Martin Key
under consolidation
and in full
IN ACCORDANCE WITH THE TRANSFER SUBJECT TO ANY EXCEPTIONS AND RESERVATIONS THEREIN AND A NEW CERTIFICATE OF TITLE NO 161 to 163 N201
ISSUED THIS 11 DAY OF Sept. 1963
TO Self
DB 7217 N.E.
REGISTRAR

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof I have hereunto subscribed my name and affixed my official seal this TWENTY NINTH day of AUGUST A.D. 19 63

FC

Registrar,
North Alberta Land Registration District

P.O. Address MARSHALL COUNTY, R.F.D. MARYSVILLE, KANSAS, U.S.A.

OVER

THIS CERTIFICATE OF TITLE IS CANCELLED

AS TO THE INTEREST

OF JOSEPH KEY UNDER

TRANSMISSION

IN ACCORDANCE WITH THE TRANSFER SUBJECT TO ANY EXCEPTIONS AND/OR RESERVATIONS THEREIN AND A NEW CERTIFICATE OF TITLE NO. 36-J-201

ISSUED THIS 29 DAY OF AUGUST 19 63

TO MONTREAL TRUST COMPANY

DB 5246 N.G. E.NAHIRNAK

AD REGISTRAR

32-J-201

LAND TITLES ACT, Sec. 64 —The land mentioned in any certificate of title granted under this Act shall by implication and without any special mention therein, be subject to—
a) Any subsisting reservations or exceptions including royalties contained in the original grant of the land from the Crown;
(b) All unpaid taxes, including irrigation and drainage district rates;
(c) Any public highway or right-of-way or other public easement, howsoever created upon, over or in respect of the land;
(d) Any subsisting lease or agreement for a lease for a period not exceeding three years, where there is actual occupation of the land under the same;
(e) Any decrees, orders or executions against or affecting the interest of the owner of the land which have been registered and maintained in force against the owner;
(f) Any right of expropriation which may by statute be vested in any person, body corporate, or Her Majesty;
(g) Any right-of-way or other easement granted or acquired under the provisions of any Act or law in force in the Province.

GOVERNMENT OF THE PROVINCE OF ALBERTA

Issued on instrument registered at 12.28 o'clock P m. on the 29 day of AUGUST A.D. 19 63 Number 5242 Book N.G. Folio 161
L.A. DUHAMEL
Registrar, N.A.L.R.D.

32

Certificate of Title

Assoc. Fund Value $533.00

TRANSMISSION

Refer Cert. No. 146-E-67

North Alberta Land Registration District

This is to Certify that MONTREAL TRUST COMPANY ADMINISTRATOR OF THE ESTATE OF MARY ELIZABETH KEY (DECEASED)

is now the owner of an estate in fee simple AS TO AN UNDIVIDED ONE-THIRD (1/3) INTEREST

of and in ALL THAT PORTION OF RIVER LOT TWENTY (20) SUBDIVISION OF THE CITY OF EDMONTON IN THE PROVINCE OF ALBERTA, CANADA, DESCRIBED AS FOLLOWS,--- COMMENCING AT THE SOUTH EAST CORNER OF THAT PARCEL OF LAND OWNED BY ELIZABETH J. IRWIN AND DESCRIBED IN CERTIFICATE OF TITLE NO. 162-Q-2, THENCE NORTH NINETEEN (19) DEGREES SEVEN (7) MINUTES EAST THREE (3) CHAINS AND TWENTY FOUR (24) LINKS, THENCE NORTH SIXTY EIGHT (68) DEGREES NINETEEN (19) MINUTES WEST TWO (2) CHAINS AND FIFTY THREE AND ONE-HALF (53 1/2) LINKS, THENCE NORTH TWENTY NINE (29) DEGREES FIFTY EIGHT (58) MINUTES EAST, TWO (2) CHAINS AND SIXTEEN AND ONE HALF (16 1/2) LINKS, THENCE NORTH TWENTY FIVE (25) DEGREES, SEVENTEEN (17) MINUTES EAST, TWO (2) CHAINS AND SEVENTY FIVE (75) LINKS, THENCE NORTH SEVENTY FOUR (74) DEGREES FORTY ONE (41) MINUTES WEST, THREE (3) CHAINS TWELVE AND ONE HALF (12 1/2) LINKS, THENCE SOUTH EIGHT (8) DEGREES TWENTY SEVEN (27) MINUTES WEST, THREE (3) CHAINS AND FORTY FOUR AND ONE HALF (44 1/2) LINKS, THENCE SOUTH FIFTY ONE (51) DEGREES FIFTY (50) MINUTES EAST EIGHTY SIX (86) LINKS, THENCE SOUTH THIRTY NINE (39) DEGREES NINE (9) MINUTES WEST, SEVENTY TWO (72) LINKS, THENCE SOUTH ZERO (0) DEGREES TWELVE (12) MINUTES EAST, THREE (3) CHAINS AND TWENTY EIGHT AND ONE HALF (28 1/2) LINKS, THENCE SOUTH SIXTY (60) DEGREES TWENTY FOUR (24) MINUTES EAST, TWO (2) CHAINS AND SEVENTY ONE (71) LINKS TO THE POINT OF COMMENCEMENT, EXCEPTING THEREOUT:-- A ROADWAY TWENTY FIVE (25) LINKS IN WIDTH ADJOINING ON THE EASTERLY SIDE THE LAST TWO (2) ABOVE MENTIONED COURSES AS SHOWN ON A SKETCH ATTACHED TO D.B. 3078 I, THE SAID PARCEL OF LAND CONTAINING AN AREA OF ONE AND EIGHTY-FIVE HUNDREDTHS (1.85) ACRES MORE OR LESS.

THIS CERTIFICATE OF TITLE IS CANCELLED IN FULL

IN ACCORDANCE WITH THE TRANSFER SUBJECT TO ANY EXCEPTIONS AND/OR RESERVATIONS THEREIN AND A NEW CERTIFICATE OF TITLE NO. 35-J-201 ISSUED THIS 29 DAY OF AUGUST 19 63 TO JOSEPH KEY ET AL
DB. 5245 N.G. E. NAHIRNAK
ADJ. REGISTRAR

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof I have hereunto subscribed my name and affixed my official seal this TWENTY NINTH day of AUGUST A.D. 19 63

FC

Registrar

P.O. Address EDMONTON, ALTA.

North Alberta Land Registration District

OVER

NO ENDORSEMENTS ON BACK OF TITLE

F

146-B-67

CANCELLED 146

[illegible]

GOVERNMENT OF THE PROVINCE OF ALBERTA

Issued on instrument registered at 10.46 o'clock A m. on the 6 day of DEC A.D. 192 7. Number 3464 Book D.Q. Folio 111

Registrar N.A.L.R.D.

Certificate of Title.

North Alberta Land Registration District.

Assce. Fund Value $ 1600 Unearned Inc. Value NIL Refer Cert. No. 27-Y-7

This is to Certify that JOSEPH KEY, MARY ELIZABETH KEY AND ANN MARTIN KEY ALL OF MARYSVILLE IN THE STATE OF KANSAS ONE OF THE UNITED STATES OF AMERICA.

is now the owner of an estate in fee simple TO EACH AN UNDIVIDED ONE THIRD(1/3) INTEREST

of and in ALL THAT PORTION OF RIVER LOT TWENTY (20) SUBDIVISION OF THE CITY OF EDMONTON IN THE PROVINCE OF ALBERTA DOMINION OF CANADA DESCRIBED AS FOLLOWS; -- COMMENCING AT THE SOUTH EAST CORNER OF THAT PARCEL OF LAND OWNED BY ELIZABETH J. IRWIN AND DESCRIBED IN CERTIFICATE OF TITLE NO. 162-Q-2; THENCE NORTH NINETEEN DEGREES SEVEN MINUTES EAST (N.19. 07 E) THREE (3) CHAINS TWENTY-FOUR (24) LINKS; THENCE NORTH SIXTY-EIGHT DEGREES NINETEEN MINUTES WEST (N.68.19 W) TWO CHAINS FIFTY-THREE AND ONE HALF LINKS (2.531/2) ⅓ THENCE NORTH TWENTY-NINE DEGREES FIFTY-EIGHT MINUTES EAST (N.29.58 E) TWO CHAINS SIXTEEN AND ONE HALF LINKS (2.16.1/2); THENCE NORTH TWENTY-FIVE DEGREES SEVENTEEN MINUTES EAST (N.25.17 E) TWO CHAINS SEVENTY-FIVE LINKS (2.75) THENCE NORTH SEVENTY-FOUR DEGREES FORTY-ONE MINUTES (N.74.41W) THREE CHAINS TWELVE AND ONE HALF LINKS(3.12.1/2) THENCE SOUTH EIGHT DEGREES TWENTY-SEVEN MINUTES WEST (S8.27.W) THREE CHAINS AND FORTY-FOUR AND ONE HALF LINKS (3.44.1/2) THENCE SOUTH FIFTY ONE DEGREES FIFTY MINUTES EAST (S.51.50.E) EIGHTY-SIX (86) LINKS; THENCE SOUTH THIRTY-NINE DEGREES NINE MINUTES WEST (S.39.9.W) SEVENTY-TWO LINKS (72); THENCE SOUTH TWELVE MINUTES EAST (S.0.12.E) TWO CHAINS TWENTY-EIGHT AND ONE HALF LINKS (2.28.1/2); THENCE SOUTH SIXTY DEGREES TWENTY FOUR MINUTES EAST (S.60.24.E) TWO CHAINS SEVENTY-ONE LINKS (2.71) TO THE POINT OF COMMENCEMENT. EXCEPTING THEREOUT A ROADWAY TWENTY-FIVE (25) LINKS IN WIDTH ADJOINING ON THE EASTERLY SIDE THE LAST TWO (2) ABOVE MENTIONED COURSES AS SHOWN ON A SKETCH ATTACHED TO D.S. 3078 I. THE SAID PARCEL OF LAND CONTAINING AN AREA OF ONE AND EIGHTY-FIVE HUNDREDTHS (1.85) ACRES MORE OR LESS. ~~TOGETHER WITH A RIGHT OF WAY OVER A STRIP OF LAND SIXTEEN AND ONE HALF (16.1/2) FEET IN WIDTH AS SHOWN BY DOTTED LINES UPON THE AFORESAID SKETCH BUT SUBJECT TO SUCH CHANGE AS UPON FURTHER SURVEY SHALL SEEM MOST EXPEDIENT.~~

Corrected this 3 October 1946 [illegible] a.D. Reg.

R. of W. [illegible]

CANCELLED

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

23/8/63

In Witness Whereof I have hereunto subscribed my name and affixed my official seal this SIXTH day of DECEMBER A.D. 192 7.

Registrar, North Alberta Land Registration District.

P.O. Address MARYSVILLE KANSAS USA.

THIS CERTIFICATE OF TITLE IS CANCELLED as to interest of Ann Martin Key under Consolidation and In [illegible] IN ACCORDANCE WITH THE TRANSFER SUBJECT TO ANY EXCEPTIONS AND/OR RESERVATIONS THEREIN AND A NEW CERTIFICATE OF TITLE NO 161 L 142 [illegible] ISSUED THIS 11 DAY OF Sept. 1963 TO Self [illegible] REGISTRAR

OVER

THIS CERTIFICATE OF TITLE IS CANCELLED
[illegible]
Keyunder [illegible]

IN ACCORDANCE WITH THE TRANSFER SUBJECT TO ANY EXCEPTIONS AND/OR RESERVATIONS THEREIN AND A NEW CERTIFICATE OF TITLE NO. 30632 - T-201
ISSUED THIS 29 DAY OF August 1963
TO Montreal Trust Company
DB 5242NG [illegible]
A.D. REGISTRAR

THIS CERTIFICATE OF TITLE IS CANCELLED
as to the interest of Joseph
Keyunder [illegible]

IN ACCORDANCE WITH THE TRANSFER SUBJECT TO ANY EXCEPTIONS AND/OR RESERVATIONS THEREIN AND A NEW CERTIFICATE OF TITLE NO. 36638 - T-201
ISSUED THIS 29 DAY OF August 1963
TO Montreal Trust Company
DB 5246NG [illegible]
A.D. REGISTRAR

For Assessed Value 1913 see Book 3 folio 376 [illegible]

274.I

I certify that the within instrument is duly entered and Registered in the Land Titles Office for the North Alberta Land Registration District at Edmonton in the Province of Alberta at 12 o'clock P. M. on the 20 day of Mar. A. D. 1908 number 2416 Book 76 Fol. 137
Gracey Registrar.
N. A. L. R. D.

CANADA

Certificate of Title.

Refer Cert. No. 219 G.6 + 217 E.6

North Alberta Land Registration District

This is to certify that Sarah Key of Marysville in the County of Marshall in the State of Kansas One of the United States of America, Widow

is now the owner of an estate in fee simple

of and in Firstly Lots numbered Ten (10) Eleven (11) Sixteen (16) and Seventeen (17) in Block One (1) and Lot Thirty seven in Block three according to Plan of River Lot Twenty (20) in the City of Edmonton, in the Province of Alberta in the Dominion of Canada of record in the Land Titles Office for the Land Registration District as Plan XXXVII. Secondly:- The West half of Section Twenty one (21) in Township Fifty three (53) Range Twenty-five (25) West of the Fourth Meridian in the Province of Alberta aforesaid, containing Three hundred and Twenty (320) acres more or less: Excepting thereout all mines and minerals. Thirdly:- All that portion of River Lot Twenty (20) aforesaid described as follows:- Commencing at the South east corner of that parcel of land owned by Elizabeth J. Irwin and described in Certificate of Title No. 162 Q.2 thence North Nineteen degrees seven minutes East (N. 19°, 07' E) Three chains twenty four links (3c - 24); thence North Sixty eight degrees, Nineteen minutes West (N. 68° - 19' W) Two chains, fifty three and one half links (2c - 53½) thence North Twenty-nine degrees fifty eight minutes East (N. 29° - 58' E) Two chains Sixteen and one half links (2c - 16½) thence North Twenty-five degrees Seventeen minutes East (N. 25°, 17' E) Two chains Seventy-five links (2c - 75) thence North Seventy-four degrees forty one minutes West (N. 74° - 41' W) Three chains twelve and one half links (3c - 12½) thence South Eight degrees twenty seven minutes West (S. 8° - 27' W) Three chains forty four and one half links (3c - 44½); thence South Fifty six degrees fifty minutes East (S. 56° - 50' E) Eighty six links (86) thence South Thirty-nine degrees nine minutes West (S. 39° - 09' W) Seventy two links (- 72) thence South Twelve minutes East (S. 0° - 12' E) Two chains twenty eight and one half links (2c - 28½) thence South Sixty degrees Twenty four minutes East (S. 60° - 24' E) Two chains Seventy one links (2c - 71) to the point of commencement, Excepting and reserving thereout a Roadway Twenty five links (- 25) in width adjoining on the easterly side, the last two above mentioned courses as shown on a sketch attached to D. B. No. 3878 I the said parcel of land containing an area of One and Eighty five hundredths (1 85/100) acres more or less together with a Right of Way over a Strip of Land Sixteen and one half (16½) feet in width as shown by dotted lines upon the aforesaid sketch but subject to such changes as upon further survey shall seem most expedient.

Corrected Jan 4th 1917 J. H. Brown Dep. Reg.

subject to the encumbrances, liens and interests notified by memorandum underwritten or endorsed hereon, or which may hereafter be made in the register.

In Witness Whereof I have hereunto subscribed my name and affixed my official seal this twentieth day of March A.D. 1908

Gracey Registrar,

P.O. Address Marysville, Kansas, U.S.A.

North Alberta Land Registration District.

(For M.M. in this ½ see Title 145 E 67)
This Certificate of Title is cancelled
to 297 acres in N.W. ¼ Sec 21-53-25 W4
and a new Certificate of Title (No. 20 J 13 & more) issued this 30 day of Aug A.D., 1910 to Edmonton & Black Lake Ry Co.
Gracey Registrar

This Certificate of Title is canc. in full
and a new C... 6 Dec 7 [illegible]
144-145-146 E 67
Joseph Key et al
546409
P. McLeod

NO ENDORSEMENTS ON BACK OF TITLE

Alberta Safety Codes Authority

A Division of the Safety Codes Council

July 21, 2020

Sabinus Okafor
Thurber Engineering Ltd.
4127 Roper Road NW
Edmonton, AB T6B 3S5
sokafor@thurber.ca

Re: 29532.20

Dear Sabinus,

As per your search request submitted on July 17, 2020, Alberta Safety Codes Authority (ASCA) has searched the storage tank database for existing and former installations of storage tank systems, as defined by the Fire Code, including those known to be inside structures at the following addresses:

1. Latta Bridge, LLD: NE-4-53-24-W4M Edmonton, AB
2. 9075 Jasper Avenue NW, Lot 6 Block 1 Plan RN37A, LLD: NE-4-53-24-W4M Edmonton, AB
3. 9131 Jasper Avenue NW, Lot 6 Block 1 Plan RN37A, LLD: NE-4-53-24-W4M Edmonton, AB
4. 10336 89 Street NW, Lot 20 Plan EDMONTO, LLD: NE-4-53-24-W4M Edmonton, AB

The search of the storage tank database determined no records were available for the address requested.

The Freedom of Information and Protection of Privacy Act governs the information provided. Please note that the database is ***not*** complete. The main limitation of the database is that it only includes information reported through registration and permitting or a survey of abandoned sites completed in 1992 and should not be considered a comprehensive inventory of all past or present storage tank sites. ASCA's storage tank systems database is solely maintained based on information provided by owners and or operators of storage tank systems; therefore, the database may not reflect information related to all existing or former storage tank systems in Alberta. Further information on storage tank systems or investigations involving a spill/release or contamination may be filed with the local fire service or Alberta Environment.

Regards,

ASCA Associate
ascatanks@safetycodes.ab.ca

Latta Bridge Abadta Map

Wednesday, November 18, 2020

1:9,004

0 105 210 420 m

AbaData

Water Well Information

WATER WELL # 234401

Location:	9-4-53-24 W4M	**Location Obtained By:**	Not Verified
Latitude / Longitude:	53.550190 -113.472190	**GPS Obtained By:**	Not Verified
Elevation:		**Elevation Obtained By:**	Not Obtained
Distance:			
Lot / Block / Plan #:			
Additional Information:			
Comments:	LOCATION NOT CERTAIN BUT LOCATION MOVED FROM SEC 04 TO LSD09 OF SEC 04 IN NOV 2004.		
Method of Drilling:	Unknown	**Type of Work:**	Test Hole
Depth Drilled:	103.00 ft	**Finished Depth:**	
Date Work Started:		**Date Work Completed:**	May 22, 1975
Proposed Use:	Observation	**Date Received:**	
Top of Casing to Ground:		**Chemistries on Record:**	0
Artesian Well?	No	**Artesian Flow Rate:**	
Flow Control Installed?	No		
Recommended Pump Rate:		**Recommended Intake Depth:**	
Pump Installed?	No	**Pump Depth:**	
Saline Water Encountered?	No	**Saline Water Depth:**	
Well Disinfected?	No	**Potability Sampled/Sent?**	No / No
Gas Encountered?	No	**Gas Depth:**	
Gamma Log Taken/Sent?	No / No	**Electric Log Taken/Sent?**	No / No

AbaData

Water Well Information

WATER WELL # 81608

Location:	9-4-53-24 W4M	**Location Obtained By:**	Field
Latitude / Longitude:	53.550393 -113.470666	**GPS Obtained By:**	Field
Elevation:	2244.00 ft	**Elevation Obtained By:**	Survey-Air
Distance:			
Lot / Block / Plan #:			
Additional Information:			
Comments:	SURVEY STATES WATER IS VERY SOFT		
Method of Drilling:	Drilled	**Type of Work:**	Federal Well Survey
Depth Drilled:	165.00 ft	**Finished Depth:**	
Date Work Started:		**Date Work Completed:**	
Proposed Use:	Domestic & Stock	**Date Received:**	
Top of Casing to Ground:		**Chemistries on Record:**	0
Artesian Well?	No	**Artesian Flow Rate:**	
Flow Control Installed?	No		
Recommended Pump Rate:		**Recommended Intake Depth:**	
Pump Installed?	No	**Pump Depth:**	
Saline Water Encountered?	No	**Saline Water Depth:**	
Well Disinfected?	No	**Potability Sampled/Sent?**	No / No
Gas Encountered?	No	**Gas Depth:**	
Gamma Log Taken/Sent?	No / No	**Electric Log Taken/Sent?**	No / No

AbaData

Water Well Information

WATER WELL # 234403

Location:	SE-4-53-24 W4M	**Location Obtained By:**	Not Verified
Latitude / Longitude:	53.548585 -113.479774	**GPS Obtained By:**	Not Verified
Elevation:		**Elevation Obtained By:**	Not Obtained
Distance:			
Lot / Block / Plan #:			
Additional Information:			
Comments:	VERY DIFFICULT TO DISTINQUISH CUTTINGS DUE TO HEAVY DRILLING FLUID. NO LOCATION GIVEN IN SECTION SO SE USED		
Method of Drilling:	Unknown	**Type of Work:**	Test Hole
Depth Drilled:	60.00 ft	**Finished Depth:**	
Date Work Started:		**Date Work Completed:**	May 26, 1975
Proposed Use:	Unknown	**Date Received:**	
Top of Casing to Ground:		**Chemistries on Record:**	0
Artesian Well?	No	**Artesian Flow Rate:**	
Flow Control Installed?	No		
Recommended Pump Rate:		**Recommended Intake Depth:**	
Pump Installed?	No	**Pump Depth:**	
Saline Water Encountered?	No	**Saline Water Depth:**	
Well Disinfected?	No	**Potability Sampled/Sent?**	No / No
Gas Encountered?	No	**Gas Depth:**	
Gamma Log Taken/Sent?	No / No	**Electric Log Taken/Sent?**	No / No

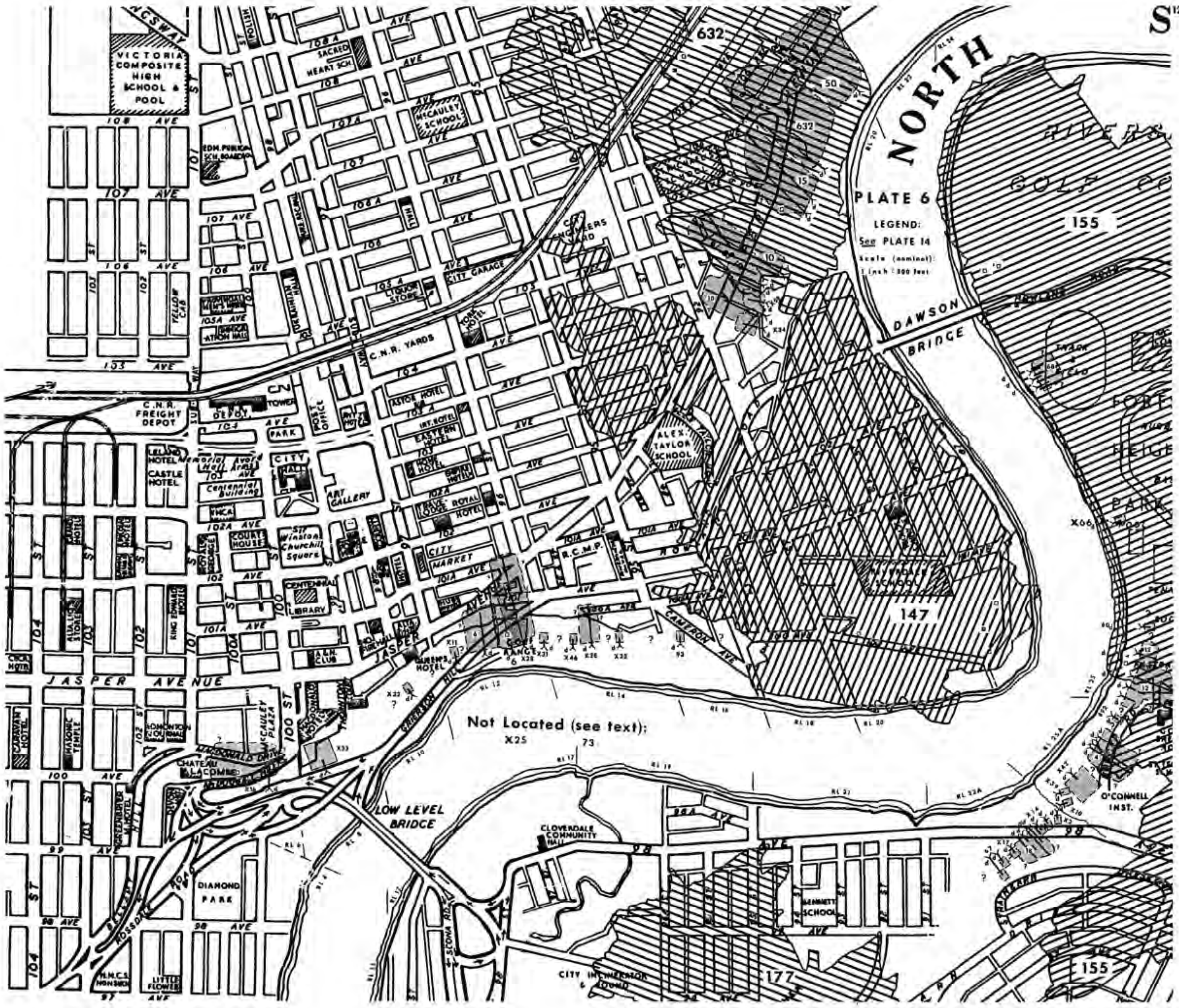

PLATE 6
LEGEND:
See PLATE 14
Scale (nominal):
1 inch : 300 feet
NORTH
DAWSON BRIDGE
LOW LEVEL BRIDGE
Not Located (see text):
X25 73
VICTORIA COMPOSITE HIGH SCHOOL & POOL
SACRED HEART SCH.
McCAULEY SCHOOL
EDM. PUBLIC SCH. BOARD
CITY ENGINEERS YARD
CITY GARAGE
LIQUOR STORE
C.N.R. YARDS
C.N.R. FREIGHT DEPOT
CN TOWER
POST OFFICE
ASTOR HOTEL
EASTERN HOTEL
LELAND HOTEL
CASTLE HOTEL
CITY HALL
ART GALLERY
Centennial Building
YMCA
COURT HOUSE
Sir Winston Churchill Square
CENTENNIAL LIBRARY
CITY MARKET
R.C.M.P.
ALEX. TAYLOR SCHOOL
QUEENS HOTEL
JASPER AVENUE
CAMERON AVE
CARAVAN HOTEL
MASONIC TEMPLE
EDMONTON JOURNAL
McCAULEY PLAZA
CHATEAU LACOMBE
MACDONALD DRIVE
DIAMOND PARK
CLOVERDALE COMMUNITY HALL
BENNETT SCHOOL
CITY INCINERATOR & POUND
H.M.C.S. NONSUCH
LITTLE FLOWER
O'CONNELL INST.
632
50
15
10
155
147
177

Plate 6, Continued from p. 11.

and a small amount mined for the company's own use. I regard this as a second drift run by the company, and have plotted it alongside the 1900 drift. It is apparent from the file that the government had no knowledge of the company's 1900 drift.

There is contradiction in the records as to whether or not this mine operated in 1904. Certainly, it was abandoned in or prior to 1905.

Classed in the aggregate as a very small mine.
Ref.: 1; 2; 3.

Mine No. 68 (u/g). White Light Mine. Location (approximate): River lot 25. 1902–1905. Seam 4'. Cover: probably up to 80'. Estimated mined area: about 1a. Recorded production (4 yrs of 4): 3,200 tons.

Remarks: No mine plan. This mine is located on the plate on the basis of two items. Firstly, topographic information from a photo in the Brown collection that led me to conclude that this mine was farther downstream than any other mine in the high seam on RL 25. Secondly, three side-by-side drifts mapped in the above general area on the final plan of the Dawson Mine (No. 155).

This mine was reported to be opening up in Nov. 1902. In Jan. 1903 the Inspector reported that the mine was "working two drifts and producing about 12 tons/day. The present opening will not last as soon as spring opens, the face of the hill being on the move".

Production stopped at the end of Jan. 1903 and started up again in Sept. 1903. The above paragraph implies that a new drift was required, and I assume that this was so.

The mine ceased operations in Oct. 1905, and it is reasonable to assume that a third drift was required in the last two years of operation. Further, the original operators sold out to Dawson and Hyndman, who established the Dawson Mine. This may well account for this mine (No. 68) appearing on the map of the Dawson Mine.
Ref.: 1; 3.

Mine No. 73 (u/g). Location unknown. Operator: James Martin, 1903.

Remarks: No mine plan. The Mine Inspector reported in Jan. 1903 that "this is also a new mine being opened by James Martin under lease on the Wood property. Work was only commenced about two weeks ago".

The Inspector reported on 22-i-04 that the mine was not in operation in 1903, that it possibly produced a few tons at the beginning of the year. A similar report of Jan. 1905 stated that the mine was not in operation in 1904. Nothing more is known of its history.

Classed as a prospect.
Ref.: 1.

Mine No. 93 (u/g). Cameron's Mine. Location (uncertain): River lot 18 (See Remarks). 1904–1906. Seam 3'. Cover: not known. No record of production.

Remarks: The file on this mine was not located in Mines Division archives. Possibly it is just misplaced; however, it may be missing, for three months of work with these files did not bring this one to light. There is no mine plan.

There is disagreement with respect to the location of this mine: it is reported in various sources to be in both RL 16 and RL 18. I opted for the RL 18 location primarily because the western part of RL 16 – next to the slide-scars of the large slump of 1901–1902 – would be the easiest place to get at the seam. Also, this area appears to have been the least built-up.

This mine was operating prior to Aug. 1904, for on the 17th of that month the Edmonton Bulletin reported that John Cameron presented to City Council a bill for 14 tons of coal at \$2.40/ton. The coal was used for [illegible] purposes. This mine was abandoned in June 1906. It is regarded as a very small (?) mine.
Ref.: 1; 2; 8; Calloway, 1958.

Mine No. 147 (u/g). Chinook Mine. Location: River lots 16, 18, and 20. 1907–1911; 1918–1930. Seam: 5' – 6'6", dipping slightly to S.W. Cover: 60' – 230'. Known area: 143a. Recorded production (18 yrs of 18): 678,731 tons (377.07 a.ft.). Estimate average thickness of coal mined at 5 1/2'; indicated recovery is about 47 1/2%.

Remarks: Oldest (United/Ritchie) surface works in S.E.: hoisting shaft 60' deep; airshaft (north N.E.), 67' deep; S., depth ?. The South airshaft was a borehole to the workings, reamed out to a depth of 25' and then abandoned before completion when the mine shut down for several months in 1908.

Chinook (old Edmonton Collieries) surface works: hoisting shaft 95' deep; airshaft, depth ?. The seam was 5' – 6'6" with 6" – 12" of this left for roof support.

Abandonment plan with date of last underground survey 2-vi-30; added information to 14-i-30 with note "By information from Chairman". Also carries note "Mine abandoned 14-ii-30". This surveyor's plan carries the workings of Ritchie (1908–1911) and the Chinook Mine (1918–1930). Someone has added, in blue ink, the workings, including hoisting and air shafts, of the United Collieries (1907–1908).

No survey tie-point is shown, but the plan carries the grid of overlying streets. All these workings are plotted from the S.E. corner of the intersection of 102 Ave. and 92 St.

Discrepancies between base map and reduced mine-plan are significant. In the extreme S.W. the workings reach about 80' too far west on the base map. In the N.W. the workings reach about 40' too far west and nearly 180' too far north. Discrepancies to the east and northeast cannot be determined, for the river boundary as shown on the mine plan is in error.

Originally, the United Collieries started this mine (1907–1908). Ritchie Coal took over in late 1908 and operated the mine until Oct. 1911 when these early workings were abandoned. City (later, Edmonton) Collieries reopened the property in 1918 and sank two shafts about 1000' west of the old surface works. In 1925 Penn Mines took the operation over and ran the mine until final closure in 1930.

These workings were troubled by cave-ins and subsidence throughout their history. Subsidence occurred around the second shaft-head in 1908. Cave-ins occurred in the workings in 1909, 1912–1913, 1925, and 1926–1927. In 1930 the operating company was involved in legal action respecting subsidence affecting some of the houses in Riverdale (Path Detter, 17-vii-30). Subsidence was also held to be involved in a gas-main fault and subsequent explosion in the same year and in the same area (letter, 30-iv-30).

An unsigned plan of the Ritchie operation with a latest date of 2-viii-11 against the underground workings shows two caves to the surface. One is about 340' N.N.W. of the hoisting shaft; the second is about 250' N.E. of the hoisting shaft. In addition, one cave is shown in the workings about 140' S.W. of the same shaft.

In much of my work with mine maps in this study, when I've found differences between the river boundary as presented on mine map and base map, I've tended to assume that the base map was incorrect. This may occasionally be true, but with respect to Plate 6 I'm convinced the opposite is true. After studying the relationships of Mines No. 147, 155, and 632 (deep) to the river on the base map, I can only conclude that the mine surveyors were using different standards for mapping the edge of the river than did the maker of the base map. Respecting Mine No. 147, there is no doubt in my mind but that these workings extend out under the river in at least one area.

According to Beach the lower Clover Bar seam was worked for a while in this mine but no evidence to support this claim is to be found in the records.
Ref.: 1; 9.

Mine No. 155 (u/g). Dawson Mine. Location: River lots 23A, 25A, and 25, and an irregular fraction of the NE1/2, Sec 34-52-24-W4. 1907–1944. Seam: 3'8" – 6', dip very slight to S.W. Cover: 80' – 240'. Known area: 191 1/4a. Recorded production (37 yrs of 38: no production 1907): 751,027 tons (401.68 a.ft.). Estimate average thickness of coal mined at 4 1/4'; indicated recovery is about 50%.

Remarks: Hoisting shaft 114' deep. Fan Shaft (old hoisting shaft, west of pair) 95' deep. Airshaft (east of pair) 96' deep. Southern Airshaft (west of Mine No. 12 drifts) 134' deep. The seam generally seems to have been 4 1/2' – 5' thick, with 6" – 12" of this left for a roof.

The final plan has a last date against the underground workings of 6-iv-44; it carries the note "Abandoned April 5th 1944". The survey tie-point is given in a company letter of 28-v-15 as a point on the common RL 25/27 boundary, 3767' N. of their S. boundary post. The plan carries part of the overlying street grid. The workings are plotted on the plate from the N.W. corner of the intersection of 101 Ave. and 84 St.

Discrepancies in departure (east-west) appear insignificant. In latitude, in the north end of the workings the discrepancy between base map and reduced mine-plan may be as much as 150'; in the south it appears to be about 50'.

On the base map the Dawson workings appear to reach under the river along much of their northeastern edge. This may be more apparent than real. On the mine plan, the distance to the river bank from my plot point (101 Ave. and 84 St.) is 875'; on the base map, only 770'. The National Topographic Sheet 83 H/11d (1:25,000) shows the distance to be about 850'. I doubt very much that the river has done enough erosion since the Dawson mine plan was made to account for these differences. It appears probable that the Dawson workings extend 50' closer to the river than is shown on the mine plan. The base map I use appears to be even more in error in this instance. See discussion on river boundaries under Remarks, Mine No. 147.

This mine had a number of cave and subsidence problems. These were sufficiently troublesome to show up in the Inspectors' reports of 1912, 1914–1916, 1923, and 1929–1932. In July 1915 a squeeze in the mine caused it to be lost that portion of the mine south of the shaft pillar. A similar squeeze occurred in the Second West entry in Feb. 1929.

An engineman told me of one cave of the Dawson that broke the surface footway up the hill west of the bridge in 1929–1930(?). The cave-in hole was in the road, was about 20' deep, and was sufficiently wide to force him to drive partly off the road to get around it. This was at an elevation of about 140' above the workings.

Subsidence and minor caving are still occurring over these workings in the western part of the Riverside Golf Course. The Head Greenskeeper of Riverside recently showed me the 12' X 10' scar in the turf a few feet from the 14th green by the clubhouse, that "has been filled 5 or 6 times when it gets down about 3', the last time being last fall". Farther down (north on) the 15th he showed me the area where subsidence is most noticeable. A series of linear swales and low ridges cut transversely across the fairway where level ground was seeded when the course was built. The relief here is about three feet and it looks typical of subsidence over long rooms and pillars. He stated that the relief is noticeably increasing with the passage of time. He also pointed out a number of small pits in the area that, to me, represent minor surface breaks caused by small caves.

The smaller number and smaller size of cave-ins here, as compared with the Highlands Golf Course, (Mine No. 889, Plate 5), I attribute to a slightly thicker rock roof over the seam, here.
Ref.: 1; 9; Long, 1971; Mitchell, 1971.

Mine No. 177. See text with Plate 8.

Mine No. 632 (u/g). Two mines: upper seam, the Penitentiary (Pen) Mine; lower seam, the Penn Mine. Location: Pen Mine, River lot 20; Penn Mine, River lots 16, 18, and 20. 1908–1920 (Pen Mine); 1920–1930 (Penn Mine). Seams: upper, 3'6"; lower (the Clover Bar), 3'6" – 6', dipping slightly to S.W. Cover: Pen Mine, up to 90'; Penn Mine, 60' – 250'. Areas: Pen Mine, known 3a, estimated 3 1/2a, total 8 1/2a; Penn Mine, known 100 3/4a. Recorded production: Pen Mine (6 yrs of 13): 13,359 tons, estimated total production, 20,000 – 23,000 tons; Penn Mine (10 yrs of 11: 2 yrs production in '20 included with '21): 370,404 tons (205.78 a.ft.). Estimate average thickness of coal mined in Penn Mine at 4 3/4'; indicated recovery is about 42 1/2%.

Remarks: The Pen Mine.

Operated by the Dominion Government in the persons of the Warden and the Chief Trades Instructor. The miners were convicts. Reported to have been operating in 1908, two years after the federal penitentiary opened for business.

The file on this mine is scant. Provincial Mines Inspectors were apparently invited in only in times of trouble in the mine. Although production figures were given to the Province for 1915 and onwards, the first Provincial Mine Inspector's report was filed in July 1917.

The convicts worked this mine through 1919. The operator who was establishing the Penn (deep seam) mine worked this (Pen) mine in 1920.

The airshaft shown on my plate is believed to be the one destroyed by fire in June 1917; it was probably about 90' deep. It is extremely likely, in view of the depth of these workings, that a second airshaft was sunk, but this is not known. These workings were, beyond question, the most extensive upper-seam workings in the Edmonton district. The known depth of the workings is sustained over 1000'.

The known workings of this mine are shown on two different maps. First, an unsigned blueprint of 7-iii-17 that carries a note stating that it incorporates information from a survey of 1915. The second map is dated Dec. 1918 and is by an Alberta mine surveyor. This 1918 map shows the two main penitentiary buildings as does the final plan of the underlying Penn Mine. After transferring the data of the 1917 map to the 1918 map, this latter was oriented and positioned by reference to the final plan of the Penn Mine, and the upper-seam workings plotted on the plate (solid line).

Over a quarter of the total estimated production from this mine was got out in 1919 and 1920 after the last survey of record. Very little of the workings from 1908 to 1914 appear to be shown on the 1917 blueprint. The dashed line with which I have extended these workings is based on a reasoned estimate of the total development of the mine.

Coal was conveyed by an incline from immediately downstream of the drift entry, up under Jasper Ave. through a subway, directly to the penitentiary power house.

The Mine Inspector reported in July 1937 that he "looked into the matter of subsidence of the laundry building reported on 8-vii-17; it is still proceeding".

This occurrence of subsidence damage to the east main penitentiary building resulted from as great a commotion [illegible] as I've ever encountered. The Dominion Government bought this property in 1901 for the avowed purpose of building a penitentiary. The Edmonton Town Council, which recommended the purchase in Dec. 1900, pointed out that the property was partly undermined by coal workings which might endanger the foundations of a large and heavy structure unless due precautions were taken to prevent it.

In Nov. 1901 the Deputy Commissioner of Public Works, N.W.T., wrote to the Secretary of the Department in Ottawa and said that Mines Inspector Smith "thinks that steps should be taken to see that the mining of coal will not have the effect of endangering the foundations of any buildings which you may put up on that property. This suggestion is made in view of the fact that serious trouble has occurred at Edmonton in connection with the foundations of certain buildings owing to the removal of the coal underneath the property upon which they are situated." – – – " – so that your Department may have the opportunity of looking into this matter before buildings are erected, and to prevent any possibility of the same trouble which has occurred with other buildings in that locality." (20-xi-01). (Ed., Mine No. 50). (Smith later recommended (Special Report, 23-ii-02; Mine No. 50) a foundation pillar of at least 300' radius about any federal building put up on the site.)

The Secretary forwarded the letter to the Minister of Justice, whose Department had jurisdiction. Apparently, the word filtered part way back down the line, for in July 1904 the Dominion Government terminated the lease of the only operating upper-seam mine in RL 20 (Mine No. 50).

The penitentiary was built, and was in operation in 1906. In 1908, mining was progressing in from the river bank with convict miners. Nine years later the easternmost of the two main penitentiary buildings (with power house, boiler room, laundry room, and work shop) was cracking up from foundation failure. The 1917 blueprint shows two-thirds of this building undermined. It is obvious that the word never got all the way back down and around to the warden. The Pen Mine closed in 1920; the penitentiary closed in 1920.

I can't help but think that the convict-miners, after March 1917, must have been laughing all the way back to their cells, each night.
Ref.: 1; 2; 9; MacGregor, 1967.

Remarks: The Penn Mine.

Hoisting shaft 247' deep; airshaft, depth ?. The final plan carries 27-v-30 as date of last survey. The operator gave 21-v-30 as the date of abandonment. No survey tie-point is given, but the overlying street grid and railways are shown on the plan. The workings are plotted from the intersection of the northern C.N. rail-line with the east boundary of 92 St.

Discrepancies between base map and reduced mine-plan are minor. In the N.W. (near 108A Ave.) the workings reach about 30' too far on the base map. Discrepancies of similar magnitude may occur in the northern and northeastern projections of the workings. Discrepancies in the south and southeast, and especially along the river, are not determined. See discussion of river boundaries under Remarks, Mine No. 147.

In Mar. 1927 a major squeeze caused by pillar robbing closed Nos. 1 and 2 West sections with the loss of much coal. In Nov. 1949 (19 yrs after closure) the operator advised the Mines Division that the washhouse building (near (?) the hoisting shaft) "is showing evidence of some movement having taken place during the last 12 months".

Little else of interest is found on this mine in the file. The annual production figures for 1927–1930 are more informative. These show that in the last 4 1/2 months of operation (1930) this mine produced more coal than it had in the previous 2 1/2 years. It seems apparent that many pillars were pulled as the crew retreated out of the mine. This would have had the effect of increasing both the rate and magnitude of eventual surface subsidence.
Ref.: 1.

Mine No. 892 (u/g). Creek Coal Mine. Location (uncertain): River lot 25A. 1921–1922(?). Seam: probably about 4'. Cover: not known. Recorded production (1 yr of 2 ?): 30 tons.

Remarks: A letter of 23-ii-21 stated that it was intended to "drive a drift on RL 25A to be called the Creek Coal Mine; coal owner Mrs. Ritchie; lessees and operators as above (Dodge and Thomas?) property is about 3a in westerly corner of river lot".

I positioned this mine on the map in the northwesterly corner of the river lot. However, from the description and name it is probable that this mine belongs closer to Dawler's Creek, possibly in the immediate vicinity of 429 or 445.

In August 1921 the partnership changed. In June 1922 the Mine Inspector requested that the mine be considered abandoned. Nothing else is known of this operation.
Ref.: 1.

PLATE 7

Mine No. 12. See text with Plate 6.

Mine No. 148 (u/g). Frank Mine. Location: River lots 29 and 33. 1907–1915. Seam: 4' – 5', horizontal. Cover: 30' – 150'. Known(?) area: 16 1/2a. Recorded production (7 yrs of 9: no reports for '08, '13): 37,185 tons (20.66 a.ft.). Estimate average thickness of coal mined as 4 1/2'; indicated recovery is about 27 1/2%.

Remarks: Hoisting shaft 42' deep; airshaft 45' deep.

Survey plan with last date of 3-iii-15, tied to an iron pin at the N.W. corner of Rose Street and Saskatchewan Avenue. This plan was made for the last (1911–1915) operator, and does not show the older workings N.W., W., and W.S.W. of the hoisting shaft. I did not use this plan for plotting the workings on the plate. Instead, for the most part I used the workings as shown on the final plan of Mine No. 1357, which worked around about 300' of the Frank Mine and mapped many parts of the Frank's workings by entries and by flat boreholes. The dashed line on the N. side of the Frank, I drew as a logical extension of the known workings. Thus, the Frank workings as shown are a composite of the information on the 3-iii-15 plan, on the final plan of Mine No. 1357, and my reasoned estimate of the N. boundary. The plot is tied to the N.W. corner of the intersection of 75th Street and (the old) 106th Avenue as shown on the final plan of Mine No. 1357.

This mine had five different operators during its nine years; this undoubtedly accounts for the very low recovery rate. The percentage of recovery from different parts of the mine undoubtedly varied markedly.

The mine was flooded by the high river levels of 1915 but the precise date is unknown. Official correspondence indicates it may have happened in April, rather than by the extreme high water of June. The shaft collar was only about 12' above "normal" high water levels.

In the period 1911–1915 a variety of minor cave-ins were reported in the workings.
Ref.: 1; 8.

Mine No. 155. See text with Plate 6.

Mine No. 1357 (u/g). Red Hot Mine. Location: River lots 29, 31, and 33. 1921–1951. Seam 2'6" – 5'. Cover: 205' – 190'. Known area: 77 1/2a. Recorded production (21 yrs of 21): 266,250 tons (147.92 a.ft.). Estimate average thickness of coal mined at 3 3/4'; this indicates about 42 1/2% recovery.

Remarks: Eastern slope (added) 18 1/4%, slope-length 188'; western slope 13 1/2%, slope-length 580'. Eastern airshaft 48' deep; southern airshaft 66' deep; western airshaft, depth ?.

Final plan dated 6-iv-51 with note "Abandoned April 1, 1951". Plan in two sections with the western section carrying the overlying street grid. No survey tie-point shown, but a note on the east boundary line of RL 31 indicates that the survey may have been tied to a pin at the southeast end of the common RL 31/33 boundary. To plot the mine workings, I used the N.W. corner of the intersection of 75th Street and (the old) 106th Avenue as shown on the final plan's street grid.

The discrepancy between the base map and the reduced mine-plan is significant in the E.-W. direction. In the N.W. corner of the workings on the base map, the workings reach nearly 90' too far west. At the eastern tip of the workings, they reach about 90' too far east. It should be noted here that the river bank as mapped on mine plan and base map is in quite different positions along most of its common length. The workings may reach about 30' too far north, but it is not possible to be sure.

The final plan carries a note on the workings from 100' – 200' S. of the S. centre of the Frank Mine: "Pillars out Sep 11, 1930", "Crushed". It is apparent that some major subsidence took place within and above the workings during the mine's operation.
Ref.: 1.

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Place Name, **Street Address**, and **Coordinate Searches** are avaliable on the map page

-A marker identified as ESA is the location of a site where Alberta Environment and Parks has received scientific and/or technical information

-A marker identified as REC is the location of a site where Alberta Environment and Parks has received an application for a reclamation certificate.

Comments and questions can be directed to:
ESAR-Support@gov.ab.ca

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1.1.10.1 Alberta Environment and Parks

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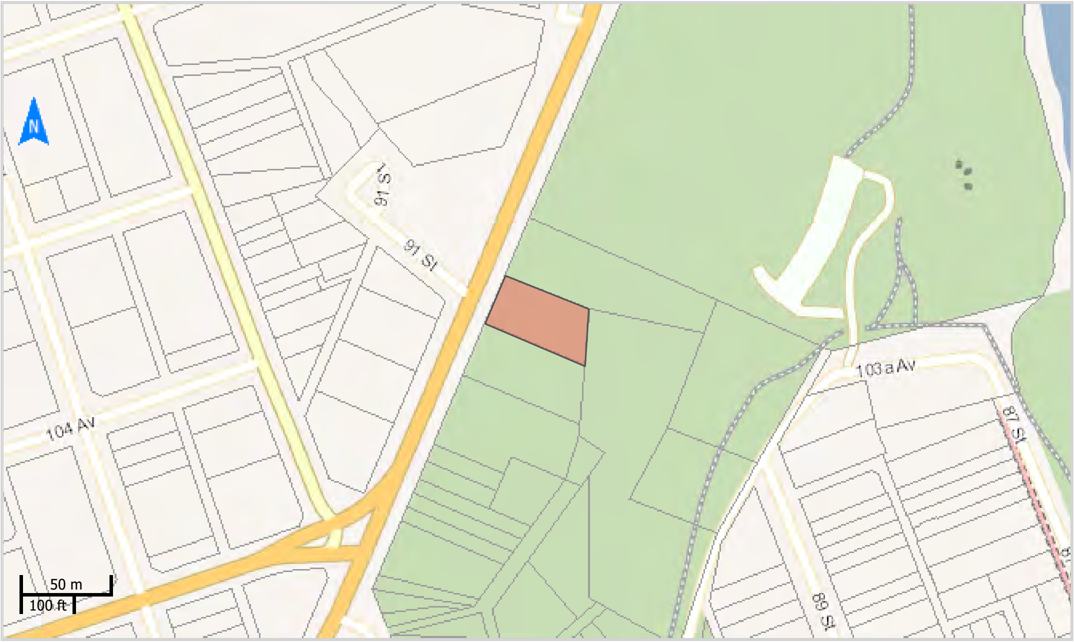
CoE's Map (9131 Jasper Avenue NW)



Legend

Title Lots

9131 - JASPER AVENUE NW

Address:	9131 - JASPER AVENUE NW
Legal Description for Title Lot:	Lot 6, Block 1, Plan RN37A
Area:	1,533.857 m^2
Year Built:	
Neighbourhood:	River Valley Kinnaird
Ward:	Ward 7
Community League:	Riverdale Community League
Waste Collection:	Wednesday More Information
Current Zone:	Metropolitan Recreation Zone (A)
Current Bylaw:	12800
Proposed Applications:	None
Proposed Zone:	None
Proposed Bylaw:	None
Overlays:	North Saskatchewan River Valley and Ravine System Protection Overlay
Plan in Effect:	None

Assessment Information

Municipal Address:	9131 JASPER AVENUE NW EDMONTON AB
Account Number:	3927266
Assessed Value:	$197,500
Assessment Class:	Other Residential
Neighbourhood:	RIVER VALLEY KINNAIRD
Longitude:	
Latitude:	

CoE's Map (9075 Jasper Avenue NW)

Legend

Title Lots

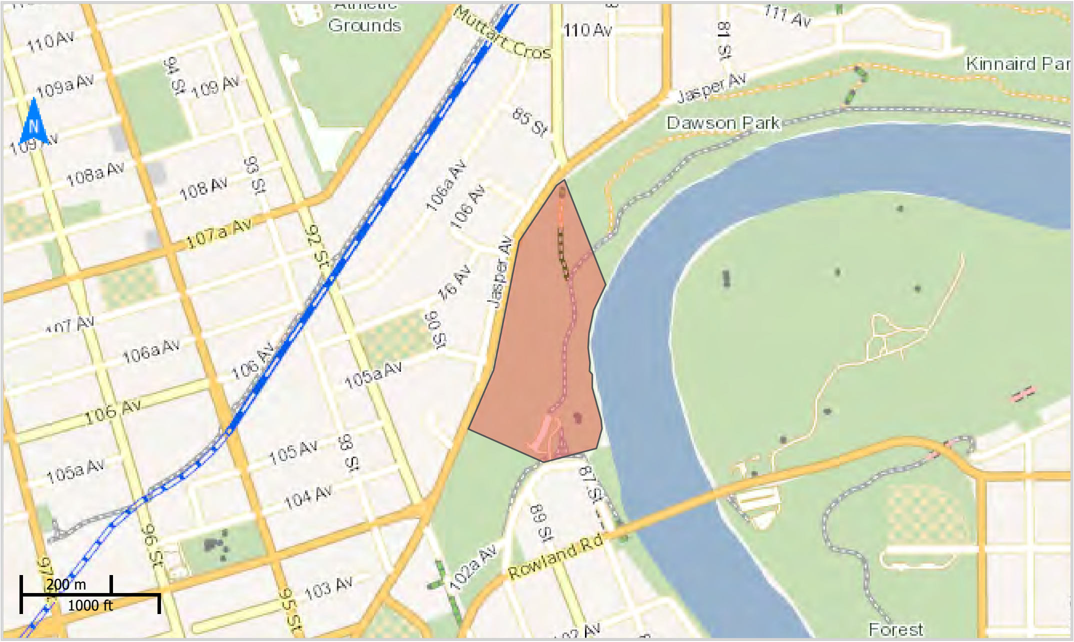
9075 - JASPER AVENUE NW

Address:	9075 - JASPER AVENUE NW
Legal Description for Title Lot:	Lot 6, Block 1, Plan RN37A
Area:	3,215.469 m^2
Year Built:	
Neighbourhood:	River Valley Kinnaird
Ward:	Ward 7
Community League:	Riverdale Community League
Waste Collection:	Wednesday More Information
Current Zone:	Metropolitan Recreation Zone (A)
Current Bylaw:	12800
Proposed Applications:	None
Proposed Zone:	None
Proposed Bylaw:	None
Overlays:	North Saskatchewan River Valley and Ravine System Protection Overlay
Plan in Effect:	None

Assessment Information

Municipal Address:	9075 JASPER AVENUE NW EDMONTON AB
Account Number:	3868601
Assessed Value:	$15,500
Assessment Class:	Non Residential
Neighbourhood:	RIVER VALLEY KINNAIRD
Longitude:	-113.47338435047
Latitude:	53.5500709942127

CoE's Map (10336 -89 Street)



Legend

Title Lots

10336 - 89 STREET NW

Address:	10336 - 89 STREET NW
Legal Description for Title Lot:	Lot 20, Block , Plan EDMONTO
Area:	107,771.892 m^2
Year Built:	
Neighbourhood:	River Valley Kinnaird
Ward:	Ward 7
Community League:	Riverdale Community League
Waste Collection:	Wednesday More Information
Current Zone:	Metropolitan Recreation Zone (A)
Current Bylaw:	12800
Proposed Applications:	None
Proposed Zone:	None
Proposed Bylaw:	None
Overlays:	Floodplain Protection Overlay North Saskatchewan River Valley and Ravine System Protection Overlay
Plan in Effect:	Riverdale ARP
Other Property Information:	Residential Parking Reductions

Citizen Services
Edmonton Fire Rescue Services
Fire Prevention

City of Edmonton
10425 106 Avenue NW
Edmonton, AB T5H 0P5

Tel.: 780.496.3628
Fax: 780.442.7364
Email: fireprevention@edmonton.ca

Edmonton.ca

August 27, 2020

Our Reference No.: 371415331-001

Thurber Engineering Ltd
4127 – Roper Road
Edmonton, Alberta T6B 3S5

Attention: Sabinus Okafor

RE: **Your File No.:** 29532.20
Legal: Plan RN37A, Block 1, Lot 6
Municipal: 9131 – Jasper Avenue NW, Edmonton, Alberta

A Fire Rescue Services record file search was conducted on August 27, 2020. Your payment has been received.

Fire Prevention has not received any information or reports regarding the following:

- installation/removal of underground storage tanks
- leaks
- site contamination or site remediation

Please understand that, as of the date indicated, none of the above described information has been reported to Fire Rescue Services in connection with this property. We make no representations or warranties whatsoever as to the present condition of the property or whether the property complies with the Safety Codes Act. We recommend that you take steps to satisfy yourself as to the condition of the property and the property's compliance with the Safety Codes Act.

Future requests for information should be accompanied by a prepayment of the charge and forwarded to Fire Prevention, 10425 – 106 Avenue, Edmonton, Alberta T5H 0P5. Please note, effective May 12, 2020, the File Search fees per address are \$136.00 + \$6.80 (G.S.T.) = \$142.80.

…/2

E-MAILED
Sept 9 2020

Should you have any questions, please contact Fire Prevention at (780) 496-3628.

Yours truly,

For G. Mayorchak
Fire Marshal

GGM/ld/ms

Citizen Services
Edmonton Fire Rescue Services
Fire Prevention

City of Edmonton
10425 106 Avenue NW
Edmonton, AB T5H 0P5

Tel.: 780.496.3628
Fax: 780.442.7364
Email: fireprevention@edmonton.ca

Edmonton.ca

August 27, 2020

Our Reference No.: 371416553-001

Thurber Engineering Ltd
4127 – Roper Road
Edmonton, Alberta T6B 3S5

Attention: Sabinus Okafor

RE: **Your File No.:** 29532.20
Legal: Plan RN37A, Block 1, Lot 6
Municipal: 9075 – Jasper Avenue NW, Edmonton, Alberta

A Fire Rescue Services record file search was conducted on August 27, 2020. Your payment has been received.

Fire Prevention has not received any information or reports regarding the following:

- installation/removal of underground storage tanks
- leaks
- site contamination or site remediation

Please understand that, as of the date indicated, none of the above described information has been reported to Fire Rescue Services in connection with this property. We make no representations or warranties whatsoever as to the present condition of the property or whether the property complies with the Safety Codes Act. We recommend that you take steps to satisfy yourself as to the condition of the property and the property's compliance with the Safety Codes Act.

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.../2

E-MAILED Sept 3, 2020

Should you have any questions, please contact Fire Prevention at (780) 496-3628.

Yours truly,

For G. Mayorchak
Fire Marshal

GGM/ld/ms

Citizen Services
Edmonton Fire Rescue Services
Fire Prevention

City of Edmonton
10425 106 Avenue NW
Edmonton, AB T5H 0P5

Tel.: 780.496.3628
Fax: 780.442.7364
Email: fireprevention@edmonton.ca

Edmonton.ca

Edmonton

August 31, 2020

Our Reference No.: 371416099-001

Thurber Engineering Ltd
4127 – Roper Road
Edmonton, Alberta T6B 3S5

Attention: Sabinus Okafor

RE: **Your File No.:** 29532.20
Legal: Plan EDMONTO, Lot 20
Municipal: 10336 – 89 Street NW, Edmonton, Alberta

A Fire Rescue Services record file search was conducted on August 27, 2020. Your payment has been received.

Fire Prevention has not received any information or reports regarding the following:

- installation/removal of underground storage tanks
- leaks
- site contamination or site remediation

Please understand that, as of the date indicated, none of the above described information has been reported to Fire Rescue Services in connection with this property. We make no representations or warranties whatsoever as to the present condition of the property or whether the property complies with the Safety Codes Act. We recommend that you take steps to satisfy yourself as to the condition of the property and the property's compliance with the Safety Codes Act.

Future requests for information should be accompanied by a prepayment of the charge and forwarded to Fire Prevention, 10425 – 106 Avenue, Edmonton, Alberta T5H 0P5. Please note, effective May 12, 2020, the File Search fees per address are \$136.00 + \$6.80 (G.S.T.) = \$142.80.

.../2

E-MAILED
Sept 3, 2020

Should you have any questions, please contact Fire Prevention at (780) 496-3628.

Yours truly,

For G. Mayorchak
Fire Marshal

GGM/ld/ms

THE CITY OF Edmonton

FINANCIAL SERVICES
AND UTILITIES

OFFICE OF THE CHIEF FINANCIAL OFFICER & TREASURER
5TH FLOOR, CHANCERY HALL
3 SIR WINSTON CHURCHILL SQUARE
EDMONTON, ALBERTA
T5J 3A3

File No.: 71-020-008-001
Search ID: 5792

Sabinus Okafor
Thurber Engineering Ltd.
4127 Roper Road
Edmonton, Alberta
T6B 3S5

Dear Sir/Madam:

	ADDRESS	LEGAL
SUBJECT:	10336 - 89 STREET NW	Plan EDMONTO Lot 20
	9075 - JASPER AVENUE NW	Plan RN37A Blk 1 Lot 6
	9131 - JASPER AVENUE NW	Plan RN37A Blk 1 Lot 6

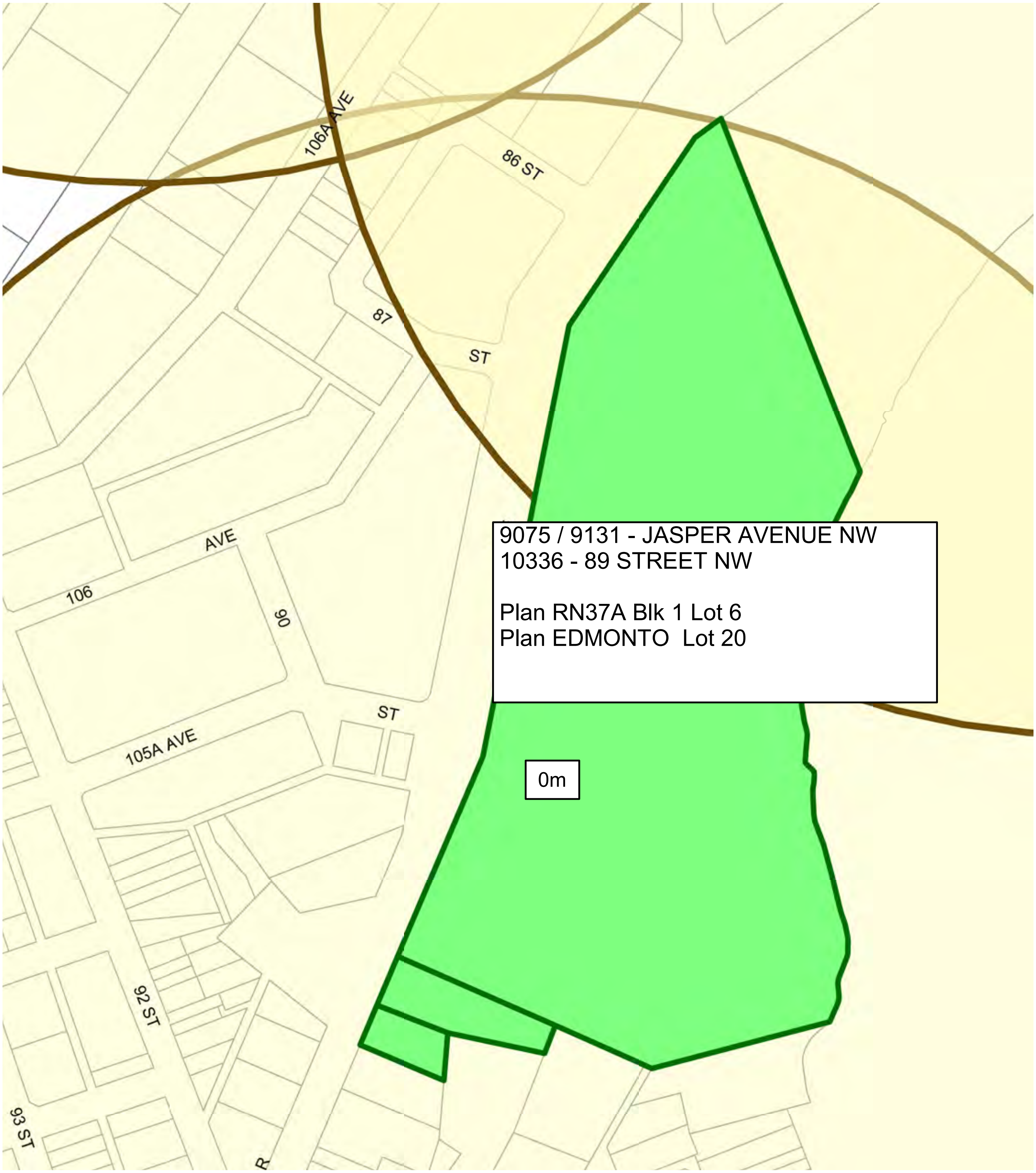
In response to your recent inquiry, the limited records available to us indicate that during previous excavation activity in the vicinity of the subject property the presence of subsurface refuse material was noted. The records do not provide any information as to the type, volume or exact location of this waste material. Also, the records do not include any information as to what previous activities have occurred on this land or how and when the waste material was deposited.

Please note that this information is provided without prejudice and the onus is on the developer/owner to verify by site tests the suitability of the property for their intended use of it.

Sincerely,

Mark Demers
Supervisor of GIS Mapping
Waste Services

Enclosure



ENVIRONMENTAL SEARCH PHASE 1

THE CITY OF Edmonton

N
W E
S

LEGEND

Refuse Site

Search Site

0.5 km Buffer Zone

For reference only. Not responsible for errors or omissions
Not to standard scale.

9504 – 49 Street NW
Edmonton, Alberta
T6B 2M9 Canada
epcor.com

August 31, 2020

Application No: 371621121-001
371621510-001
371621882-001
Customer File: 29532.20

Sabinus Okafor, M.Sc., P.Chem., P.Eng.
Environmental Engineer
Thurber Engineering Ltd.
4127 Roper Road
Edmonton, AB T6B 3S5

Re: Legal Address: **Plan RN37A; Block 1; Lot 6**
Plan RN37A; Block 1; Lot 6
Plan EDMONTO; Lot 20

Municipal Address: **9075 Jasper Avenue NW, Edmonton, AB**
9131 Jasper Avenue NW, Edmonton, AB
10336 - 89 Street NW, Edmonton, AB

Attached are the results of a record search for the above noted premises with respect to compliance with City of Edmonton Sewers Use Bylaws, Sewers Bylaws, Drainage Bylaws, EPCOR Drainage Services Bylaw and EPCOR Water Services and Wastewater Treatment Bylaws. Inquiries with respect to this search should be directed to the undersigned at (780) 509-8067. You will be invoiced for this service at a later date.

Regards,

D Johnston

Dave Johnston
Team Lead - Industrial Source Control
Drainage Services

Enclosure

9504 – 49 Street NW
Edmonton, Alberta
T6B 2M9 Canada
epcor.com

DRAINAGE SERVICES RECORD SEARCH

THIS SEARCH COVERS RECORDS RELATED TO THE FOLLOWING SECTIONS OF CITY BYLAWS: CITY OF EDMONTON SEWERS BYLAW # 9425, Sections 4-38, SEWERS USE BYLAW # 9675, Sections 4-37, DRAINAGE BYLAW # 16200, Sections 4-40, 50-51, DRAINAGE BYLAW # 18093 Sections 15-20, EPCOR DRAINAGE SERVICES BYLAW # 18100, Schedule 2 and EPCOR WATER SERVICES AND WASTEWATER TREATMENT BYLAW # 17698, Schedule 1, Part IV, Wastewater Overstrength Surcharges.

CUSTOMER: Thurber Engineering Ltd.

CUSTOMER FILE #: 29532.20 **DATE RECEIVED:** August 25, 2020

APPLICATION #: 371621121-001; 371621510-001; 371621882-001

PROPERTY DETAIL:

MUNICIPAL ADDRESS: 9075 Jasper Avenue NW, Edmonton, AB
9131 Jasper Avenue NW, Edmonton, AB
10336 – 89 Street NW, Edmonton, AB

LEGAL ADDRESS / DESCRIPTION: Plan RN37A; Block 1; Lot 6
Plan RN37A; Block 1; Lot 6
Plan EDMONTO; Lot 20

NAME OF FACILITY:

TYPE OF BUSINESS:

☒ **- NOT INSPECTED / NO RECORDS FOUND**

☐ **- INSPECTED - DATE OF INSPECTION:**

☐ **- NO VIOLATION(S) FOUND**

☐ **- VIOLATION(S) FOUND:**

☐ **- NOTICE TO COMPLY ISSUED:**

☐ **- FINE(S) ISSUED:**

☐ **- OVERSTRENGTH SURCHARGES LEVIED:**

COMMENTS:

This Records Search is provided in accordance with City of Edmonton Bylaw 18100, EPCOR Drainage Services Bylaw. While EPCOR strives to provide complete and accurate information, no warranties, promises or guarantees are made about the accuracy, completeness or adequacy of this Records Search.

SEARCH BY: Kate Aspden DATE: August 31, 2020

REVIEWED BY: Dave Johnston DATE: August 31, 2020

Locate

I'm looking for Address Lookup

House Number:
9131

Unit (optional):

Street or Avenue Name:
JASPER AVENUE NW

Find Address

Popular: To show assessment values on the map click here

New: To show address labels on the map click here

Help Data Refresh List Contact Us

Print Pan To Selected Pictometry Drawing Tools: 100% done... Leger

Results

Address

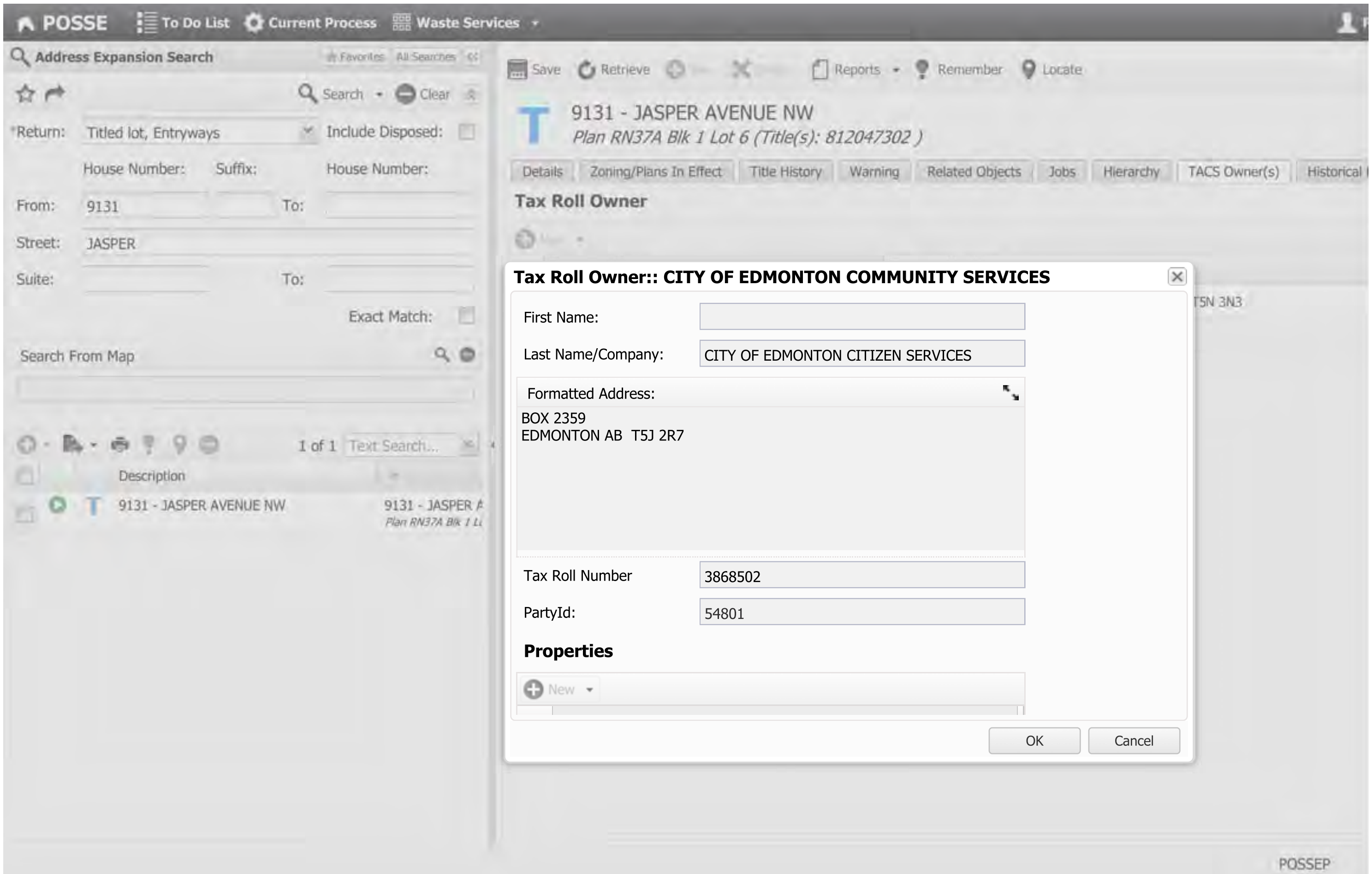
The address '9131 - JASPER AVENUE NW' found at 1 lot

9131 - JASPER AVENUE NW

Show: Selected Only Fit List

General | Assessment | Applications | Nearby Applications | Nearby Addresses

Address:	9131 - JASPER AVENUE NW
Legal Description for Title Lot:	Lot 6, Block 1, Plan RN37A
Area:	1,533.857 m^2
Year Built:	
Neighbourhood:	River Valley Kinnaird
Ward:	Ward 7
Community League:	Riverdale Community League
Waste Collection:	Wednesday More Information
Current Zone:	Metropolitan Recreation Zone (A)
Current Bylaw:	12800
Proposed Applications:	None


POSSE
To Do List
Current Process
Waste Services
Address Expansion Search
Search
Clear
Return: Titled lot, Entryways
Include Disposed:
House Number:
Suffix:
House Number:
From: 9131
To:
Street: JASPER
Suite:
To:
Exact Match:
Search From Map
1 of 1
Text Search...
Description
9131 - JASPER AVENUE NW
Save
Retrieve
Reports
Remember
Locate
9131 - JASPER AVENUE NW
Plan RN37A Blk 1 Lot 6 (Title(s): 812047302)
Details
Zoning/Plans In Effect
Title History
Warning
Related Objects
Jobs
Hierarchy
TACS Owner(s)
Tax Roll Owner
Tax Roll Owner:: CITY OF EDMONTON COMMUNITY SERVICES
First Name:
Last Name/Company:
CITY OF EDMONTON CITIZEN SERVICES
Formatted Address:
BOX 2359
EDMONTON AB T5J 2R7
Tax Roll Number
3868502
PartyId:
54801
Properties
New
OK
Cancel
POSSEP

Locate

I'm looking for Address Lookup

House Number:
9075

Unit (optional):

Street or Avenue Name:
JASPER AVENUE NW

Find Address

Popular: To show assessment values on the map click here

New: To show address labels on the map click here

Help Data Refresh List Contact Us

Print Pan To Selected Pictometry Drawing Tools: 100% done... Leger

Results

Address

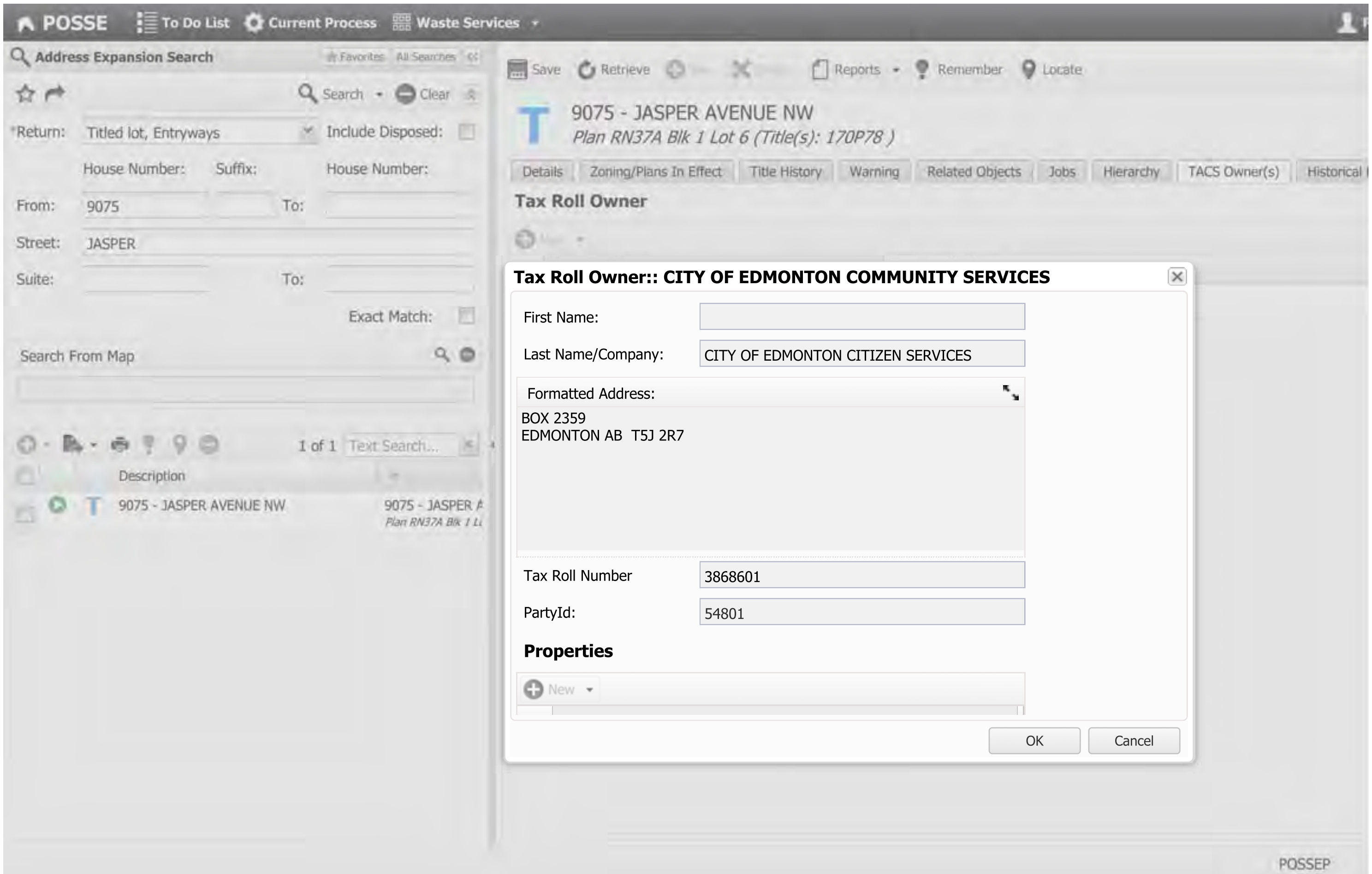
The address '9075 - JASPER AVENUE NW' found at 1 lot

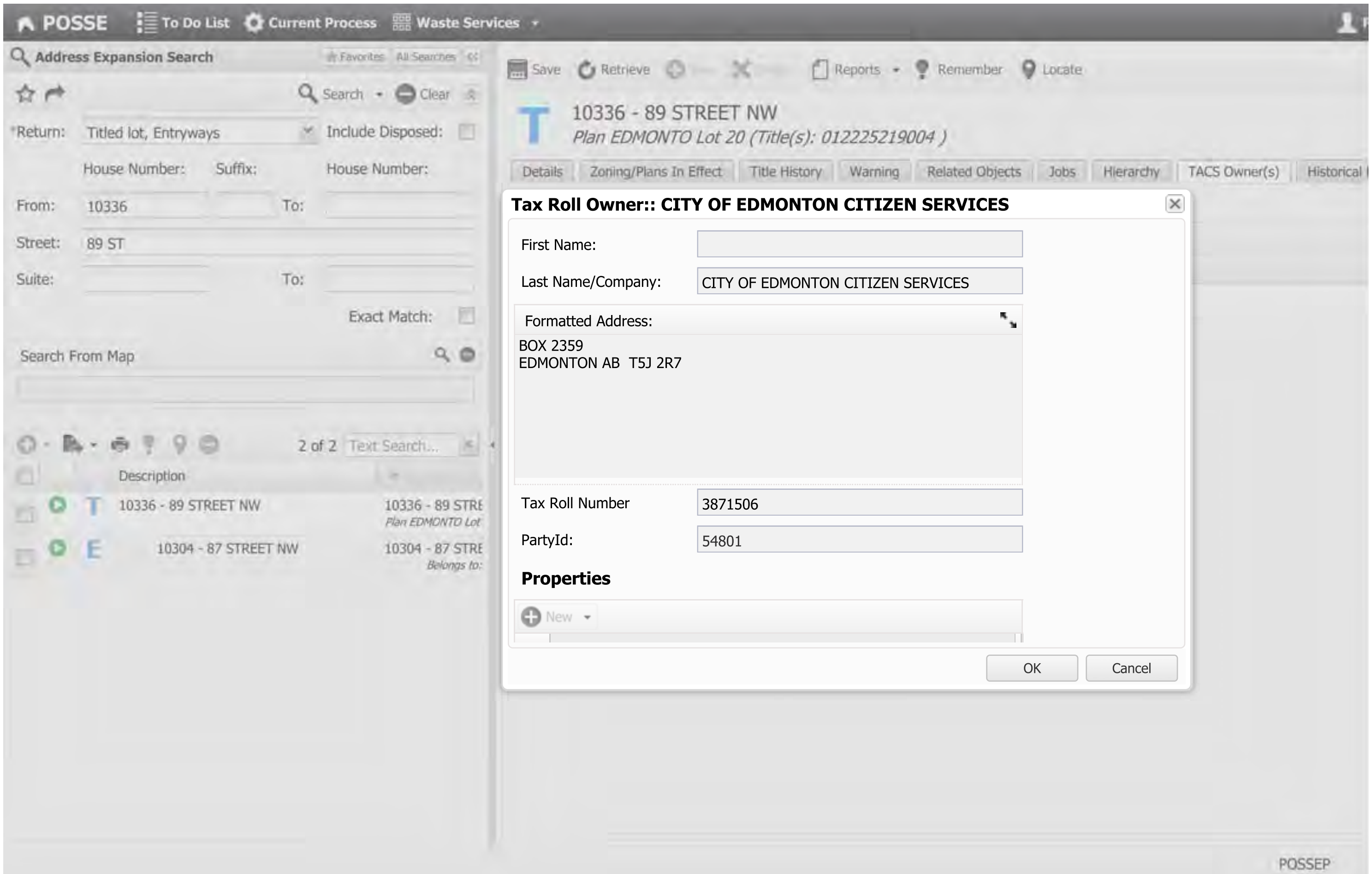
9075 - JASPER AVENUE NW

Show: Selected Only Fit List

General | Assessment | Applications | Nearby Applications | Nearby Addresses

Address:	9075 - JASPER AVENUE NW
Legal Description for Title Lot:	Lot 6, Block 1, Plan RN37A
Area:	3,215.469 m^2
Year Built:	
Neighbourhood:	River Valley Kinnaird
Ward:	Ward 7
Community League:	Riverdale Community League
Waste Collection:	Wednesday More Information
Current Zone:	Metropolitan Recreation Zone (A)
Current Bylaw:	12800
Proposed Applications:	None


POSSE
To Do List
Current Process
Waste Services
Address Expansion Search
Search
Clear
*Return: Titled lot, Entryways
Include Disposed:
House Number:
Suffix:
House Number:
From: 9075
To:
Street: JASPER
Suite:
To:
Exact Match:
Search From Map
1 of 1
Text Search...
Description
9075 - JASPER AVENUE NW
Save
Retrieve
Reports
Remember
Locate
9075 - JASPER AVENUE NW
Plan RN37A Blk 1 Lot 6 (Title(s): 170P78)
Details
Zoning/Plans In Effect
Title History
Warning
Related Objects
Jobs
Hierarchy
TACS Owner(s)
Tax Roll Owner
Tax Roll Owner:: CITY OF EDMONTON COMMUNITY SERVICES
First Name:
Last Name/Company: CITY OF EDMONTON CITIZEN SERVICES
Formatted Address:
BOX 2359
EDMONTON AB T5J 2R7
Tax Roll Number 3868601
PartyId: 54801
Properties
New
OK
Cancel
POSSEP


POSSE
To Do List
Current Process
Waste Services
Address Expansion Search
Favorites
All Searches
Search
Clear
*Return:
Titled lot, Entryways
Include Disposed:
House Number:
Suffix:
House Number:
From:
10336
To:
Street:
89 ST
Suite:
To:
Exact Match:
Search From Map
2 of 2
Text Search...
Description
10336 - 89 STREET NW
10336 - 89 STRE
Plan EDMONTO Lot
10304 - 87 STREET NW
10304 - 87 STRE
Belongs to:
Save
Retrieve
Reports
Remember
Locate
10336 - 89 STREET NW
Plan EDMONTO Lot 20 (Title(s): 012225219004)
Details
Zoning/Plans In Effect
Title History
Warning
Related Objects
Jobs
Hierarchy
TACS Owner(s)
Tax Roll Owner:: CITY OF EDMONTON CITIZEN SERVICES
First Name:
Last Name/Company:
CITY OF EDMONTON CITIZEN SERVICES
Formatted Address:
BOX 2359
EDMONTON AB T5J 2R7
Tax Roll Number
3871506
PartyId:
54801
Properties
New
OK
Cancel
POSSEP

Locate

I'm looking for: Address Lookup

House Number:
10336

Unit (optional):

Street or Avenue Name:
89 STREET NW

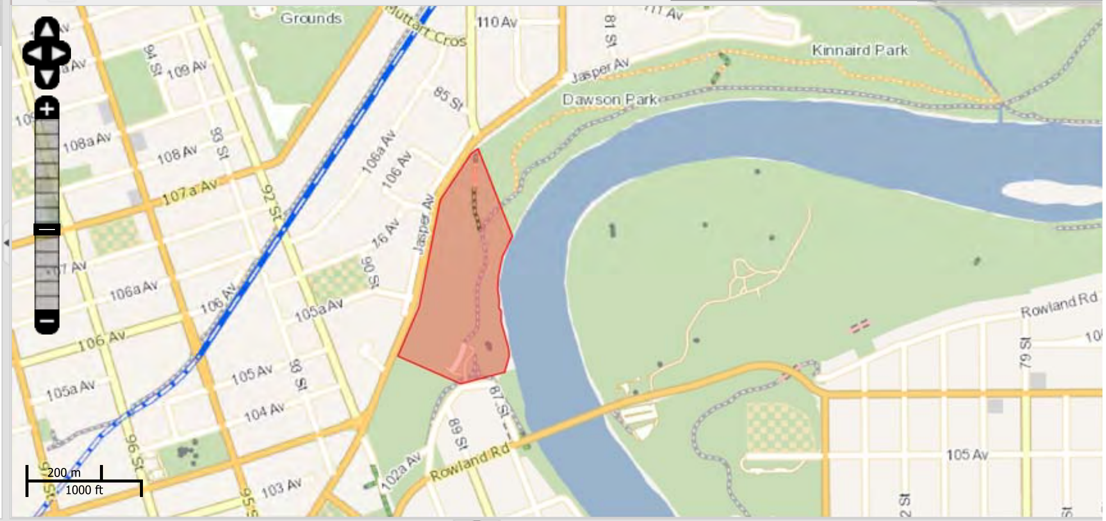
Find Address

Popular: To show assessment values on the map click here

New: To show address labels on the map click here

Help Data Refresh List Contact Us

Print | Pan To Selected | Pictometry | Drawing Tools: | 100% done... | Legen



Results

Address

The address '10336 - 89 STREET NW' found at 1 lot

10336 - 89 STREET NW

Show: Selected Only | Fit List

General | Assessment | Applications | Nearby Applications | Nearby Addresses

Address:	10336 - 89 STREET NW
Legal Description for Title Lot:	Lot 20, Block , Plan EDMONTO
Area:	107,771.892 m^2
Year Built:	
Neighbourhood:	River Valley Kinnaird
Ward:	Ward 7
Community League:	Riverdale Community League
Waste Collection:	Wednesday More Information
Current Zone:	Metropolitan Recreation Zone (A)
Current Bylaw:	12800
Proposed Applications:	None

Engineering Services Library Search Concise Report

Cadastral: **934-36-12-01** ; 934-36-12; 934-36-09 **ACCESSION NO:** 861
Title: Landslide Investigations, Jasper Avenue at 84 and 88 Streets
Date: March 28, 1995
Author: Eglauer, A.; Ruban, A. ; EBA Engineering Consultants Ltd.
Abstract: A preliminary slope stability investigation of two landslides on the crest of the North Saskatchewan River Valley below Jasper Avenue
Neighbrhd: River Valley Kinnaird
Location: 84 Street to 89 Street Jasper Avenue
Digital Copy: Yes

****

Cadastral: **934-36-12-02** ; 934-36-12 **ACCESSION NO:** 1377
Title: Soil Investigation in the Area Lot 29 to 34 BL.14 at the North East Corner of the Intersection of 106 Avenue and 95 Street
Date: October 28, 1975
Author: Rizkalla, F. ; City of Edmonton, Materials Engineering
Abstract: A foundation investigation for the proposed surveyors trailer site at 95 Street and 106 Avenue
Neighbrhd: Boyle Street
Location: 95 Street 106 Avenue
Routine Disclosure: Yes **Digital Copy:** Yes

****

Cadastral: **934-36-12-03** ; 934-36-12; 934-36-09 **ACCESSION NO:** 1725
Title: Proposed Latta Ravine Road
Date: 1958
Author: Sinclair, S.R. ; R.M. Hardy & Associates Ltd.
Abstract: An investigation to assess the slope stability and foundation conditions for the proposed Latta Ravine Roadway
Neighbrhd: Boyle Street; Riverdale
Location: 89 Street to 91 Street Jasper Avenue to Rowland Road
Digital Copy: Yes

****

Cadastral: **934-36-12-04** ; 934-36-12 **ACCESSION NO:** 1728
Title: Non-profit Public Housing Sites 92 Street - 105 Avenue
Date: May, 1979
Author: Kochan, D. ; City of Edmonton, Materials & Testing
Abstract: Foundation investigation for non profit housing complex at 92 Street and 105 Avenue
Neighbrhd: Boyle Street
Location: 92 Street 105 Avenue
Routine Disclosure: Yes **Digital Copy:** Yes

****

Engineering Services Library Search Concise Report

Cadastral: **934-36-12-05** ; 934-36-12; 934-36-13; 934-36-08; 934-36-09 **ACCESSION NO:** 2133
Title: Phase II Environmental Site Assessment, Lots 41 to 44 Inclusive, Block 13, Plan NP, 9514, 9516, 9520 & 9524 - 104 Avenue, Edmonton, Alberta
Date: August 1, 2000
Author: Inkpen, R. B.; Hunter, G. G. ; Shelby Engineering Ltd.
Neighbrhd: Boyle Street
Location: 95 Street 104 Avenue
Digital Copy: Yes

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Cadastral: **934-36-12-06** ; 934-36-12; 934-36-13; 934-36-08; 934-36-09 **ACCESSION NO:** 2137
Title: Phase I Environmental Site Assessment, Lots 41 Through 44 Inclusive, Block 13, Plan ND, Edmonton, Alberta
Date: July, 2000
Author: Inkpen, R.; Hunter, G. G. ; Shelby Engineering Ltd.
Neighbrhd: Boyle Street
Location: 95 Street 104 Avenue
Routine Disclosure: No **Digital Copy:** Yes

****

Cadastral: **934-36-12-07** ; 934-36-12 **ACCESSION NO:** 2727
Title: Environmental Screening Report for the Proposed Rehabilitation of Latta Bridge
Date: December, 2002
Author: Westworth Associates Environmental Ltd. ; Westworth Associates Environmental Ltd.
Abstract: A condition assessment outlines a number of propsed rehabilitation measures to extend the service life of the bridge structure for 20 years.
Neighbrhd: River Valley Kinnaird; Riverdale
Location: 90 to 92 Jasper Avenue 104 to 105
Digital Copy: Yes

****

Cadastral: **934-36-12-08** ; 934-36-12 **ACCESSION NO:** 2944
Title: Geotechnical Evaluation, 3 Highrise Apartment Buildings, 105 Avenue & 93-95 Avenue, SITE #1
Date: March, 1981
Author: Lanigan, M.A. ; EBA Engineering Consultants Ltd.
Abstract: A geotechnical investigation of the foundation of 3 multi- structures.
Neighbrhd: McCauley
Location: 93 to 95 105
Digital Copy: Yes

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Engineering Services Library Search Concise Report

Cadastral: **934-36-12-09** ; 934-36-12 **ACCESSION NO:** 2766
Title: Phase I Environmental Site Assessment, 10293, 10295, 10297 - 89 Street, Plan 0120776 and Plan RN 37
Date: June, 2003
Author: Niawchuk, D.; Hwang, C. ; CT & Associates Engineering Inc.
Abstract: The environmental assessment was to review previous and current uses and operations of the subject site and surrounding properties and to assess potential areas of environmental concern.
Neighbrhd: Riverdale
Location: 89 102
Routine Disclosure: No **Digital Copy:** Yes

****

Cadastral: **934-36-12-10** ; 934-36-12 **ACCESSION NO:** 2767
Title: Phase II Environmental Site Assessment, 10293, 10295, 10297 - 89 Street, Plan 0120776 and Plan RN37
Date: June, 2003
Author: Witkos, M.; Hwang, C. ; CT & Associates Engineering Inc.
Abstract: To determine the extent and quality of fill materials and to delineate the extent of lead contamination which was encountered within a previous study at the northwest area of Lot 1.
Neighbrhd: Riverdale
Location: 89 102
Digital Copy: Yes

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Cadastral: **934-36-12-11** ; 934-36-12 **ACCESSION NO:** 2768
Title: Site Remediation Program, 10293, 10295, 10297 - 89 Street, Plan 0120776 and Plan RN37
Date: June, 2003
Author: Witkos, M.; Hwang, C. ; CT & Associates Engineering Inc.
Abstract: The purpose of this remediation work was to remove lead-contaminated soils, within an isolated area at the northwest portion of Lot 1.
Neighbrhd: Riverdale
Location: 89 102
Digital Copy: Yes

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Cadastral: **934-36-12-12** ; 934-36-12 CENTRAL YARD PI: 52295227 SI: 33229; 934-32-25 NORTHWEST YARD PI: 109704283 SI: 33439; 934-40-23 NORTHEAST YARD PI: 109728069 SI: 33458; 928-40-12 SOUTHEAST YARD PI: 109729730 SI: 33459; 934-40-08 SOUTHWEST YARD PI: 109731925 SI: 33460 **ACCESSION NO:** 2967
Title: City of Edmonton, Roadway Maintenance Yards Environmental Audit, 10517-95 St, 14402-114 Ave, 13003-56 St, 5404-59 Ave, 6607-103 St
Date: January, 2002
Author: Wawrychuk, W. ; Earth Tech (Canada) Inc.
Abstract: Earth Tech performed historical research, interviewed various personnel, conducted file reviews to identify potential issues, and conducted site visits to verify current operating procedures and infrastruchure.
Neighbrhd: McCauley; Kennedale Industrial; Roper Industrial; Fulton Place
Location: 95; 144; 56; 59; 103 105 114 130 59 66
Routine Disclosure: Yes **Digital Copy:** Yes

****

Engineering Services Library Search Concise Report

Cadastral: **934-36-12-13** ; 934-36-12 **ACCESSION NO:** 3894

Title: Dawson Paddle Centre Environmental Screening Report (Draft - For Review Purposes Only)

Date: December, 2005
Author: Abma, Geoff ; Gibbs Brown Johansson
Abstract: draft environmental screening report

Neighbrhd: Riverdale
Location: 10297 89 Street 10336 89 Street 89 102 103
Digital Copy: Yes

****

Cadastral: **934-36-12-14** ; 934-36-12 **ACCESSION NO:** 5405
Title: Analytical Assessment of Sump Wastes, City of Edmonton Roadway Maintenance
Date: February 8, 2007
Author: Stuart, Clarence ; City of Edmonton
Abstract: An analysis of sump wastes from the City of Edmonton Central Roadway Maintenance Yard. Analyses covered metals,organics, and other compounds.
Neighbrhd: Boyle Street
Location: 10517 - 95 STREET NW 95 105
Routine Disclosure: Yes **Digital Copy:** Yes

****

Cadastral: **934-36-12-15** ; 934-36-12 **ACCESSION NO:** 3670
Title: Rat Creek Fish Habitat Creation - 83 Street - 107 Avenue, Environmental Samples - Revised
Date: November 15, 2005
Author: Haug, E. ; Stantec Consulting Ltd.
Abstract: Report compares results of surface water sample analysis with freshwater Aquatic Life criteria in CCME. Although concentrations of aluminum, fluoranthene and pyrene exceed criteria, opinion is that exceedances are not of concern.
Neighbrhd: River Valley Kinnaird
Location: 83 107
Digital Copy: Yes

****

Cadastral: **934-36-12-16** ; 934-36-12 **ACCESSION NO:** 5943
Title: Phase I Environmental Site Assessment, Central Roadway Maintenance Yard, 10517 - 95th Street, Block Z;Plan 6047ET
Date: July 7, 2010
Author: Tawnya Anderson ; Nichols Environmental (Canada) Ltd.
Abstract: Phase I ESA

Neighbrhd: Boyle Street
Location: 10517 - 95 STREET NW 95 105
Routine Disclosure: No **Digital Copy:** Yes

****

Cadastral: **934-36-12-17** ; 934-36-12; 934-36-20 **ACCESSION NO:** 6945
Title: Dawson Park and McNally School Sites, Soil Closure Sampling, Edmonton, Alberta

Date: July 23, 2012
Author: Kennelly, Sean ; Nichols Environmental (Canada) Ltd.
Abstract: Assessed environmental quality of soil within haul road in Dawson Park and lay-down area east of McNally School, related to West Edmonton Sanitary Sewer installation. No impacts at McNally site, SAR impacts at two locations on haul road were rated as "unsuitable" but these locations may have been impacted by salting of walks in winter months. No further remedial efforts warranted.
Neighbrhd: River Valley Kinnaird
Location: 86 Rowland Road 106
Routine Disclosure: Yes **Digital Copy:** Yes

****

Cadastral: **934-36-12-18** ; 934-36-12; 934-36-13 **ACCESSION NO:** 8096
Title: Phase I Environmental Site Assessment Update, Central Maintenance Yard, 10517 - 95th Street NW, Blocks Z and T; Plan 6047ET and Lots 25-28; Block 10; Plan RN23, Edmonton, Alberta
Date: June 3, 2015
Author: Dickie, Rob; Griffith, Fritz; Anderson, Tawnya ; Nichols Environmental (Canada) Ltd.
Abstract: Phase I Environmental Site Assessment Update for the Central Maintenance Yard

Neighbrhd: Boyle Street
Location: 10517 - 95 Street 95 105
Routine Disclosure: No **Digital Copy:** Yes

****

Cadastral: **934-36-12-19** ; 934-36-12 **ACCESSION NO:** 8232
Title: Vibration Assessment Open Cut - Drainage Services/CKB 95 Street and 104 Avenue Edmonton [DIGITAL COPY ONLY]
Date: April 1, 2012
Author: Stuart, Clarence; Bartlett, Deidre ; City of Edmonton, Engineering Services
Abstract: City of Edmonton's Engineering Services Section at the request of Drainage Services conducted a vibration test located at 95 Street and 104 Avenue, Edmonton Alberta. The test was to evaluate the vibration impact of an open cut construction activity in the North lane of 95 Street.
Neighbrhd: Boyle Street
Location: 10357 - 95 Street 65 104
Digital Copy: Yes

****

Cadastral: **934-36-12-20** ; 934-36-12; 934-36-13 **ACCESSION NO:** 8464
Title: Phase II Environmental Site Assessment, Central Maintenance Yard, 10517 - 95th Street NW, Blocks Z and T; Plan 6047ET & Lots 25-28; Block 10; Plan RN23, Edmonton, Alberta
Date: March 3, 2016
Author: Dickie, Rob; Griffith, Fritz; Anderson, Tawnya ; Nichols Environmental (Canada) Ltd.
Abstract: Phase II Environmental Site Assessment for the Central Maintenance Yard

Neighbrhd: Boyle Street
Location: 10517 - 95 Street 95 105
Routine Disclosure: Yes **Digital Copy:** Yes

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Engineering Services Library Search Concise Report

Cadastral: **934-36-12-21** ; 934-36-12; 931-32-22; 931-32-17 **ACCESSION NO:** 8508
Title: Initial Project Review, Geotechnical Drilling Program, Proposed Boat Launches in Dawson Park, Emily Murphy Park and Hawrelak Park
Date: September 24, 2015
Author: Panesar, Harjeet; Rasmussen, Niels ; Thurber Engineering Ltd.
Abstract: Information about proposed test hole drilling program to collect geotechnical subsurface information for proposed boat launches. Drilling program will assist in design of floating docks, staircases and dock signage.
Routine Disclosure: Yes **Digital Copy:** Yes

****

Cadastral: **934-36-12-22** ; 934-36-12; 934-36-13 **ACCESSION NO:** 9141
Title: Delineation Program, Central Maintenance Yard, 10517 & 10555 - 95th Street NW, Blocks Z and T; Plan 6047ET & Lots 25-28; Block 10; Plan RN23, Edmonton, Alberta
Date: January 10, 2018
Author: Dickie, Rob; Anderson, Tawnya ; Nichols Environmental (Canada) Ltd.
Abstract: Phase II Environmental Site Assessment for the Central Maintenance Yard. Risk Management is recommended.
Neighbrhd: Boyle Street
Location: 10517 - 95 Street 95 105
Digital Copy: Yes

****

Cadastral: **934-36-12-23** ; 934-36-12; 934-36-19; 934-36-20; 934-40-16; 934-40-25 **ACCESSION NO:** 9238
Title: Dawson Park and Kinnaird Ravine Master Plan, Environmental Impact Assessment, (Draft Report) (DIGITAL COPY ONLY)
Date: February 1, 2018
Author: Jordan, Julia; Rath, Darren; O'Brien, Darcy ; Basin Environmental Ltd.
Abstract: EIA for numerous upgrades to Dawson Park and Kinnaird Ravine.
Routine Disclosure: Yes **Digital Copy:** Yes

****

Cadastral: **934-36-12-24** ; 934-36-12; 934-36-13 **ACCESSION NO:** 9516
Title: Site Assessment Central Maintenance Yard 10517 - 95 Street NW Blocks Z and T; Plan 6047ET Edmonton, Alberta - DIGITAL COPY ONLY
Date: December 5, 2018
Author: Trahan, Tessa; Hunter, Kyle; Anderson, Tawnya; Rakewich, Barry; Dickie, Rob ; Nichols Environmental (Canada) Ltd.
Abstract: Site assessment initiated to delineate the petroleum hydrocarbon plume identified in previous assessments in the southeast portion of the Property.
Neighbrhd: Boyle Street
Location: 10517 - 95 Street NW 95 Street 105 Avenue
Routine Disclosure: Yes **Digital Copy:** Yes

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Cadastral: **934-36-12-25** ; 934-36-12; 934-36-19; 934-36-20; 934-36-21; 934-40-16; 934-40-17 **ACCESSION NO:** 9629
Title: Dawson Park/Kinnaird Ravine and Oleskiw Park Master Plans, Geotechnical Assessment, Edmonton, Alberta
Date: March 17, 2017
Author: Butorac, Milan; Rasmussen, Niels; Tweedie, Robin ; Thurber Engineering Ltd.

Abstract: Development of two separate and distinct park master plans. Purpose of this plan is to protect the North Saskatchewan River Valley and Ravine system.
Routine Disclosure: Yes **Digital Copy:** Yes

****

Cadastral: **934-36-12-26** ; 934-36-12 **ACCESSION NO:** 9787

Title: DIGITAL COPY ONLY - Latta Bridge (B027) Condition Assessment, Load Evaluation and Management Strategy
Date: December 11, 2019
Author: Khushiram, Chand; Dastfan, Mehdi; Alexander, Scott ; COWI North America Ltd.
Abstract: Level I and II inspections, concrete deck and abutment non-destructive testing were completed and a desktop study on the slope stability of the South abutment. Condition assessment, load evaluation and development of a management strategy.
Neighbrhd: River Valley Kinnaird; Boyle Street
Location: 91 Jasper
Routine Disclosure: Yes **Digital Copy:** Yes

****

Cadastral: **934-36-12-27** ; 934-36-12 **ACCESSION NO:** 9788
Title: DIGITAL COPY ONLY - Latta Bridge at Jasper Avenue and 91st Street, Edmonton, Alberta, Preliminary Geotechnical Assessment
Date: July 31, 2019
Author: Froese, Ken; Wang, Xiaobo ; Thurber Engineering Ltd.
Abstract: Preliminary geotechnical assessment with recommendations for further remediation or replacement.

Neighbrhd: River Valley Kinnaird; Boyle Street
Location: 91 Jasper
Routine Disclosure: Yes **Digital Copy:** Yes

****

Cadastral: **934-36-12-28** ; 934-36-12 **ACCESSION NO:** 9789
Title: DIGITAL COPY ONLY - Latta Bridge, Condition Assessment and Preliminary Design Report

Date: April 25, 2001
Author: Zemp, Robert ; Maxim Morrison Hershfield Limited
Abstract: Condition assessment and preliminary design for the Latta Bridge.
Neighbrhd: River Valley Kinnaird; Boyle Street
Location: 91 Jasper
Routine Disclosure: Yes **Digital Copy:** Yes

****

Cadastral: **934-36-12-29** ; 934-36-12; 934-36-13 **ACCESSION NO:** 9832

Title: 2019 Field Program Central Maintenance Yard 10517 - 95 Street NW Block Z; Plan 6047ET; Edmonton, Alberta AEP File No. SCD02626

Date: March 31, 2020

Author: Hunter, Kyle; Belzevick, Ivan; Anderson, Tawnya; Dickie, Rob ; Nichols Environmental (Canada) Ltd.

Abstract: 2019 field program initiated to develop a recovery well network, delineate PHC impacts in soil and groundwater, complete annual groundwater monitoring, and biannual soil vapour monitoring programs as per the property's RMP.

Neighbrhd: Boyle Street

Location: 10517 - 95 Street NW 95 Street

Routine Disclosure: Yes **Digital Copy:** Yes

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Cadastral: **934-36-12-30** ; 934-36-12 **ACCESSION NO:** 9841

Title: Latta Bridge, Preliminary Geotechnical Investigtion and Slope Stability Assessment - Jasper Avenue Near 91 Street NW

Date: May 7, 2020

Author: Pineda, José G. ; Thurber Engineering Ltd.

Abstract: This report presents the results of a preliminary geotechnical investigation, slope stability assessment, and coal mine workings evaluation carried out by Thurber Engineering Ltd. (Thurber) at the Latta Bridge site located on Jasper Avenue near 91 Street, Edmonton, Alberta.

Neighbrhd: Boyle Street; River Valley Kinnaird

Location: 91 Street NW Jasper Avenue

Routine Disclosure: Yes **Digital Copy:** Yes

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Environmental Public Health
HSBC Building
Suite 700, 10055 – 106 Street,
Edmonton, AB T5J 2Y2
Fax 780.735.1802
Phone 780.735.1800
AHS.EZ.RecordsSearch@albertahealthservices.ca

24 September, 2020

Sabinus Okafor
Thurber Engineering Ltd.
4127 Roper Road NW
Edmonton, AB   T6B 3S5

Dear Sabinus,

Re: Your request for records search –

On August 25, 2020, our office received your request for information regarding the following properties:

9075 & 9131 - Jasper Avenue & 10336 – 89 Street, Edmonton, Alberta

We have conducted a search for records created in accordance with public health legislation, including records relating to hazardous waste sites, abandoned landfills and contamination sources constituting a public health nuisance.

Our records indicate there are no results of any contaminated sites at the above properties. No further documentation was available, no landfills found. It should be noted that the fact that records do not exist does not necessarily mean that the properties comply with all applicable legislation.

Please be advised that records relevant to your search may be held by other agencies, such as Alberta Environment and Sustainable Resource Development, Alberta Energy and Utilities Board, local governments, and others. You should contact these agencies directly for further information.

Enclosed is the invoice for this service.

$50.00 x 3 file search
TOTAL OWING: $150.00

Sincerely,
Alberta Health Services

For Karah Harvey, HBK, BEH(AD), CPHI(C)
Environmental Health Officer/Executive Officer

ENVIRONMENTAL LAW CENTRE
#410, 10115 - 100A Street, Edmonton, AB T5J 2W2
Phone: (780) 424-5099 Fax: (780) 424-5133
Internet: www.elc.ab.ca E-Mail: elc@elc.ab.ca

July 17, 2020

Our File: 131048

Mr. Sabinus Okafor
Thurber Engineering Ltd.
7201, 4127 Roper Road NW
Edmonton, AB T6B 3S5

Dear Mr. Okafor:

RE: Search Requested - City of Edmonton

In response to your request of July 17, 2020, we have searched the Environmental Enforcement Historical Search Service database for an exact match with respect to the above request, and can advise that as of today's date, the enforcement actions listed in the attached report have been issued by Alberta Environment and Parks (AEP) pursuant to the Alberta "Environmental Protection and Enhancement Act" ("EPEA") and its predecessor legislation, the "Hazardous Chemicals Act", "Agricultural Chemicals Act", "Clean Water Act" and "Clean Air Act" to 1971, and/or pursuant to the "Water Act" from 1999 onwards. The attached report may also contain records which are not an exact match to your search request but may be related to the subject of your search.

This search is limited to the following enforcement actions under EPEA and its predecessor legislation: Tickets, Prosecutions, Administrative Penalties, Warnings, Enforcement Orders, Enforcement Orders Concerning Waste, Environmental Protection Orders, Emergency Environmental Protection Orders, Emission Control Orders, Chemical Control Orders, Water Quality Control Orders and Stop Orders. This search is limited to the following enforcement actions under the Water Act: Prosecutions, Administrative Penalties, Water Management Orders, Warnings and Enforcement Orders. It does not include Clean Up Orders issued under the Litter Act or Environmental Protection Orders respecting unsightly property issued under EPEA; this information may be available from the local municipality.

Enforcement actions are entered in the database following: (1) the decision date, for prosecutions; (2) the date an administrative penalty was paid or due (30 days after issuance), whichever is sooner; and (3) the date the document was issued for all other enforcement actions.

These search results are based on information provided by AEP. AEP advises that they try to provide the best information possible. However, AEP advises that it cannot guarantee that the information provided is complete or accurate and that any person relying on these search results does so at their own risk. More information may be gained by referring to original enforcement documents. Alberta Energy Regulator (AER) enforcement actions are not included (see the AER Public Compliance dashboard database).

Copies of orders are available from the Environmental Law Centre. Any other enforcement information may be available directly from Alberta Environment.

Yours sincerely,

Cindy Dewing
Enforcement Search Service
Encl.

ENVIRONMENTAL LAW CENTRE
#410, 10115 - 100A Street, Edmonton, AB T5J 2W2
Phone: (780) 424-5099 Fax: (780) 424-5133
Internet: www.elc.ab.ca E-Mail: elc@elc.ab.ca

Environmental Enforcement Historical Search Service

Accountable Party	Action	Decision Date/ Penalty	Municipality/s Legal Description/s	Act/s & Section/s	Comments/Disposition
Edmonton, City of	Water Quality Control Order	05-Nov-1991 $0.00	Edmonton	CWA 14(1)	Release of water contaminant (raw sewage); failure to report; company to take temporary measures to prevent discharges of raw sewage; submit written report outlining monitoring results and methods; submit written proposal for long term and permanent corrective actions; submit written proposal to identify magnitude of dry weather raw sewage overflows; submit written monthly reports detailing actions taken to comply with Order.
Edmonton, City of	Warning Letter	03-Mar-1992 $0.00	Edmonton	HCA 17	Acceptance of prohibited material at Cloverbar Landfill, contrary to licence conditions and Hazardous Waste Regulations
Edmonton, City of	Water Quality Control Order	19-Feb-1993 $0.00	Edmonton	CWA 14	Discharge of hydrofluosilicic acid from Rossdale Water Treatment and Clean Water Reservoir into the North Saskatchewan River; directed to install additional containment systems; undertake preventative maintenance inspections; develop a plan to ensure adequate (secondary) containment at both Rossdale and E.L. Smith treatment plants; detail existing methods used for keeping inventories of chemicals.
Edmonton, City of	Administrative Penalty	27-Sep-1995 $2,000.00	Edmonton	AEPEA 99(2)	Failed to report the release of hydraulic oil from a City of Edmonton vehicle into the North Saskatchewan River (at Capilano Bridge); paid 23-OCT-1995.
Edmonton, City of	Warning Letter	21-Jul-1999	Edmonton	AEPEA 213(e)	The City of Edmonton contravened the terms of their approval to operate the Goldbar Wastewater Treatment Plant by bypassing the wastewater treatment plant and releasing untreated or partially treated wastewater to the North Saskatchewan River.

Report Printed:

July 17, 2020
9:28 AM

Search Requested:

City of Edmonton

Acts:

ACA:	Agriculture Chemicals Act	CAA:	Clean Air Act	HCA:	Hazardous Chemicals Act
AEPEA:	Environmental Protection Enhancement Act(S.A.1992)	CC:	Criminal Code (Canada)	LA:	Litter Act
AEPEA(R)	Environmental Protection & Enhancement Act(R.S.A.2000)	CWA:	Clean Water Act	TDGCA:	Transportation of Dangerous Goods Control Act
BCA:	Beverage Container Act	DEA:	Dept. of Environment Act	WA:	Water Act
		FFA:	Fisheries Act (Canada)		

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Accountable Party	Action	Decision Date/ Penalty	Municipality/s Legal Description/s	Act/s & Section/s	Comments/Disposition
Edmonton, The City of	Prosecution	07-Mar-2002		AEPEA 213(e)	Count 1: On or about September 16, 2000 at or near Edmonton, in the Province of Alberta did unlawfully contravene a term or condition of an approval, to wit: 9.2.1(a)(ii) of Approval No. 95-MUN-117 which provides as follows: The Approval Holder shall contact the Director of Pollution Control at 1-800-222-6514 immediately after any of the following events: (a) if untreated or partially treated sewage; (ii) from the wastewater collection system overflows under dry weather conditions, contrary to s.213(e) of the Environmental Protection and Enhancement Act. Withdrawn 7 March 2002.
Edmonton, The City of	Prosecution	07-Mar-2002 $200,000.00		AEPEA 213(e)	Count 2: On or about September 16, 2000 at or near Edmonton, in the Province of Alberta did unlawfully contravene a term or condition of an Approval, to wit: 9.2.1(a)(iii) of Approval No. 95-MUN-117 which provides as follows: The Approval Holder shall contact the Director of Pollution Control at 1-800-222-6514 immediately after any of the following events: (a) if untreated or partially treated sewage; (iii) bypasses or overflows from lift stations contrary to s.213(e) of the Environmental Protection and Enhancement Act. Pled guilty 7 March 2002 and sentenced to a fine of 5,000 with a creative sentence. Fine paid 11 April 2002. An order requiring the City to pay a further $5,000 to cover the costs of Alberta Environment's investigation into the matter, and a Creative Sentence Order of $190,000 was issued 30 April 2002. The Creative Sentence Order was granted to fund a leading-edge university study to determine potential alternate uses for city wastewater. Order complied with 14 October 2005.

Acts:

ACA:	Agriculture Chemicals Act	CAA:	Clean Air Act	HCA:	Hazardous Chemicals Act
AEPEA:	Environmental Protection Enhancement Act(S.A.1992)	CC:	Criminal Code (Canada)	LA:	Litter Act
AEPEA(R)	Environmental Protection & Enhancement Act(R.S.A.2000)	CWA:	Clean Water Act	TDGCA:	Transportation of Dangerous Goods Control Act
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Accountable Party	Action	Decision Date/ Penalty	Municipality/s Legal Description/s	Act/s & Section/s	Comments/Disposition
Edmonton, The City of	Prosecution	07-Mar-2002		AEPEA 213(e)	Count 3: On or between September 16, 2000 and September 18, 2000, both dates inclusive, at or near Edmonton, in the Province of Alberta, did unlawfully contravene a term or condition of an Approval, to wit: 5.1.2 of Approval No. 95-MUN-117 which provides as follows: Untreated or partially treated wastewater into the treatment plant shall not be bypassed to the North Saskatchewan River during dry weather conditions, contrary to s.213(e) of the Environmental Protection and Enhancement Act. Withdrawn 7 March 2002.
Edmonton, The City of	Prosecution	17-Feb-2006	Edmonton Plan 2191EO, Block OT	AEPEA 98(2)	Count 1: On or between the 3rd day of August and the 8th day of August, 2001, at or near Edmonton, in the Province of Alberta, did unlawfully release or permit the release into the environment of a substance in an amount, concentration or level or at a rate of release that causes or may cause a significant adverse effect, contrary to section 98(2) of the Environmental Protection and Enhancement Act. Found not guilty 17 February 2006.
Edmonton, The City of	Prosecution	17-Feb-2006	Edmonton Plan 2191EO, Block OT	AEPEA 99(1)	Count 2: On or between the 3rd day of August, 2001 and the 9th day of August, 2001 at or near Edmonton, in the Province of Alberta, being a person who releases or causes or permits the release of a substance into the environment that has caused, is causing, or may cause an adverse effect, did fail, as soon as that person knows or ought to know of the release, report it to the Director, contrary to section 99(1) of the Environmental Protection and Enhancement Act. Found not guilty 17 February 2006.

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Accountable Party	Action	Decision Date/ Penalty	Municipality/s Legal Description/s	Act/s & Section/s	Comments/Disposition
Edmonton, The City of	Prosecution	17-Feb-2006	Edmonton Plan 2191EO, Block OT	AEPEA 99(2)	Count 3: On or between the 3rd day of August, 2001 and the 9th day of August, 2001 at or near Edmonton in the Province of Alberta, being a person having control of a substance that is released into the environment that has caused, is causing, or may cause an adverse effect, did fail, immediately on becoming aware of the release, report it to the Director, contrary to section 99(2) of the Environmental Protection and Enhancement Act. Found not guilty 17 February 2006.
Edmonton, The City of	Prosecution	17-Feb-2006	Edmonton Plan 2191EO, Block OT	AEPEA 99(1)	Count 4: On or between the 4th day of August, 2001 and the 10th day of August, 2001 at or near Edmonton, in the Province of Alberta, being a person who releases or causes or permits the release of a substance into the environment that has caused, is causing, or may cause an adverse effect, did fail, as soon as that person knows or ought to know of the release, report it to the Director, contrary to section 99(1) of the Environmental Protection and Enhancement Act. Found not guilty 17 February 2006.
Edmonton, The City of	Prosecution	17-Feb-2006	Edmonton Plan 2191EO, Block OT	AEPEA 99(2)	Count 5: On or between the 4th day of August, 2001 and the 10th day of August, 2001 at or near Edmonton in the Province of Alberta, being a person having control of a substance that is released into the environment that has caused, is causing, or may cause an adverse effect, did fail, immediately on becoming aware of the release, report it to the Director, contrary to section 99(2) of the Environmental Protection and Enhancement Act. Found not guilty 17 February 2006.

Acts:

ACA:	Agriculture Chemicals Act	CAA:	Clean Air Act	HCA:	Hazardous Chemicals Act
AEPEA:	Environmental Protection Enhancement Act(S.A.1992)	CC:	Criminal Code (Canada)	LA:	Litter Act
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BCA:	Beverage Container Act	DEA:	Dept. of Environment Act	WA:	Water Act
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Accountable Party	Action	Decision Date/ Penalty	Municipality/s Legal Description/s	Act/s & Section/s	Comments/Disposition
Edmonton, The City of	Prosecution	17-Feb-2006	Edmonton Plan 2191EO, Block OT	AEPEA 99(1)	Count 6: On or between the 5th day of August, 2001 and the 10th day of August, 2001 at or near Edmonton, in the Province of Alberta, being a person who releases or causes or permits the release of a substance into the environment that has caused, is causing, or may cause an adverse effect, did fail, as soon as that person knows or ought to know of the release, report it to the Director, contrary to section 99(1) of the Environmental Protection and Enhancement Act. Found not guilty 17 February 2006.
Edmonton, The City of	Prosecution	17-Feb-2006	Edmonton Plan 2191EO, Block OT	AEPEA 99(2)	Count 7: On or between the 5th day of August, 2001 and the 10th day of August, 2001 at or near Edmonton, in the Province of Alberta, being a person having control of a substance that is released into the environment that has caused, is causing, or may cause an adverse effect, did fail, immediately on becoming aware of the release, report it to the Director, contrary to section 99(2) of the Environmental Protection and Enhancement Act. Found not guilty 17 February 2006.
Edmonton, The City of	Prosecution	17-Feb-2006	Edmonton Plan 2191EO, Block OT	AEPEA 99(1)	Count 8: On or between the 8th day of August, 2001 and the 10th day of August, 2001 at or near Edmonton, in the Province of Alberta, being a person who releases or causes or permits the release of a substance into the environment that has caused, is causing, or may cause an adverse effect, did fail, as soon as that person knows or ought to know of the release, to report it to the Director, contrary to section 99(1) of the Environmental Protection and Enhancement Act. Found not guilty 17 February 2006.

Acts:

ACA:	Agriculture Chemicals Act	CAA:	Clean Air Act	HCA:	Hazardous Chemicals Act
AEPEA:	Environmental Protection Enhancement Act(S.A.1992)	CC:	Criminal Code (Canada)	LA:	Litter Act
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Accountable Party	Action	Decision Date/ Penalty	Municipality/s Legal Description/s	Act/s & Section/s	Comments/Disposition
Edmonton, The City of	Prosecution	17-Feb-2006	Edmonton Plan 2191EO, Block OT	AEPEA 99(2)	Count 9: On or between the 8th day of August, 2001 and the 10th day of August, 2001 at or near Edmonton in the Province of Alberta, being a person having control of a substance that is released into the environment that has caused, is causing, or may cause an adverse effect, did fail, immediately on becoming aware of the release, report it to the Director, contrary to section 99(2) of the Environmental Protection and Enhancement Act. Found not guilty 17 February 2006.
Edmonton, City of	Prosecution	15-Jul-2019		AEPEA(R) 227(j), 110(1)	Count 1: On or between the 11th day of May, 2016, and the 9th day of September, 2016, at or near Edmonton, in the Province of Alberta, being a person who releases or causes or permits the release of a substance into the environment that may cause, is causing or has caused an adverse effect did fail to report that release to the Director as soon as that person knew or ought to have known of the release contrary to section 110(1) of the Environmental Protection and Enhancement Act and did thereby commit an offence contrary to section 227(j) of the Environmental Protection and Enhancement Act, evidence of said offence having first come to the attention of the Director on or after September 9, 2016. Withdrawn July 15, 2019.
Edmonton, City of	Prosecution	15-Jul-2019		AEPEA(R) 109(2), 227(j)	Count 2: On or about the 11th day of May, 2016, at or near Edmonton, in the Province of Alberta, did release or permit the release into the environment of a substance in an amount, concentration or level or at a rate of release that causes or may cause a significant adverse effect contrary to section 109(2) of the Environmental Protection and Enhancement Act and did thereby commit an offence contrary to section 227(j) of the Environmental Protection and Enhancement Act, evidence of said offence having first come to the attention of the Director on or after September 9, 2016. Withdrawn July 15, 2019.

Acts:

ACA:	Agriculture Chemicals Act	CAA:	Clean Air Act	HCA:	Hazardous Chemicals Act
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Accountable Party	Action	Decision Date/ Penalty	Municipality/s Legal Description/s	Act/s & Section/s	Comments/Disposition
Edmonton, City of	Prosecution	15-Jul-2019		AEPEA(R) 24/97; 33(a), 5(1)	Count 3: On or about the 11th day of May, 2016, at or near Edmonton, in the Province of Alberta, did use, apply, supply, handle, transport, display, store or dispose of a pesticide in a manner or at a time or place that causes or is likely to cause an adverse effect contrary to section 5(1) of the Pesticide Sales, Handling, Use and Application Regulation and did thereby commit an offence contrary to section 33(a) of the Pesticide Sales, Handling, Use and Application Regulation, evidence of said offence having first come to the attention of the Director on or after September 9, 2016. Withdrawn July 15, 2019.
Edmonton, City of	Prosecution	15-Jul-2019 $165,000.00		AEPEA(R) 227(j), 163(1)	Count 4: On or about the 11th day of May, 2016, at or near Edmonton in the Province of Alberta, did distribute, use, apply or handle a pesticide except in accordance with the label for that pesticide contrary to section 163(1) of the Environmental Protection and Enhancement Act and did thereby commit an offence contrary to section 227(j) of the Environmental Protection and Enhancement Act, evidence of said offence having first come to the attention of the Director on or after September 9, 2016. Pled guilty and was sentenced to a fine of $165,000.00. A a bulk of the penalty is to be diverted to three creative sentencing projects, which include, the creation of two new eco-islands within the Wagner Natural Area in Parkland County; a University of Alberta-led study of biological control potential for slugs; updating of the Identification Guide for Alberta Invasive Plants and the Be Plant Wise brochures, and; a sub project will include using goats to remove invasive plants in the North Saskatchewan watershed.

Acts:

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AEPEA:	Environmental Protection Enhancement Act(S.A.1992)	CC:	Criminal Code (Canada)	LA:	Litter Act
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Accountable Party	Action	Decision Date/ Penalty	Municipality/s Legal Description/s	Act/s & Section/s	Comments/Disposition
Edmonton, City of	Prosecution	15-Jul-2019		AEPEA(R) 163(1), 227(j)	Count 5: On or about the 11th day of May, 2016, at or near Edmonton in the Province of Alberta, did distribute, use, apply or handle a pesticide except in accordance with the label for that pesticide: to wit: did distribute, use, apply or handle a pesticide in a manner that failed to comply with the portion of the label that provides: "PRECAUTIONS...Do not use in residential areas. Residential areas are defined as sites where bystanders including children may be potentially exposed during or after applying. This includes around homes, on school grounds, in parks, playgrounds, playing fields around public buildings or any other areas where the general public including children could be exposed." contrary to section 163(1) of the Environmental Protection and Enhancement Act and did thereby commit an offence contrary to section 227(j) of the Environmental Protection and Enhancement Act, evidence of said offence having first come to the attention of the Director on or after September 9, 2016. Withdrawn July 15, 2019.
Edmonton, City of	Prosecution	15-Jul-2019		AEPEA(R) 163(1), 227(j)	Count 6: On or about the 11th day of May, 2016, at or near Edmonton in the Province of Alberta, did distribute, use, apply or handle a pesticide except in accordance with the label for that pesticide: to wit: did distribute, use, apply or handle a pesticide in a manner that failed to comply with the portion of the label that provides: "PRECAUTIONS...IMPORTANT - Injury to or loss of desirable trees or other plants may result from failure to observe the following: Do not apply, or drain or flush equipment on or near desirable trees or other plants or on areas where their roots may extend, or in locations where the chemical may be washed or moved into contact with their roots. Do not use on lawns, walks, driveways, tennis courts, or similar areas. Prevent drift of spray to desirable plants." contrary to section 163(1) of the Environmental Protection and Enhancement Act and did thereby commit an offence contrary to section 227(j) of the Environmental Protection and Enhancement Act, evidence of said offence having first come to the attention of the Director on or after September 9, 2016. Withdrawn July 15, 2019.

Search Requested:
City of Edmonton

Acts:

ACA:	Agriculture Chemicals Act	CAA:	Clean Air Act	HCA:	Hazardous Chemicals Act
AEPEA:	Environmental Protection Enhancement Act(S.A.1992)	CC:	Criminal Code (Canada)	LA:	Litter Act
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Accountable Party	Action	Decision Date/ Penalty	Municipality/s Legal Description/s	Act/s & Section/s	Comments/Disposition
Edmonton, City of	Prosecution	15-Jul-2019		AEPEA(R) 163(1), 227(j)	Count 7: On or about the 11th day of May, 2016, at or near Edmonton in the Province of Alberta, did distribute, use, apply or handle a pesticide except in accordance with the label for that pesticide: to wit: did distribute, use, apply or handle a pesticide in a manner that failed to comply with the portion of the label that provides: ?BRUSH CONTROL - HYVAR? X-L Weed & Brush Killer may be used to control undesirable woody plants on utility transmission lines, airports, telecommunication sites, storage areas and other non-cropland sites such as farm buildings and fence lines not immediately adjacent to cropland or desirable trees or shrubs. Final kill of brush may not take place until the year following treatment.? contrary to section 163(1) of the Environmental Protection and Enhancement Act and did thereby commit an offence contrary to section 227(j) of the Environmental Protection and Enhancement Act, evidence of said offence having first come to the attention of the Director on or after September 9, 2016. Withdrawn July 15, 2019.

Acts:

ACA:	Agriculture Chemicals Act	CAA:	Clean Air Act	HCA:	Hazardous Chemicals Act
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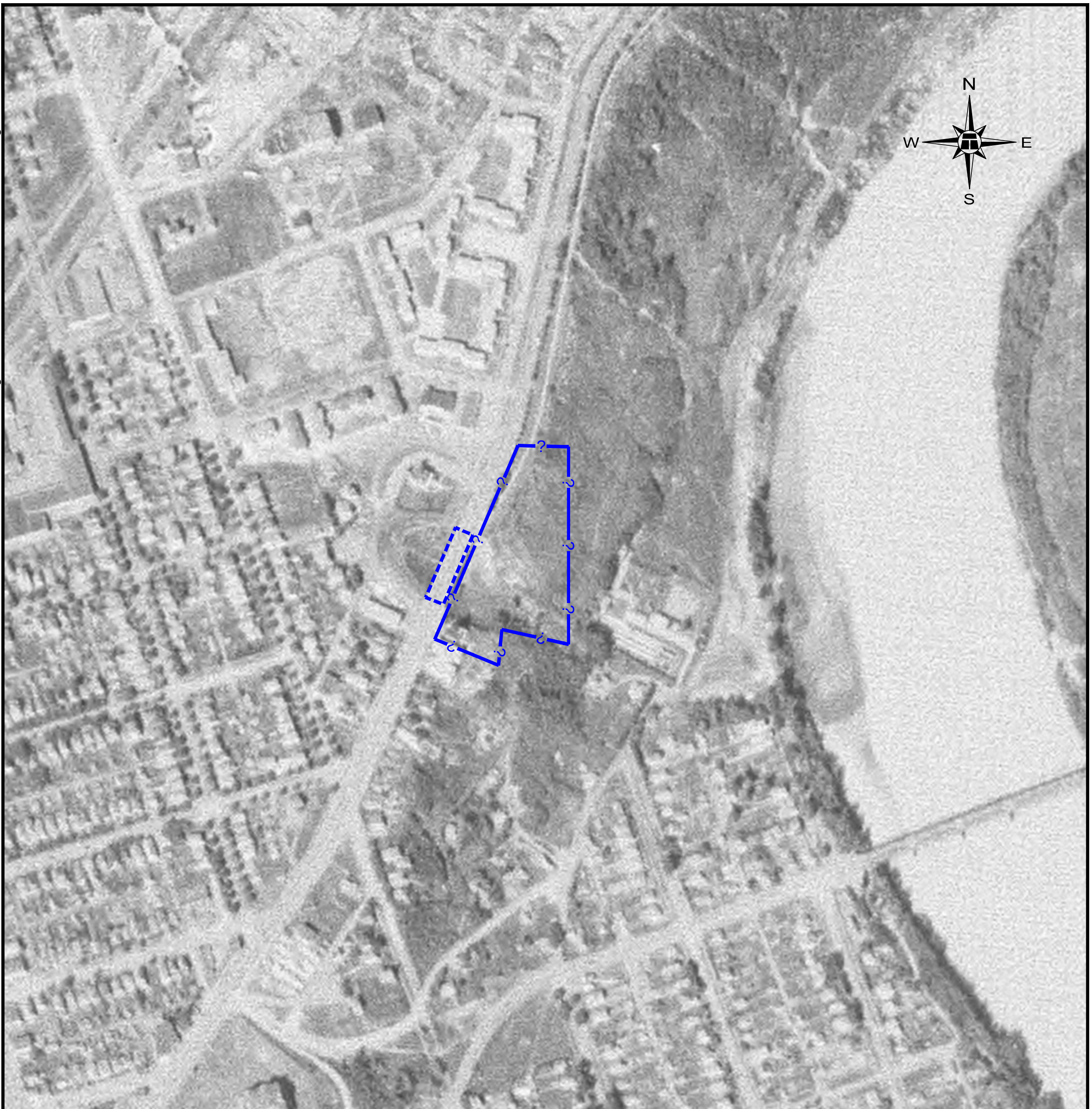
Accountable Party	Action	Decision Date/ Penalty	Municipality/s Legal Description/s	Act/s & Section/s	Comments/Disposition
Edmonton, City of	Enforcement Order	08-Apr-2020	Edmonton SW-18-52-23-W4	WA 36(1), 142(1)(h)	The Party is the registered owner of the lands which are 11 ha in size and are a part of the "Southeast Industrial Development" and that include two seasonal wetlands near the nothern boundary of the lands. The Party, through a consultant, reported to Alberta Environment and Parks ["AEP"] that in preperation for the further development of the lands, which included submitting an application for an approval to infill wetlands, it was discovered that between 2013-2015 approximately 0.97ha of the two wetlands had been impacted during construction of an access road and temporary drainage easement. The wetlands were not observed at that time and that no approval had been obtained. AEP has not issued an approval authorizing any of the unauthorized activities on the lands. The Director is of the opinion that restoration and remediation of the impacted wetlands is required. The Party shall complete the restoration work to the on-site wetlands in accordance with the Wetland Restoration Plan that has been approved by AEP; submit a written Wetland Restoration Monitoring Report; a Wetlands Restoration Verification Proposal, and; upon approval, implement the Proposal in accordance with the Director's written authorization.

THURBER

APPENDIX C

Historical Air photos

H:\29000\29532 Latta & Kinnaird Phase I and II ESA\Drafting\29532 HISTORICAL AIR PHOTO.dwg - 1 - Nov. 27, 2020



LEGEND

APPROXIMATE BOUNDARY OF LATTA BRIDGE

APPROXIMATE BOUNDARY OF TITLED ADJACENT PROPERTIES TO THE EAST OF LATTA BRIDGE

0 50 100 150 200 250 300m

SCALE 1:5000

LATTA BRIDGE (B027) REPLACEMENT, ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT JASPER AVENUE, EDMONTON, ALBERTA

SITE LOCATION SHOWN ON 1950 AIR PHOTO

FIGURE 1

BPTEC ENGINEERING

DRAWN BY	ML
DESIGNED BY	SIO
APPROVED BY	NHF
SCALE	1:5000
DATE	NOVEMBER 2020
FILE No.	29532

THURBER ENGINEERING LTD.

H:\29000\29532 Latta & Kinnaird Phase I and II ESA\Drafting\29532 HISTORICAL AIR PHOTO.dwg - 2 - Nov. 27, 2020

LEGEND

APPROXIMATE BOUNDARY OF LATTA BRIDGE

APPROXIMATE BOUNDARY OF TITLED ADJACENT PROPERTIES TO THE EAST OF LATTA BRIDGE

0 50 100 150 200 250 300m

SCALE 1:5000

LATTA BRIDGE (B027) REPLACEMENT, ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT JASPER AVENUE, EDMONTON, ALBERTA

SITE LOCATION SHOWN ON 1962 AIR PHOTO

FIGURE 2

BPTEC ENGINEERING

DRAWN BY	ML
DESIGNED BY	SIO
APPROVED BY	NHF
SCALE	1:5000
DATE	NOVEMBER 2020
FILE No.	29532

THURBER ENGINEERING LTD.

H:\29000\29532 Latta & Kinnaird Phase I and II ESA\Drafting\29532 HISTORICAL AIR PHOTO.dwg - 3 - Nov. 27, 2020

LEGEND

APPROXIMATE BOUNDARY OF LATTA BRIDGE

APPROXIMATE BOUNDARY OF TITLED ADJACENT PROPERTIES TO THE EAST OF LATTA BRIDGE

0 50 100 150 200 250 300m

SCALE 1:5000

LATTA BRIDGE (B027) REPLACEMENT, ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT JASPER AVENUE, EDMONTON, ALBERTA

SITE LOCATION SHOWN ON 1967 AIR PHOTO

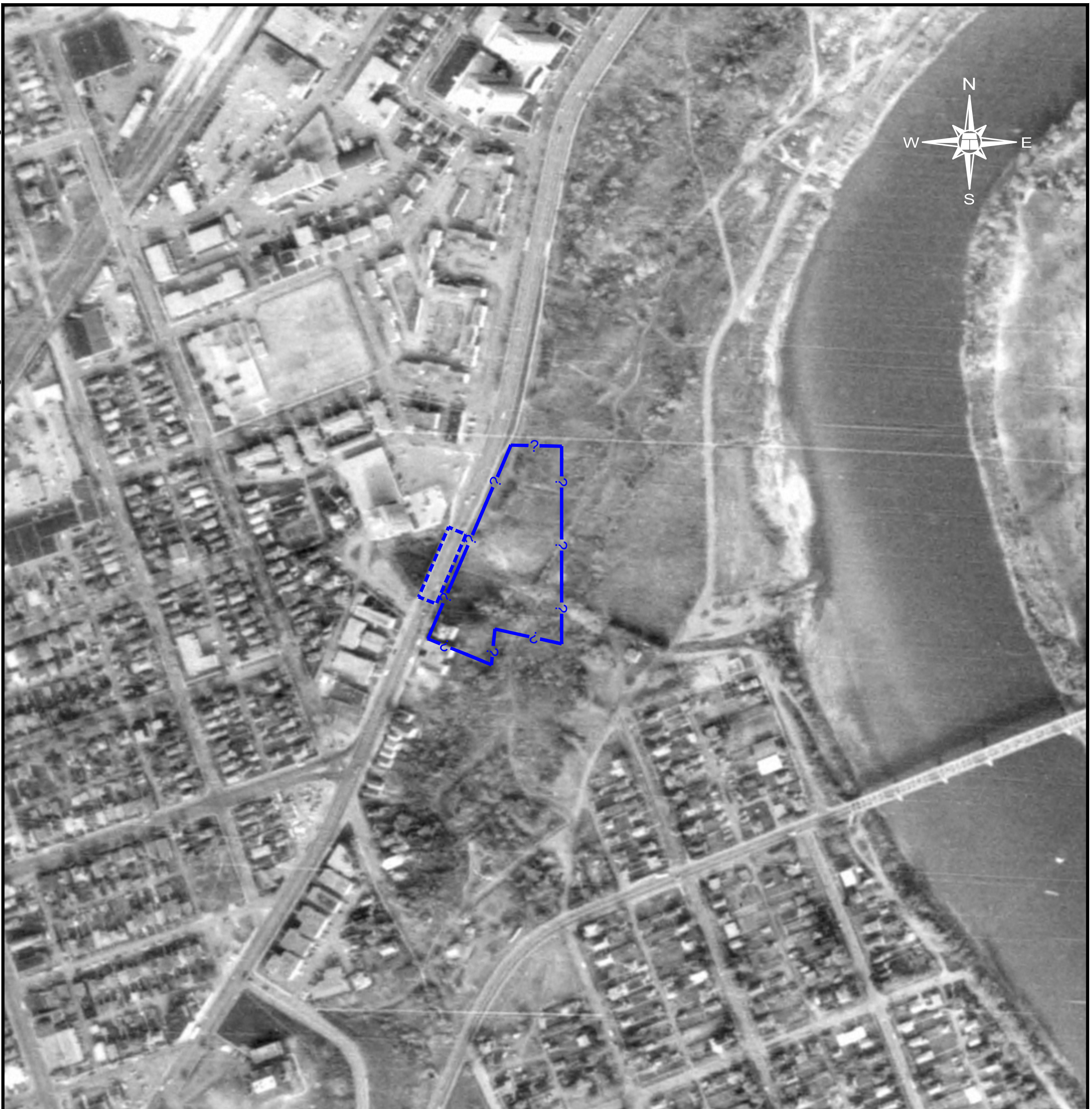
FIGURE 3

BPTEC ENGINEERING

DRAWN BY	ML
DESIGNED BY	SIO
APPROVED BY	NHF
SCALE	1:5000
DATE	NOVEMBER 2020
FILE No.	29532

THURBER ENGINEERING LTD.

H:\29000\29532 Latta & Kinnaird Phase I and II ESA\Drafting\29532 HISTORICAL AIR PHOTO.dwg - 4 - Nov. 27, 2020



LEGEND

APPROXIMATE BOUNDARY OF LATTA BRIDGE

APPROXIMATE BOUNDARY OF TITLED ADJACENT PROPERTIES TO THE EAST OF LATTA BRIDGE

0 50 100 150 200 250 300m

SCALE 1:5000

LATTA BRIDGE (B027) REPLACEMENT, ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT JASPER AVENUE, EDMONTON, ALBERTA

SITE LOCATION SHOWN ON 1972 AIR PHOTO

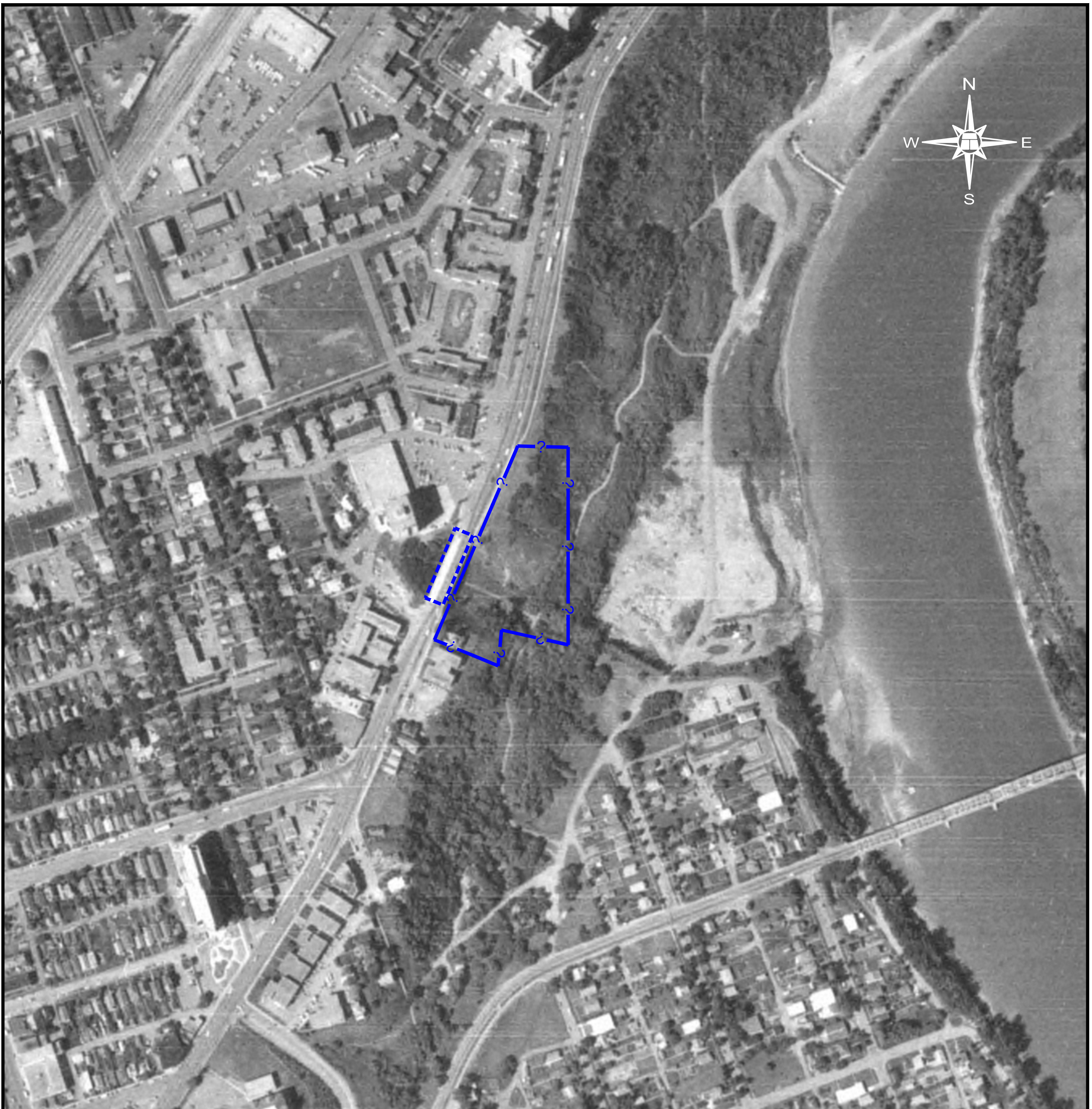
FIGURE 4

BPTEC ENGINEERING

DRAWN BY	ML
DESIGNED BY	SIO
APPROVED BY	NHF
SCALE	1:5000
DATE	NOVEMBER 2020
FILE No.	29532

THURBER ENGINEERING LTD.

H:\29000\29532 Latta & Kinnaird Phase I and II ESA\Drafting\29532 HISTORICAL AIR PHOTO.dwg - 5 - Nov. 27, 2020



LEGEND

APPROXIMATE BOUNDARY OF LATTA BRIDGE

APPROXIMATE BOUNDARY OF TITLED ADJACENT PROPERTIES TO THE EAST OF LATTA BRIDGE

0 50 100 150 200 250 300m

SCALE 1:5000

LATTA BRIDGE (B027) REPLACEMENT, ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT JASPER AVENUE, EDMONTON, ALBERTA

SITE LOCATION SHOWN ON 1977 AIR PHOTO

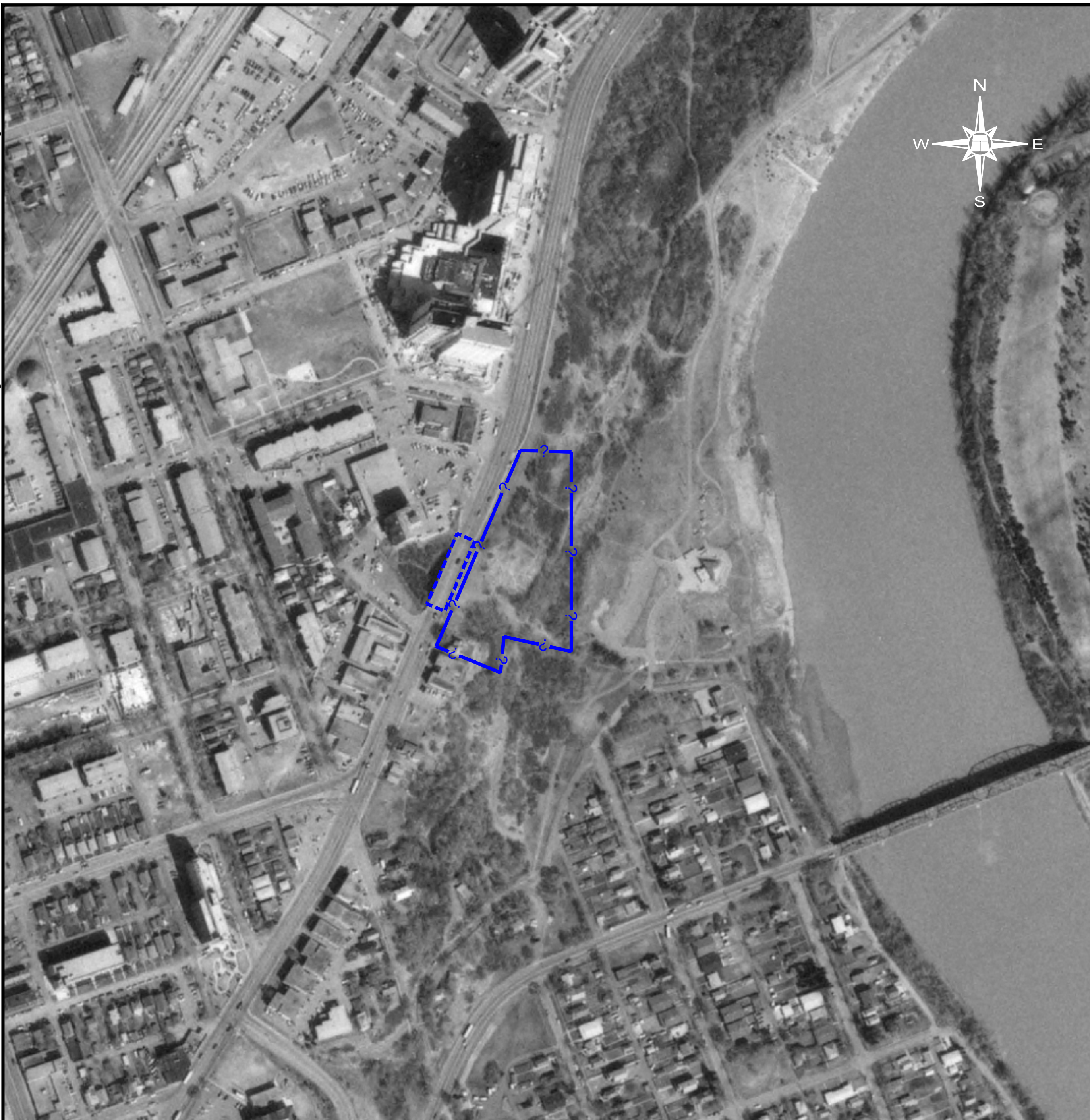
FIGURE 5

BPTEC ENGINEERING

DRAWN BY	ML
DESIGNED BY	SIO
APPROVED BY	NHF
SCALE	1:5000
DATE	NOVEMBER 2020
FILE No.	29532

THURBER ENGINEERING LTD.

H:\29000\29532 Latta & Kinnaird Phase I and II ESA\Drafting\29532 HISTORICAL AIR PHOTO.dwg - 6 - Nov. 27, 2020



LEGEND

APPROXIMATE BOUNDARY OF LATTA BRIDGE

APPROXIMATE BOUNDARY OF TITLED ADJACENT PROPERTIES TO THE EAST OF LATTA BRIDGE

0 50 100 150 200 250 300m

SCALE 1:5000

LATTA BRIDGE (B027) REPLACEMENT, ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT
JASPER AVENUE, EDMONTON, ALBERTA

SITE LOCATION SHOWN ON 1983 AIR PHOTO

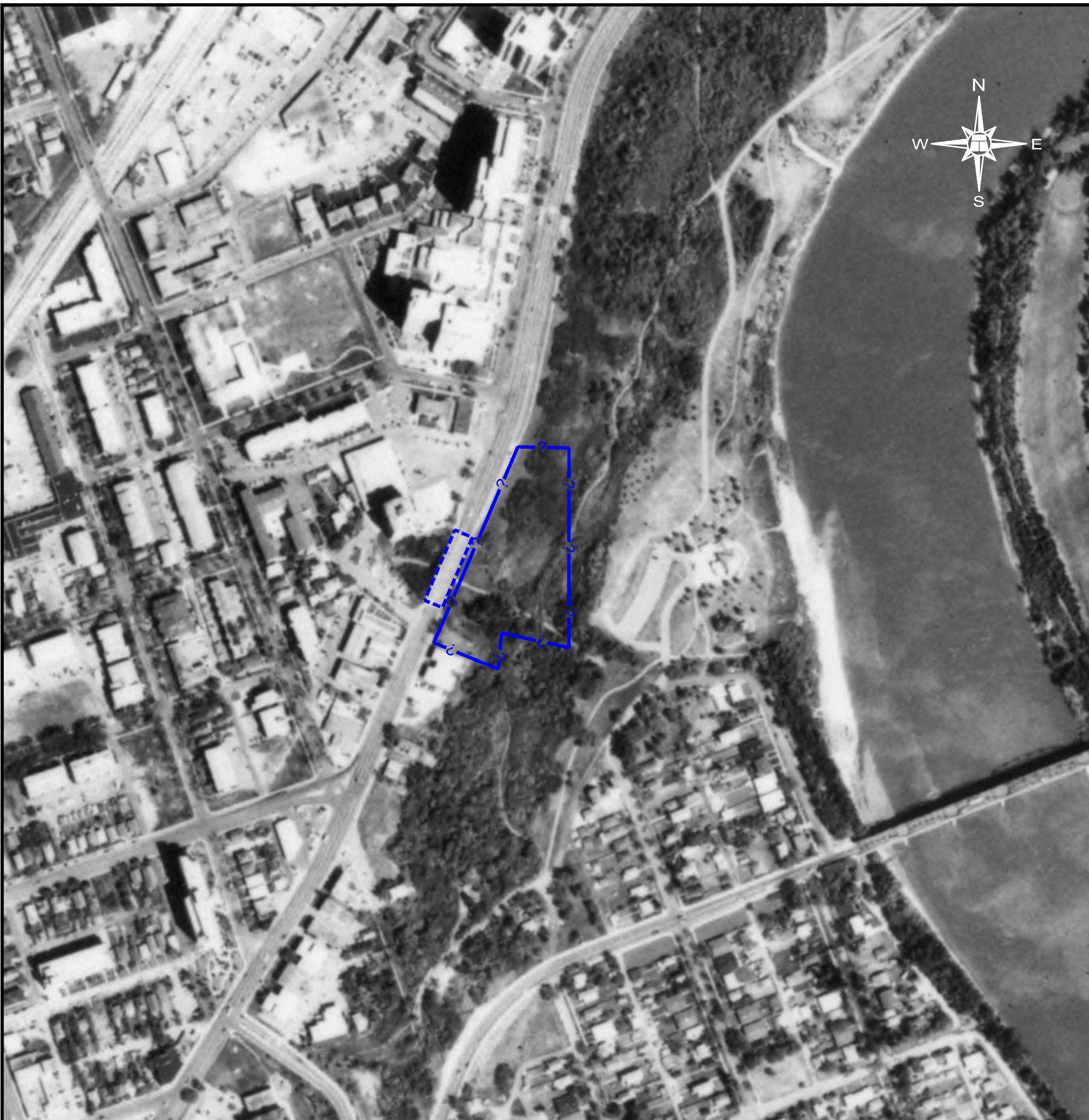
FIGURE 6

BPTEC ENGINEERING

DRAWN BY	ML
DESIGNED BY	SIO
APPROVED BY	NHF
SCALE	1:5000
DATE	NOVEMBER 2020
FILE No.	29532

THURBER ENGINEERING LTD.

H:\29000\29532 Latta & Kinnaird Phase I and II ESA\Drafting\29532 HISTORICAL AIR PHOTO.dwg - 7 - Nov. 27, 2020



LEGEND

APPROXIMATE BOUNDARY OF LATTA BRIDGE

APPROXIMATE BOUNDARY OF TITLED ADJACENT PROPERTIES TO THE EAST OF LATTA BRIDGE

0 50 100 150 200 250 300m

SCALE 1:5000

LATTA BRIDGE (B027) REPLACEMENT, ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT JASPER AVENUE, EDMONTON, ALBERTA

SITE LOCATION SHOWN ON 1987 AIR PHOTO

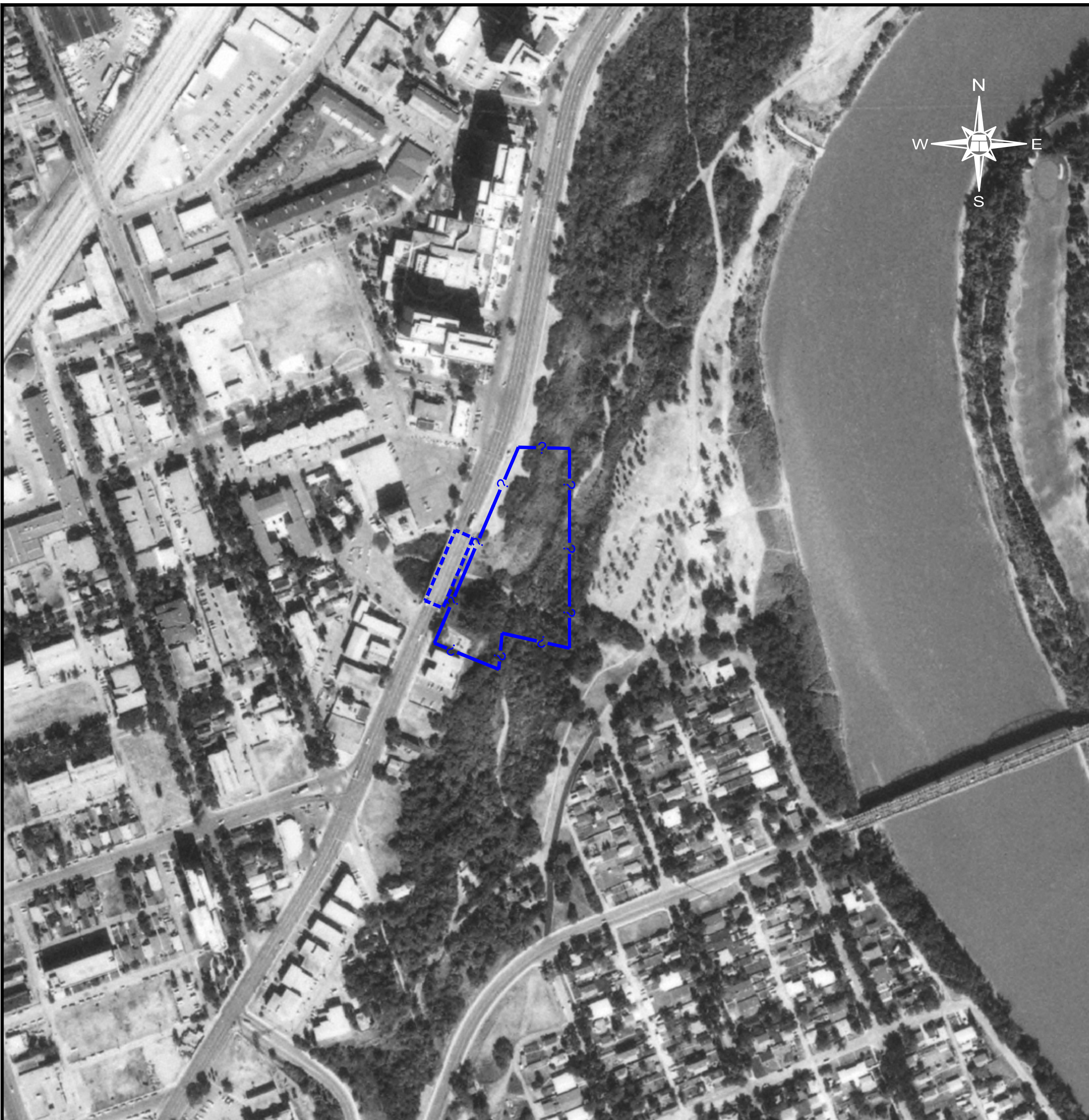
FIGURE 7

BPTEC ENGINEERING

DRAWN BY	ML
DESIGNED BY	SIO
APPROVED BY	NHF
SCALE	1:5000
DATE	NOVEMBER 2020
FILE No.	29532

THURBER ENGINEERING LTD.

H:\29000\29532 Latta & Kinnaird Phase I and II ESA\Drafting\29532 HISTORICAL AIR PHOTO.dwg - 8 - Nov. 27, 2020



LEGEND

APPROXIMATE BOUNDARY OF LATTA BRIDGE

APPROXIMATE BOUNDARY OF TITLED ADJACENT PROPERTIES TO THE EAST OF LATTA BRIDGE

0 50 100 150 200 250 300m

SCALE 1:5000

LATTA BRIDGE (B027) REPLACEMENT, ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT JASPER AVENUE, EDMONTON, ALBERTA

SITE LOCATION SHOWN ON 1992 AIR PHOTO

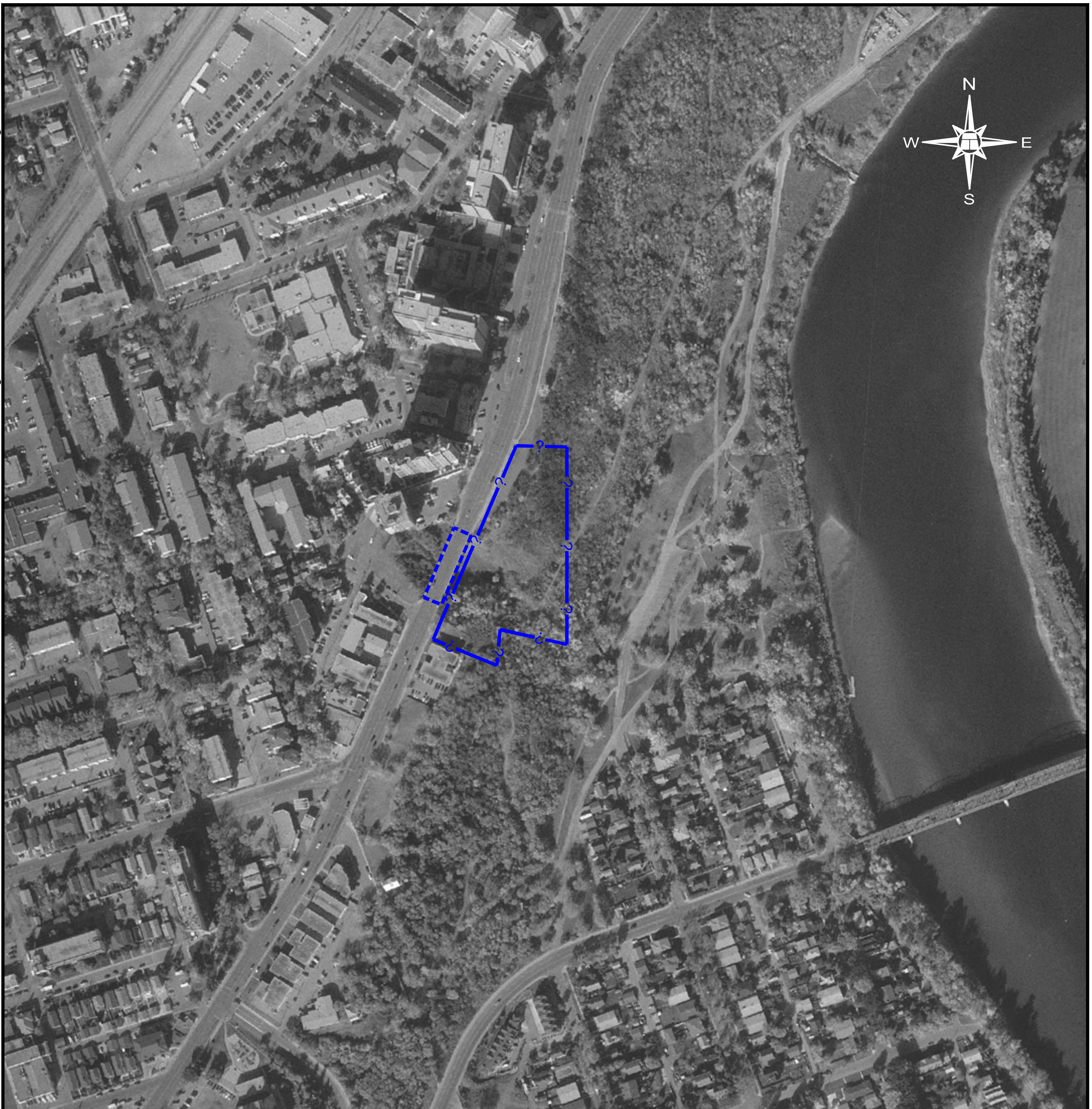
FIGURE 8

BPTEC ENGINEERING

DRAWN BY	ML
DESIGNED BY	SIO
APPROVED BY	NHF
SCALE	1:5000
DATE	NOVEMBER 2020
FILE No.	29532

THURBER ENGINEERING LTD.

H:\29000\29532 Latta & Kinnaird Phase I and II ESA\Drafting\29532 HISTORICAL AIR PHOTO.dwg - 9 - Nov. 27, 2020



LEGEND

APPROXIMATE BOUNDARY OF LATTA BRIDGE

APPROXIMATE BOUNDARY OF TITLED ADJACENT PROPERTIES TO THE EAST OF LATTA BRIDGE

0 50 100 150 200 250 300m

SCALE 1:5000

LATTA BRIDGE (B027) REPLACEMENT, ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT JASPER AVENUE, EDMONTON, ALBERTA

SITE LOCATION SHOWN ON 2001 AIR PHOTO

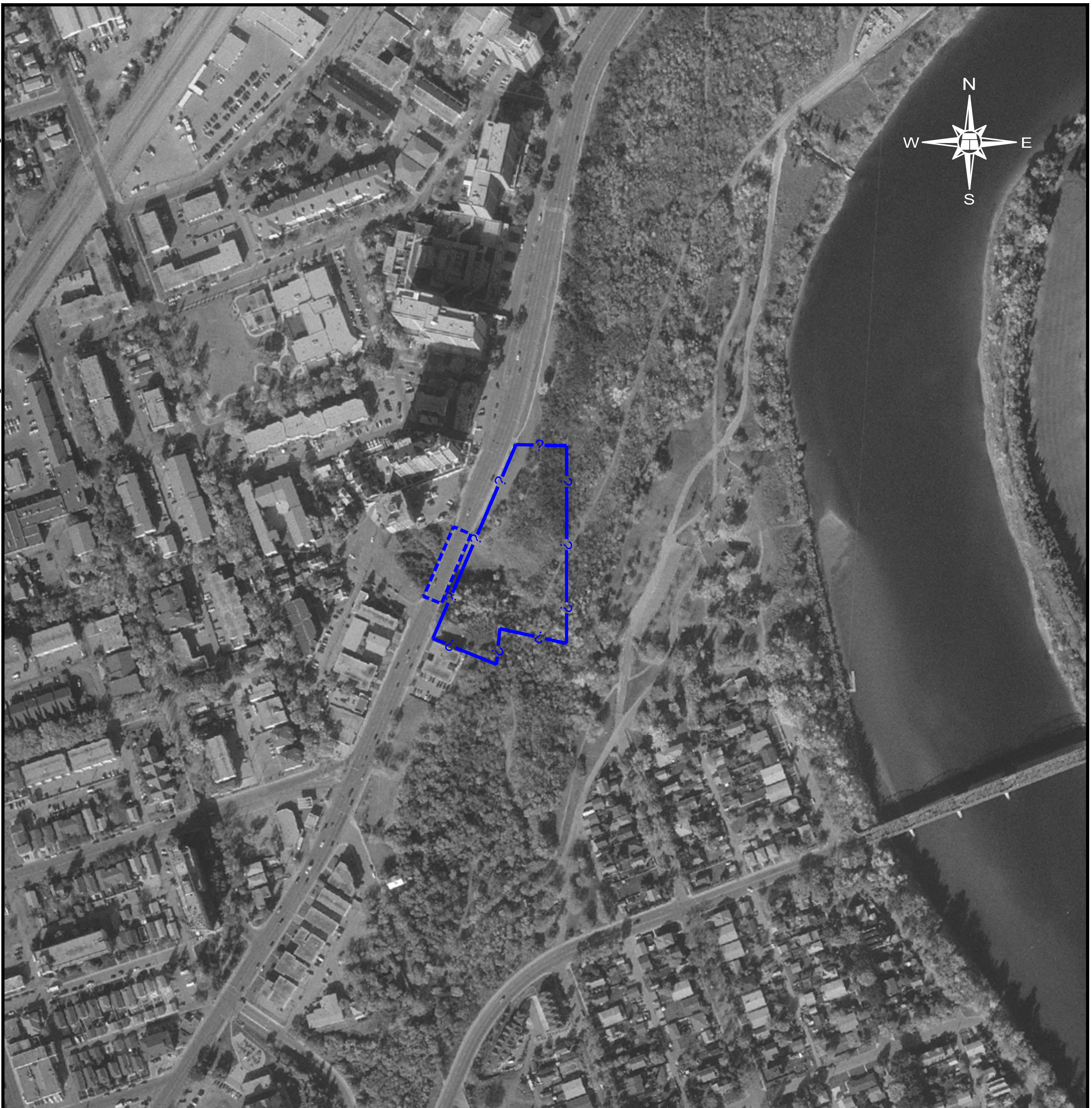
FIGURE 9

BPTEC ENGINEERING

DRAWN BY	ML
DESIGNED BY	SIO
APPROVED BY	NHF
SCALE	1:5000
DATE	NOVEMBER 2020
FILE No.	29532

THURBER ENGINEERING LTD.

H:\29000\29532 Latta & Kinnaird Phase I and II ESA\Drafting\29532 HISTORICAL AIR PHOTO.dwg - 10 - Nov. 27, 2020



LEGEND

APPROXIMATE BOUNDARY OF LATTA BRIDGE

APPROXIMATE BOUNDARY OF TITLED ADJACENT PROPERTIES TO THE EAST OF LATTA BRIDGE

0 50 100 150 200 250 300m

SCALE 1:5000

LATTA BRIDGE (B027) REPLACEMENT, ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT JASPER AVENUE, EDMONTON, ALBERTA

SITE LOCATION SHOWN ON 2008 AIR PHOTO

FIGURE 10

BPTEC ENGINEERING

DRAWN BY	ML
DESIGNED BY	SIO
APPROVED BY	NHF
SCALE	1:5000
DATE	NOVEMBER 2020
FILE No.	29532

THURBER ENGINEERING LTD.

APPENDIX D

Hand Auger and Test Hole Logs

SURFICIAL BASELINE SOIL LOGS (HAND AUGER TEST HOLES)
ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT
LATTA BRIDGE (B027) REPLACEMENT PROJECT
EDMONTON, ALBERTA

Sample ID	GPS Coordinates (12 U TM)		Approximate Elevation	Sample Depth	Eagle RKI Organo-Vapour Analyser	Eagle RKI Photoionization	Soil Description
	Easting (m)	Northing (m)	(m)	(m bgs)	(ppmv)	(ppmv)	
TP20-1	336092	5936303		0-0.15	5	0	Topsoil: silty, dark brown
				0.15-0.3	10	0	
				0.3-0.5	15	0	
TP20-2	336105	5936333	657	0-0.15	25	0	Clay: silty, dark brown
				0.15-0.3	15	0	
				0.3-0.5	15	0	
TP20-3	336110	5936330	647	0-0.15	35	0	Clay: silty, dark brown
				0.15-0.3	5	0	
				0.3-0.5	30	0	
TP20-4	336115	5936327	649	0-0.15	15	0	Topsoil: clayey, some silt, trace gravel, dark brown
				0.15-0.3	15	0	
TP20-5	336111	5936344	650	0-0.15	35	0	Clay: silty, dark brown
				0.15-0.3	15	0	
				0.3-0.5	0	0	
TP20-6	336116	5936342	646	0-0.15	15	0	Clay: silty, dark brown
				0.15-0.3	15	0	
				0.3-0.5	0	0	
TP20-7	336121	5936339	644	0-0.15	0	0	Clay: silty, dark brown
				0.15-0.3	0	0	
				0.3-0.5	0	0	
TP20-8	336115	5936353	651	0-0.15	0	0	Clay: silty, dark brown
				0.15-0.3	0	0	
				0.3-0.5	0	0	
TP20-9	336121	5936349	652	0-0.15	5	0	Clay: silty, dark brown
				0.15-0.3	0	0	
				0.3-0.5	5	0	
TP20-10	336127	5936346	652	0-0.15	5	0	Clay: silty, dark brown
				0.15-0.3	5	0	
				0.3-0.5	5	0	
TP20-11	336088	5936340	644	0-0.15	0	0	Topsoil: clayey, plant roots, dark brown
				0.15-0.3	0	0	
				0.3-0.5	5	0	Clay: silty, dark brown
TP20-12	336083	5936343	652	0-0.15	5	0	Topsoil: clayey, plant roots, dark brown
				0.15-0.3	5	0	
				0.3-0.5	0	0	Clay: silty, dark brown
TP20-13	336078	5936346	653	0-0.15	0	0	Topsoil: clayey, plant roots, dark brown
				0.15-0.3	5	0	
				0.3-0.5	0	0	Clay: silty, dark brown
TP20-14	336093	5936350	660	0-0.15	15	0	Topsoil: clayey, dark brown
				0.15-0.3	20	0	
				0.3-0.5	20	0	Clay: silty, trace gravel, light brown
TP20-15	336088	5936353	654	0-0.15	0	0	Topsoil: clayey, dark brown
				0.15-0.3	0	0	Sand: light brown
				0.3-0.5	0	0	
TP20-16	336083	5936356	655	0-0.15	0	0	Topsoil: silty, trace gravel, dark brown
				0.15-0.3	0	0	
				0.3-0.5	0	0	
TP20-17	336098	5936360	665	0-0.15	15	0	Topsoil: Clayey, dark brown
				0.15-0.3	25	0	Clay: silty, trace gravel, brown
				0.3-0.5	15	0	
TP20-18	336093	5936362	663	0-0.15	0	5	Topsoil: Clayey, dark brown
				0.15-0.3	5	0	Clay: silty, trace gravel, brown
				0.3-0.5	15	0	
TP20-19	336087	5936365	655	0-0.15	15	0	Topsoil: Clayey, dark brown
				0.15-0.3	10	0	Clay: silty, trace gravel, brown
				0.3-0.5	10	0	
TP20-20	336100	5936344	675	0-0.15	0	10	Topsoil: Clayey, dark brown
				0.15-0.3	5	0	Clay: silty, trace gravel, brown
				0.3-0.5	0	0	
TP20-21	336127	5936376	668	0-0.15	25	0	Topsoil: silty, dark brown
				0.15-0.3	15	0	
				0.3-0.5	10	0	

Notes:

ID	Identification
GPS	Global Positioning System
m	Meters
ppmv	Parts per million vapour
m bgs	Meter below ground surface

CLIENT: BPTEC Engineering Ltd.	PROJECT: Latta Bridge Environmental Investigation	BOREHOLE NO: **TH20-4/MW20-4**
DRILLING COMPANY: ALL SERVICE DRILLING INC	DATE DRILLED: October 11, 2020	PROJECT NO: 29532
DRILL/METHOD: Track / Solid Stem Augers	LOCATION: N5936380.5481, E336113.0269	ELEVATION: 661.0 (m)

SAMPLE TYPE

BACKFILL TYPE: BENTONITE, SAND

DEPTH (m)	SAMPLE TYPE	☆ PID (ppmv) ☆ 2 4 6 8 / △ OVA (ppmv) △ 20 40 60 80	REMARKS	WELL INSTALLATION	SOIL DESCRIPTION	ELEVATION (m)
0					ASPHALTIC CONCRETE	
					GRAVEL (FILL), 20mm size	
1					CLAY (FILL) brown, silty, sandy, trace organics, pebbles, and bricks -trace oxides and silt lenses	660
2					CLAY brown, silty, trace oxides, occasional silt lenses -trace calcareous deposits	659
3						658
4					CLAY (TILL) brown, silty, sandy, trace gravel, coal, and oxides, occasional sand lenses	657
5						656
6					Sand brown, silty, fine grained, trace oxides, occasional clay lenses	655
7					-trace sand pockets	654
8						653
9					Sand brown, silty, fine grained, trace oxides, occasional clay lenses	652
10			-Seepage			651
11					Sand brown, medium grained, trace silt and oxides	650
					CLAY (TILL) grey, silty, some sand, trace coal, oxides, and calcareous deposits, occasional clay shale nodules	
12						649
13						648
					END OF TEST HOLE AT 13.1m UPON COMPLETION: Monitoring well installed WATER LEVEL BELOW GROUND SURFACE: -October 24, 2020 = 9.3m	
14						647
15						

THURBER ENGINEERING LTD.	FIELD LOGGED BY: MW	COMPLETION DEPTH: 13.1 m
	PREPARED BY: SIO	COMPLETION DATE: 20-10-11
	REVIEWED BY: NHF	Page 1 of 1

CLIENT: BPTEC Engineering Ltd.	PROJECT: Latta Bridge Environmental Investigation	BOREHOLE NO: **TH20-5/MW20-5**
DRILLING COMPANY: ALL SERVICE DRILLING INC	DATE DRILLED: October 10, 2020	PROJECT NO: 29532
DRILL/METHOD: Track / Solid Stem Augers	LOCATION: N5936316.8639, E336081.8844	ELEVATION: 661.3 (m)

SAMPLE TYPE

BACKFILL TYPE: BENTONITE, SAND

DEPTH (m)	SAMPLE TYPE	☆PID (ppmv)☆ 2 4 6 8 / △OVA (ppmv)△ 20 40 60 80	REMARKS	WELL INSTALLATION	SOIL DESCRIPTION	ELEVATION (m)
0					ASPHALTIC CONCRETE	661
		☆			GRAVEL (FILL)	
1		☆			CLAY (FILL) dark brown - black, silty, sandy, trace pebbles, bricks, roots, organics, and oxides	660
2		☆			grey, trace wood pieces	
		☆			CLAY brown - grey, silty, trace oxides, occasional silt lenses	659
3		☆				658
4						657
5					CLAY (TILL) brown, silty, sandy, trace gravel, coal, and oxides, occasional sand lenses	656
6					Sand, brown, medium to coarse grained	655
7					Sand, dense, light brown, fine grained, trace silt and coal	654
8					-some sand lenses	653
9						652
10					-grey	651
11			-Seepage		-sand seam at 11.6m	650
12					END OF TEST HOLE AT 12.2m UPON COMPLETION: Monitoring well installed WATER LEVEL BELOW GROUND SURFACE: -October 24, 2020 = 9.2m	649
13						648
14						647
15						

BOREHOLE LOG 29532.30-OVA 100 PID 10 NEW.GPJ THRBR_AB.GDT 21-1-15- LIBRARY-NEW LOGO - OVA-100 PID 10-NEW.GLB

THURBER ENGINEERING LTD.

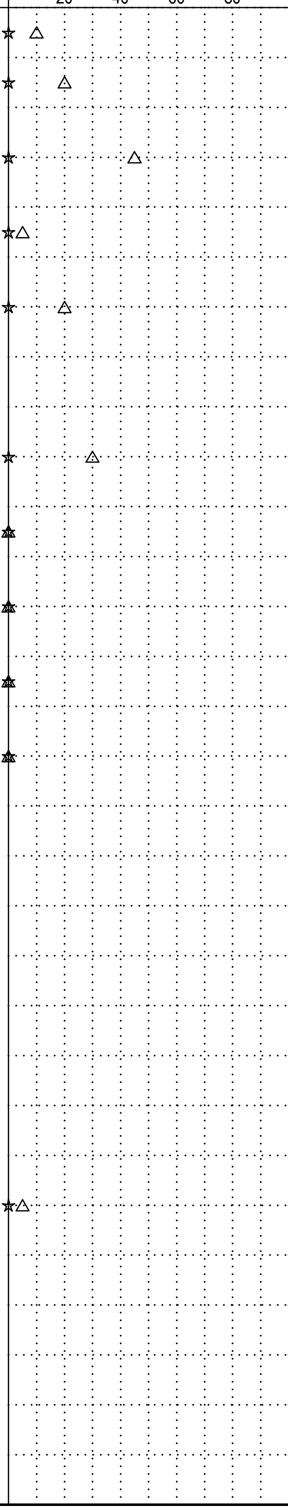
FIELD LOGGED BY: MW	COMPLETION DEPTH: 12.2 m
PREPARED BY: SIO	COMPLETION DATE: 20-10-10
REVIEWED BY: NHF	Page 1 of 1

CLIENT: BPTEC Engineering Ltd.	PROJECT: Latta Bridge Environmental Investigation	BOREHOLE NO: **TH20-6/MW20-6**
DRILLING COMPANY: ALL SERVICE DRILLING INC	DATE DRILLED: October 10, 2020	PROJECT NO: 29532
DRILL/METHOD: Track / Solid Stem Augers	LOCATION: N5936347.978, E336091.3409	ELEVATION: 651.2 (m)

SAMPLE TYPE

BACKFILL TYPE: BENTONITE, SAND

DEPTH (m)	SAMPLE TYPE	☆ PID (ppmv) ☆ 2 4 6 8 / △ OVA (ppmv) △ 20 40 60 80	REMARKS	WELL INSTALLATION	SOIL DESCRIPTION	ELEVATION (m)
0					CLAY (FILL), black, sandy, silty, trace glass, construction debris, and pebbles	651
					GRAVEL (FILL) beige, sandy, rounded, trace silt, bricks, glass, and debris	650
2						649
3					CLAY (FILL) brown - grey, silty, trace oxides and oxide staining, occasional silt lenses and bricks	648
4						647
5					-trace decaying wood pieces	646
6					-trace organics	645
7					CLAY (TILL) brown, silty, sandy, trace gravel, coal, and oxides, occasional sand lenses	644
8						643
9						642
10					SAND AND GRAVEL brown, moist, fine to medium grained, trace silt, occasional pebbles	641
11						640
12						639
13					END OF TEST HOLE AT 12.4m UPON COMPLETION: -No slough -No water Monitoring well installed WATER LEVEL BELOW GROUND SURFACE: -October 24, 2020 = Dry	638
14						637
15						



THURBER ENGINEERING LTD.	FIELD LOGGED BY: MW	COMPLETION DEPTH: 12.4 m
	PREPARED BY: SIO	COMPLETION DATE: 20-10-10
	REVIEWED BY: NHF	Page 1 of 1

THURBER

APPENDIX E

Tables

THURBER

TABLE 1- GROUNDWATER MONITORING SUMMARY
ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT
LATTA BRIDGE (B027) REPLACEMENT PROJECT
EDMONTON, ALBERTA

		Well Construction Data				Monitoring Data									
Monitoring Location	Monitoring Date	Ground Surface Elevation (m asl)	Casing Elevation (m asl)	Screen Interval (m bgs)	Depth to Liquid Hydrocarbon (m btoc)	Depth to Water (m btoc)	Depth to Water (m bgs)	Groundwater Elevation (m asl)	Volume of Water Purged (l)	Headspace Vapour Concentration (OVA) (ppmv)	Headspace Vapour Concentration (PID) (ppmv)	pH ---	Temperature (°C)	Electrical Conductivity µS/cm	Comments
MW20-4	24-Oct-20	661.005	660.871	10.1-13.1	---	9.12	9.3	651.75	16	185	8	7.07	6.7	3,050	
MW20-5	24-Oct-20	661.310	661.222	9.2-12.2	---	9.10	9.2	652.12	12	25	2	6.85	8.1	6,043	
MW20-6	24-Oct-20	651.196	651.912	9.4-12.4	---	Dry	---	---	---	0	0	---	---	---	

Notes:

---	Not present or not applicable.
m btoc	Depth measured in meters below top of casing (btoc).
m bgs	Depth measured in meters below ground surface (bgs).
m asl	Elevations in meters above mean sea level (asl).
l	Volume purged in liters.
°C	degrees Celsius
µS/cm	Microsiemens Per Centimeter
OVA	Organic Vapour Analyzer
PID	Photoionization Detector

TABLE 2 - SUMMARY OF HAND AUGURED TEST HOLE SOIL SAMPLE CHEMICAL ANALYSES
ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT
LATTA BRIDGE (B027) REPLACEMENT PROJECT
EDMONTON, ALBERTA

Sample Area	Sample Location	Sample ID	Sample Depth (m bgs)	Grain Size	Metals: Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Boron, Saturated Paste (mg/L)	Cadmium (mg/kg)	Chromium, Total (mg/kg)	Chromium, Hexavalent (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Molybdenum (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Thallium (mg/kg)	Tin (mg/kg)	Uranium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
AEP TIER 1 GUIDELINES [1,2]					**20**	**17**	**500**	**5**	**3.3**	**10**	**64**	**0.4**	**20**	**63**	**140**	**6.6**	**4**	**45**	**1**	**20**	**1**	**5**	**33**	**130**	**250**
Beneath Bridge	Central Portion	TP20-20	0-0.15	---	0.7	5.6	141	0.4	<1	0.2	21.1	<0.05	6.5	14.6	52.5	<0.05	1	20.6	<0.3	<0.10	0.1	1.8	0.6	15.9	106
Abutments	North	TP20-21	0-0.15	---	0.9	2.7	52	0.1	0.06	0.15	28	<0.05	2.9	20	11	<0.05	1.4	8.9	<0.3	<0.10	<0.05	1.4	<0.5	9.2	235
	South	TP20-1	0-0.15	---	1.1	3.6	86	0.2	0.23	0.25	22.7	<0.05	3.6	26.9	39.3	<0.05	1.2	12.4	<0.3	<0.10	0.06	1.7	<0.5	12.1	**724**
			0.3-0.5	Fine	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	**875**
Bridge Drip Lines	East Site	TP20-2	0-0.15	Fine	---	---	---	---	---	---	---	---	---	---	**383**	---	---	---	---	---	---	---	---	---	238
			0.3-0.5		1.1	9	213	0.6	0.73	0.4	0.06	18.2	10.3	29	**466**	0.06	1.1	27.3	0.4	0.10	0.2	2.6	1.1	28.6	236
		TP20-5	0-0.15	---	---	---	---	---	---	---	---	---	---	---	**445**	---	---	---	---	---	---	---	---	---	**373**
		DUP20-5	0-0.15	---	---	---	---	---	---	---	---	---	---	---	**399**	---	---	---	---	---	---	---	---	---	**314**
		TP20-5	0.3-0.5		1.1	8.3	178	0.6	0.25	0.64	0.06	22.2	8.1	32.4	**474**	0.07	1.3	23.4	0.4	0.10	0.15	2.4	0.7	26	**348**
		TP20-8	0-0.15	Fine	---	---	---	---	---	---	---	---	---	---	**215**	---	---	---	---	---	---	---	---	---	205
			0.3-0.5		0.9	8.5	191	0.4	0.44	0.55	<0.05	19.2	8.9	31	**311**	0.06	1.2	24.5	0.4	0.10	0.17	2.5	0.8	26.3	**299**
	West Side	TP20-11	0-0.15	---	---	---	---	---	---	---	---	---	---	---	**150**	---	---	---	---	---	---	---	---	---	**284**
			0.3-0.5		0.8	6.2	196	0.7	0.43	0.46	<0.05	14.3	6.5	18.7	**561**	0.06	<1.0	18.2	0.4	<0.10	0.11	2.5	0.9	21.0	**296**
		TP20-14	0-0.15	Fine	---	---	---	---	---	---	---	---	---	---	43.4	---	---	---	---	---	---	---	---	---	102
		TP20-17	0-0.15	---	---	---	---	---	---	---	---	---	---	---	28.5	---	---	---	---	---	---	---	---	---	79
5 m Bridge Step Out	East Side	TP20-3	0-0.15	---	1.0	8.0	217	0.6	0.23	0.43	17.8	<0.05	9.4	27.4	**495**	<0.05	1.0	24.5	0.3	0.10	0.17	3.0	0.8	26.8	**291**
			0.3-0.5		---	---	---	---	---	---	---	---	---	---	**411**	---	---	---	---	---	---	---	---	---	370
		TP20-6	0-0.15	Fine	2.0	8.3	227	0.6	0.21	0.53	20.7	<0.05	9.4	30.8	**526**	0.06	1.0	26.6	0.4	0.10	0.17	5.0	0.8	29.9	**325**
			0.3-0.5	---	---	---	---	---	---	---	---	---	---	---	**447**	---	---	---	---	---	---	---	---	---	215
		TP20-9	0-0.15	---	0.9	8.5	186	0.5	0.23	0.42	21.3	<0.05	13.8	30.0	**147**	0.05	1.3	24.3	0.4	0.10	0.15	1.9	0.7	26	182
			0.3-0.5	---	---	---	---	---	---	---	---	---	---	---	**284**	---	---	---	---	---	---	---	---	---	---
	West Side	TP20-12	0-0.15	---	0.9	5.2	197	0.4	0.25	0.41	16.9	<0.05	6.4	26.2	**275**	0.12	<1.0	20.2	<0.3	0.10	0.11	2.7	0.6	19.3	170
			0.3-0.5	---	---	---	---	---	---	---	---	---	---	---	135	---	---	---	---	---	---	---	---	---	---
		TP20-15	0-0.15	Coarse	0.6	6.5	153	0.5	0.37	0.32	20.2	<0.05	8.7	23.4	40.6	0.07	<1.0	26.5	0.4	<0.10	0.14	1.0	0.8	23.8	108
		TP20-18	0-0.15	---	0.9	5.9	204	0.5	1.25	0.56	14.1	<0.05	5.9	24.4	**439**	0.11	<1.0	17.1	0.3	<0.10	0.11	3.0	0.6	21.3	239
			0.3-0.5	---	---	---	---	---	---	---	---	---	---	---	109	---	---	---	---	---	---	---	---	---	---
10 m Bridge Step Out	East Side	TP20-4	0-0.15	Fine	1.0	7.3	234	0.6	0.32	0.54	16.6	<0.05	7.5	30.1	**220**	0.09	1.0	20.4	0.3	0.10	0.14	2.6	0.7	26.3	158
			0.15-0.3	Fine	---	---	---	---	---	---	---	---	---	---	**190**	---	---	---	---	---	---	---	---	---	---
		TP20-7	0-0.15	---	0.8	6.3	194	0.5	0.19	0.52	11.4	<0.05	5.9	22.8	**230**	0.07	1.0	15.1	<0.3	<0.10	0.11	2.0	0.5	16.5	137
			0.3-0.5	Fine	---	---	---	---	---	---	---	---	---	---	124	---	---	---	---	---	---	---	---	---	---
		TP20-10	0-0.15	Fine	1.0	7.0	228	0.6	0.19	0.51	17.8	<0.05	8.0	27.8	**181**	0.10	1.2	21.6	0.4	0.10	0.13	2.5	0.7	23.0	122
		DUP20-6	0-0.15	Fine	1.0	7.2	198	0.5	0.2	0.53	15.6	<0.05	7.0	28.8	**215**	0.08	1.1	20.4	0.3	0.10	0.12	2.4	0.6	22.5	134
		TP20-10	0.3-0.5	Fine	---	---	---	---	---	---	---	---	---	---	113	---	---	---	---	---	---	---	---	---	---
	West Side	TP20-13	0-0.15	---	1.2	7.7	263	0.7	0.4	0.39	18.7	<0.05	9.3	34.9	**142**	0.22	<1.0	24.5	0.4	0.20	0.16	3.4	0.7	29.2	149
			0.3-0.5	Fine	---	---	---	---	---	---	---	---	---	---	107	---	---	---	---	---	---	---	---	---	---
		TP20-16	0-0.15	Coarse	0.8	7.0	204	0.5	0.75	0.30	12.7	<0.05	7.5	22.6	35.5	<0.05	<1.0	20.4	0.4	<0.10	0.12	1.5	1.1	23.5	81
		TP20-19	0-0.15	Coarse	0.8	6.3	174	0.3	1.76	0.51	16.0	<0.05	7.6	25.7	**188**	0.13	<1.0	19.8	0.4	<0.10	0.11	1.8	2.0	25.4	156
			0.3-0.5	Coarse	---	---	---	---	---	---	---	---	---	---	106	---	---	---	---	---	---	---	---	---	---

Sample Area	Sample Location	Sample ID	Sample Depth (m bgs)	Grain Size	Detailed Salinity: pH (CaCl Method)	Electrical Conductivity (dS/m)	Sodium Adsorption Ratio	Calcium (mg/kg)	Magnesium (mg/kg)	Sodium (mg/kg)	Potassium (mg/kg)	Chloride (mg/L)	Chloride (mg/kg)	Sulfate (mg/kg)
AEP TIER 1 GUIDELINES [1,2]					**6-8.5**	**<3**	**<4**	**---**	**---**	**---**	**---**	**---**	**---**	**---**
Abutments	South	TP20-1	0 - 0.15	---	7.4	0.52	2.9	18.8	2.3	35	18	62	30	13

Notes:

1 Alberta Environment and Parks, January 2019, *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* based on Residential/Parkland Land Use
2 Alberta Environment (currently Alberta Environment and Parks), May 2001, Salt Contamination Assessment and Remediation Guidelines
3 --- Parameter not analyzed or no guideline value
4 **BOLD** Parameter concentration does not meet Tier 1 Guidelines
5 Sample - Duplicate Pair
m bgs meters below ground surface
mg/kg milligram per kilogram
mg/L milligram per liter

THURBER

TABLE 3 - SUMMARY OF TEST HOLE SOIL SAMPLE CHEMICAL ANALYSES
ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT
LATTA BRIDGE (B027) REPLACEMENT PROJECT
EDMONTON, ALBERTA

											Duplicate								
Sample Location	**Units**	**AEP**	**North Bridge Abutment**			**South Bridge Abutment**				**Middle of Ravine (Beneath the Bridge)**									
Sample ID		**TIER 1 GUIDELINES [1,2]**	**TH20-4**	**TH20-4**	**TH20-4**	**TH20-5**	**TH20-5**	**TH20-5**	**TH20-5**	**TH20-6**	**TH20-6**	**DUP20-1**	**TH20-6**	**TH20-6**	**TH20-6**	**TH20-6**	**TH20-6**	**TH20-6**	**TH20-6**
Approximate Sample Depth, m			0.5	0.75	1.5	0.5	0.75	1.5	2.25	0.25	0.75		1.5	2.25	3	3.75	4.5	5.25	6
Grain Size		Fine-Grained	Fine-Grained		Fine-Grained	Fine-Grained		Fine-Grained	Fine-Grained	Coarse-Grained	Fine-Grained		Coarse-Grained				Fine-Grained		
Petroleum Hydrocarbons																			
Benzene	(mg/kg)	0.046	<0.005	---	---	<0.005	---	---	---	---	---	---	<0.005	---	---	---	<0.005	---	---
Toluene	(mg/kg)	0.52	<0.02	---	---	<0.02	---	---	---	---	---	---	<0.02	---	---	---	<0.02	---	---
Ethylbenzene	(mg/kg)	0.073	<0.005	---	---	<0.005	---	---	---	---	---	---	0.016	---	---	---	<0.005	---	---
Xylenes	(mg/kg)	0.99	<0.03	---	---	<0.03	---	---	---	---	---	---	0.15	---	---	---	<0.03	---	---
F1	(mg/kg)	210/420*	<10	---	---	<10	---	---	---	---	---	---	<10	---	---	---	<10	---	---
F2	(mg/kg)	150 /300*	<25	---	---	<25	---	---	---	---	---	---	**178**	---	<25	---	<25	---	---
F3	(mg/kg)	1300/2,600*	<50	---	---	<50	---	---	---	---	---	---	**6160**	---	<50	---	<50	---	---
F4	(mg/kg)	5600/10,000*	<100	---	---	<100	---	---	---	---	---	---	**4460**	---	<100	---	<100	---	---
Polycyclic Aromatic Hydrocarbons																			
Naphthalene	(mg/kg)	0.014	<0.01	---	---	<0.01	---			---	---	---	**59.9**	---	<0.01	---	<0.01	---	---
Acenaphthylene	(mg/kg)	---	<0.05	---	---	<0.05	---	---	---	---	---	---	14.1	---	<0.05	---	<0.05	---	---
Acenaphthene	(mg/kg)	0.33	<0.05	---	---	<0.05	---	---	---	---	---	---	**20.7**	---	<0.05	---	<0.05	---	---
Fluorene	(mg/kg)	0.40	<0.05	---	---	<0.05	---	---	---	---	---	---	**52.4**	---	<0.05	---	<0.05	---	---
Phenanthrene	(mg/kg)	0.11	<0.01	---	---	0.03	---	---	---	---	---	---	**302**	---	<0.01	---	<0.01	---	---
Anthracene	(mg/kg)	1.3	<0.003	---	---	0.008	---	---	---	---	---	---	40.1	---	<0.003	---	<0.003	---	---
Fluoranthene	(mg/kg)	50	<0.01	---	---	0.044	---	---	---	---	---	---	**274**	---	<0.01	---	<0.01	---	---
Pyrene	(mg/kg)	2100	<0.01	---	---	0.039	---	---	---	---	---	---	318	---	<0.01	---	<0.01	---	---
Benzo(a)anthracene	(mg/kg)	---	<0.01	---	---	0.02	---	---	---	---	---	---	137	---	<0.01	---	<0.01	---	---
Chrysene	(mg/kg)	---	<0.05	---	---	<0.05	---	---	---	---	---	---	127	---	<0.05	---	<0.05	---	---
Benzo(b+j)fluoranthene	(mg/kg)	---	<0.05	---	---	<0.05	---	---	---	---	---	---	99.2	---	<0.05	---	<0.05	---	---
Benzo(k)fluoranthene	(mg/kg)	---	<0.05	---	---	<0.05	---	---	---	---	---	---	50	---	<0.05	---	<0.05	---	---
Benzo(a)pyrene	(mg/kg)	20	<0.05	---	---	<0.05	---	---	---	---	---	---	**91.3**	---	<0.05	---	<0.05	---	---
Indeno(1,2,3-c,d)pyrene	(mg/kg)	---	<0.05	---	---	<0.05	---	---	---	---	---	---	25.9	---	<0.05	---	<0.05	---	---
Dibenzo(a,h)anthracene	(mg/kg)	---	<0.05	---	---	<0.05	---	---	---	---	---	---	8.66	---	<0.05	---	<0.05	---	---
Benzo(g,h,i)perylene	(mg/kg)	---	<0.05	---	---	<0.05	---	---	---	---	---	---	28.4	---	<0.05	---	<0.05	---	---
B[a]P Total Potency Equivalents (TPE)	mg/kg	≤ 5.3	<0.001	---	---	0.02	---	---	---	---	---	---	**133**	---	<0.001	---	<0.001	---	---
Index of addictive Cancer Risk (IACR) Coarse	---	<1.0	<0.001	---	---	0.003	---	---	---	---	---	---	**73.9**	---	<0.001	---	<0.001	---	---
Index of addictive Cancer Risk (IACR) Fine	---	<1.0	<0.001	---	---	0.006	---	---	---	---	---	---	**140**	---	<0.001	---	<0.001	---	---
Extractable Metals																			
Antimony	(mg/kg)	20	0.9	0.6	0.5	0.4	0.3	0.5	0.5	0.8	1.5	1.6	0.7	0.8	0.6	0.6	0.5	0.6	0.5
Arsenic	(mg/kg)	17	9.6	10.4	10.4	8.4	7.4	8.9	9.9	6.0	8.0	5.8	6.2	8.8	10.4	10.2	9.8	9.7	10.2
Barium	(mg/kg)	500	293	195	284	237	198	224	353	216	359	301	332	460	277	239	247	278	249
Beryllium	(mg/kg)	5	1.0	1.1	0.9	0.7	0.5	0.8	0.8	0.5	0.8	0.6	0.5	1.1	0.8	1.0	0.7	0.8	0.8
Boron, Saturated Paste	(mg/L)	3.3	1.5	0.7	<0.5	<0.5	<0.5	<0.5	<0.5	0.2	0.64	0.67	0.92	1.09	0.43	0.21	0.17	<0.5	0.14
Cadmium	(mg/kg)	10	0.22	0.12	0.29	0.32	0.29	0.25	0.3	0.33	0.43	0.41	0.32	0.25	0.21	0.14	0.26	0.28	0.27
Chromium, Total	(mg/kg)	64	44.8	30.3	25.4	27.2	20.7	26.7	25.1	19.5	23.3	15.9	24.7	25.7	29.1	23.7	21.5	25.9	24.6
Chromium, Hexavalent	(mg/kg)	0.4	<0.05	<0.05	<0.05	0.1	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cobalt	(mg/kg)	20	10.3	13.4	13.7	10.1	9.8	12.8	12.5	6.9	8.9	6.7	5.9	11.2	13.1	14.1	11.0	11.1	10.7
Copper	(mg/kg)	63	29	32.3	32.1	24.6	21.3	28.8	31.4	20.8	33.8	28.3	21.6	37.4	32.0	31.2	28.5	30.4	30
Lead	(mg/kg)	140	37.8	22.9	15.1	12.8	11.2	12.6	15.3	95	**147**	**239**	80.5	25.4	16.3	26.1	14.2	15.9	22.2
Mercury	(mg/kg)	6.6	0.09	0.07	0.05	0.06	<0.05	0.05	0.05	0.11	0.19	0.11	0.14	0.87	0.08	0.07	0.06	0.09	0.07
Molybdenum	(mg/kg)	4	1.3	<1.0	1.3	1	<1.0	<1.0	1.1	<1.0	1.2	<1.0	<1.0	1.5	1.2	1.2	1.0	1.1	1.1
Nickel	(mg/kg)	45	43.7	35.9	38.7	33.7	26.2	36.1	35.0	22.5	29.5	19.5	21.2	31.5	35.6	34.5	29.6	34.8	32.2
Selenium	(mg/kg)	1	0.4	0.5	0.4	0.6	0.6	0.3	0.4	0.4	0.4	0.4	0.3	0.6	0.4	<0.3	0.3	0.7	0.4
Silver	(mg/kg)	20	<0.10	<0.10	0.1	0.1	<0.10	0.1	0.1	<0.10	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1
Thallium	(mg/kg)	1	0.14	0.19	0.23	0.15	0.16	0.19	0.22	0.12	0.16	0.12	0.1	0.17	0.22	0.21	0.21	0.21	0.2
Tin	(mg/kg)	5	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	2	4.4	3.5	4.9	1.6	<1.0	<1.0	<1.0	<1.0	1.1
Uranium	(mg/kg)	33	0.9	0.9	1.2	0.8	0.7	0.8	1.2	1.1	1.1	1.0	0.9	1.6	1.0	0.9	0.9	2.0	1.0
Vanadium	(mg/kg)	130	45.9	44.0	40.5	35.4	34.1	42.3	38.2	23.3	28.1	22.5	26.6	35.0	38.9	37.1	33.5	36.9	34.7
Zinc	(mg/kg)	250	138	97	103	96	83	86	94	113	173	144	115	101	97	93	89	91	97
Detailed Salinity																			
pH (CaCl Method)	---	6-8.5	7.3	7.7	7.7	7.3	7.8	7.8	7.7	8.3	7.8	7.8	7.9	7.5	7.7	7.6	7.9	7.8	8.0
Electrical Conductivity	(dS/m)	**	8.23	4.56	3.02	13.6	8.72	8.41	6.73	0.81	0.93	0.91	0.82	1.69	1.38	0.65	1.35	3.24	1.14
Sodium Adsorption Ratio	---	**	20.7	11.7	2.4	63.5	48	20.2	2.8	4.9	5.6	5.7	4.1	1.1	2.6	0.8	2.7	1.1	1.3
Calcium	(mg/kg)	---	261	166	259	188	92.5	301	607	41.1	36.5	30.9	46.1	228	136	75.2	111	591	123
Magnesium	(mg/kg)	---	104	77	139	11	8	72	339	3.8	6.4	5.6	8.3	81.9	33.7	18.6	35.2	269	53.9
Sodium	(mg/kg)	---	1390	746	199	3130	1700	1490	361	115	130	111	113	84	141	30	131	126	75
Potassium	(mg/kg)	---	10	<11	11	44	19	<10	16	10	8	9	12	28	18	11	10	20	13
Chloride	mg/L	---	2740	1470	930	4600	2950	2880	2280	44	69	74	41	109	240	66	188	82	51
Chloride	(mg/kg)	---	2170	1540	977	4090	2630	2840	2400	38	59	53	39	128	290	70	192	79	57
Sulfate	(mg/kg)	---	120	120	150	130	97	140	180	135	125	84.4	193	657	176	145	344	2220	479

Notes:

1 Alberta Environment and Parks, January 2019, *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* based on Residential/Parkland Land Use

2 Alberta Environment (currently Alberta Environment and Parks), May 2001, Salt Contamination Assessment and Remediation Guidelines

3 --- Parameter with no guideline value or not analyzed

4 * Surficial Soil Guideline / Subsoil Guideline

5 **BOLD** Parameter concentration does not meet Tier 1 Guidelines

Parameter **		**Rating Categories**			
		Good	**Fair**	**Poor**	**Unsuitable**
Topsoil	EC dS/m	<2	2 to 4	4 to 8	>8
	SAR	<4	4 to 8	8 to 12	>12
Subsoil	EC dS/m	<3	3 to 5	5 to 10	>10
	SAR	<4	4 to 8	8 to 12	>12

THURBER

TABLE 4 - SUMMARY OF GROUNDWATER SAMPLE CHEMICAL ANALYSES
ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT
LATTA BRIDGE (B027) REPLACEMENT PROJECT
EDMONTON, ALBERTA

			SAMPLE-DUPLICATE PAIR		
Sample ID	**Units**	**AEP 2019 Tier 1 [1]**	**MW20-4**	**DUP1**	**MW20-5**
Sample Date			**24-Oct-20**	**24-Oct-20**	**24-Oct-20**
Petroleum Hydrocarbons					
Benzene	mg/L	0.005	<0.001	<0.001	<0.001
Toluene	mg/L	0.024	<0.0004	<0.0004	<0.0004
Ethylbenzene	mg/L	0.0016	<0.0010	<0.0010	<0.0010
Xylenes	mg/L	0.02	<0.001	<0.001	<0.001
PHC F1	mg/L	2.2	<0.1	<0.1	<0.1
PHC F2	mg/L	1.1	<0.1	<0.1	<0.1
Dissolved Metals					
Aluminum	mg/L	0.05	<0.002	<0.002	<0.010
Antimony	mg/L	0.006	0.0003	0.0003	<0.001
Arsenic	mg/L	0.005	0.0011	0.001	<0.001
Barium	mg/L	1	0.066	0.067	0.061
Beryllium	mg/L	---	<0.0001	<0.0001	<0.0005
Bismuth	mg/L	---	<0.0005	<0.0005	<0.002
Boron	mg/L	1.5	0.202	0.197	0.165
Cadmium	mg/L	0.005	0.00017	0.00015	0.0003
Chromium (VI)	mg/L	0.001	<0.0005	<0.0005	<0.002
Cobalt	mg/L	---	0.0047	0.0043	0.004
Copper	mg/L	0.007	0.001	0.001	<0.005
Lead	mg/L	0.01	<0.0001	<0.0001	<0.0005
Lithium	mg/L	---	0.183	0.177	0.378
Mercury	mg/L	0.000005	<0.000005	<0.000005	<0.000005
Molybdenum	mg/L	---	0.003	0.004	<0.005
Nickel	mg/L	0.15	0.0115	0.0104	0.017
Selenium	mg/L	0.002	0.0011	0.0013	0.002
Silicon	mg/L	---	8.51	8.25	11.4
Silver	mg/L	0.0001	<0.00001	<0.00001	<0.00005
Strontium	mg/L	---	1.77	1.74	4.01
Sulfur	mg/L	---	150	152	507
Thallium	mg/L	---	0.00007	0.00007	<0.0003
Tin	mg/L	---	<0.001	<0.001	<0.005
Titanium	mg/L	---	<0.0005	<0.0005	<0.002
Uranium	mg/L	0.015	**0.0251**	**0.0252**	**0.047**
Vanadium	mg/L	---	0.0001	0.0002	<0.0005
Zinc	mg/L	0.03	0.003	0.003	0.008
Routine Chemistry Parameters					
pH	---	6.5-8.5	7.73	7.75	7.56
Temperature of Observed pH	°C	---	21.5	21.6	21.3
Electrical Conductivity at 25 °C	µS/cm	---	1840	1840	3800
Calcium (Dissolved)	mg/L	---	285	282	720
Magnesium (Dissolved)	mg/L	---	57	57	182
Sodium (Dissolved)	mg/L	200	60.1	60.7	59
Potassium (Dissolved)	mg/L		9.3	9.5	17
Iron (Dissolved)	mg/L	0.3	<0.01	<0.01	<0.05
Manganese (Dissolved)	mg/L	0.05	**1.56**	**1.47**	**1.34**
Chloride (Dissolved)	mg/L	120	105	105	**279**
Nitrate - N	mg/L	3	2.77	**3.35**	0.75
Nitrite - N	mg/L	1.0	0.862	0.809	0.051
Nitrate and Nitrite - N	mg/L	---	3.64	4.16	0.8
Sulfate (Dissolved)	mg/L	500	**446**	**450**	**1520**
Hydroxide	mg/L	---	<5	<5	<5
Carbonate	mg/L	---	<6	<6	<6
Bicarbonate	mg/L	---	585	584	726
P-Alkalinity (CaCO3)	mg/L	---	<5	<5	<5
T-Alkalinity (CaCO3)	mg/L	---	480	479	596
TDS	mg/L	500	**1250**	**1250**	**3130**
Hardness (CaCO3) (Dissolved)	mg/L	---	947	940	2550
Ionic Balance (Dissolved)	%	---	99	98	105
Polycyclic Aromatic Hydrocarbons					
Naphthalene	µg/L	1	0.1	<0.1	<0.1
Quinoline	µg/L	---	<0.3	<0.3	<0.3
Acenaphthylene	µg/L	---	<0.1	<0.1	<0.1
Acenaphthene	µg/L	6	<0.1	<0.1	<0.1
Fluorene	µg/L	4.2	<0.1	<0.1	<0.1
Phenanthrene	µg/L	0.86	<0.1	<0.1	<0.1
Acridine	µg/L	---	<0.1	<0.1	<0.1
Anthracene	µg/L	3.4	<0.005	<0.005	<0.005
Fluoranthene	µg/L	240	0.04	0.03	0.01
Pyrene	µg/L	710	0.08	0.07	0.02
Benzo(a)anthracene	µg/L	---	0.01	0.01	<0.01
Chrysene	µg/L	---	<0.1	<0.1	<0.1
Benzo(b)fluoranthene	µg/L	---	<0.1	<0.1	<0.1
Benzo(b+j)fluoranthene	µg/L	---	<0.1	<0.1	<0.1
Benzo(k)fluoranthene	µg/L	---	<0.1	<0.1	<0.1
Benzo(a)pyrene	µg/L	1.8	0.01	0.021	<0.008
Indeno(1,2,3-c,d)pyrene	µg/L	---	<0.05	<0.05	<0.05
Dibenzo(a,h)anthracene	µg/L	---	<0.05	<0.05	<0.05
Benzo(g,h,i)perylene	µg/L	---	<0.05	<0.05	<0.05
Carcinogenic PAHs (as CB(a)P)	µg/L	0.04	0.01	0.02	<0.01

Notes
[1] Alberta Environment and Parks (AEP) 2019 *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* - Residential/Parkland land use and fine grained soils.
BOLD - Do not meet applied guidelines
"--" - No guideline available or not measured
mg/L - Milligrams per liter
µg/L- Micrograms per liter
µS/cm - Micro Siemens per Centimeter
◦C - Degrees Celsius
% - Percent

THURBER

TABLE 5 -SUMMARY OF LEAD IN PAINT CHEMICAL ANALYSES
ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT
LATTA BRIDGE (B027) REPLACEMENT PROJECT
EDMONTON, ALBERTA

Sample location	Units	Guideline*	Southwest Pier (Bottom of the Latta Ravine)	Southeast Pier (Bottom of the Latta Ravine)	Girder (North Abutment)	Girder (North Abutment)	Girder (South Abutment)
Sample ID			**PA20-1**	**PA20-2**	**PA20-3**	**PA20-4**	**PA20-5**
Lead (Pb)	(mg/kg)	90	**38600**	**472**	41.3	4.8	**940**

Notes:
1 * - Government of Canada, 2016. "Surface Coating Material Regulations."
2 **BOLD**
mg/kg milligram per kilogram

THURBER

TABLE 6 - SOIL QUALITY ASSURANCE RESULTS - FIELD DUPLICATE
ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT
LATTA BRIDGE (B027) REPLACEMENT PROJECT
EDMONTON, ALBERTA

			TH20-6 (0.75 m)/DUP20-1			TP20-5 (0-0.15 m)/DUP20-5			TP20-6 (0-0.15 m)/DUP20-6		
Parameter	**Units**	**MDL**	**TH20-6 at 0.75 m**	**DUP20-1**	**RPD**	**TP20-5 at 0-0.15 m**	**DUP20-5**	**RPD**	**TP20-10 at 0-0.15 m**	**DUP20-6**	**RPD**
Extractable Metals											
Antimony	mg/kg	0.2	1.5	1.6	6%	---	---	---	1.0	1.0	<5x MDL
Arsenic	mg/kg	0.2	8	5.8	32%	---	---	---	7.0	7.2	3%
Barium	mg/kg	1	359	301	18%	---	---	---	228	198	14%
Beryllium	mg/kg	0.1	0.8	0.6	29%	---	---	---	0.6	0.5	<5x MDL
Boron (Saturated Paste)	mg/L	0.05	0.64	0.67	5%	---	---	---	0.19	0.2	<5x MDL
Cadmium	mg/kg	0.01	0.43	0.41	5%	---	---	---	0.51	0.53	4%
Chromium	mg/kg	0.5	23.3	15.9	38%	---	---	---	17.8	15.6	13%
Hexavalent Chromium	mg/kg	0.05	<0.05	<0.05	---	---	---	---	<0.05	<0.05	---
Cobalt	mg/kg	0.1	8.9	6.7	28%	---	---	---	8.0	7.0	13%
Copper	mg/kg	1	33.8	28.3	18%	---	---	---	27.8	28.8	4%
Lead	mg/kg	0.1	147	239	48%	445	399	11%	181	215	17%
Mercury	mg/kg	0.05	0.19	0.11	<5x MDL	---	---	---	0.10	0.08	<5x MDL
Molybdenum	mg/kg	1	1.2	<1.0	---	---	---	---	1.2	1.1	<5x MDL
Nickel	mg/kg	0.5	29.5	19.5	41%	---	---	---	21.6	20.4	6%
Selenium	mg/kg	0.3	0.4	0.4	<5x MDL	---	---	---	0.4	0.3	<5x MDL
Silver	mg/kg	0.1	0.1	0.1	<5x MDL	---	---	---	0.1	0.1	<5x MDL
Thallium	mg/kg	0.05	0.16	0.12	<5x MDL	---	---	---	0.13	0.12	<5x MDL
Tin	mg/kg	1	4.4	3.5	<5x MDL	---	---	---	2.5	2.4	<5x MDL
Uranium	mg/kg	0.5	1.1	1	<5x MDL	---	---	---	0.7	0.6	<5x MDL
Vanadium	mg/kg	0.1	28.1	22.5	22%	---	---	---	23	22.5	2%
Zinc	mg/kg	1	173	144	18%	373	314	17%	122	134	9%
Detailed Salinity											
pH (Cacl Method)	---	---	7.8	7.8	0%	---	---	---	---	---	---
Electrical Conductivity	(dS/m)	0.01	0.93	0.91	2%	---	---	---	---	---	---
Sodium Adsorption Ratio	---	---	5.6	5.7	2%	---	---	---	---	---	---
Calcium	(mg/kg)	---	36.5	30.9	17%	---	---	---	---	---	---
Magnesium	(mg/kg)	---	6.4	5.6	13%	---	---	---	---	---	---
Sodium	(mg/kg)	---	130	111	16%	---	---	---	---	---	---
Potassium	(mg/kg)	---	8	9	12%	---	---	---	---	---	---
Chloride	(mg/L)	2	69	74	7%	---	---	---	---	---	---
Chloride	(mg/kg)	---	59	53	11%	---	---	---	---	---	---
Sulfate	(mg/kg)	---	125	84.4	39%	---	---	---	---	---	---

Notes:

---	Parameter not analyzed or not calculated or method detection limits.
%	Percent
MDL	Method Detection Limit
RPD	Relative Percent Difference

THURBER

TABLE 7 - GROUNDWATER QUALITY ASSURANCE RESULTS - FIELD DUPLICATE
ENVIRONMENTAL OVERVIEW AND PHASE II ENVIRONMENTAL SITE ASSESSMENT
LATTA BRIDGE (B027) REPLACEMENT PROJECT , EDMONTON, ALBERTA

Parameter	Units	MDL	MW20-4	DUP1	RPD
Petroleum Hydrocarbons					
Benzene	mg/L	0.001	<0.001	<0.001	---
Toluene	mg/L	0.0004	<0.0004	<0.0004	---
Ethylbenzene	mg/L	0.001	<0.0010	<0.0010	---
Xylenes	mg/L	0.001	<0.001	<0.001	---
PHC F1	mg/L	0.1	<0.1	<0.1	---
PHC F2	mg/L	0.1	<0.1	<0.1	---
Dissolved Metals					
Aluminum	mg/L	0.002	<0.002	<0.002	---
Antimony	mg/L	0.0002	0.0003	0.0003	<5x MDL
Arsenic	mg/L	0.0002	0.0011	0.001	<5x MDL
Barium	mg/L	0.001	0.066	0.067	2%
Beryllium	mg/L	0.0001	<0.0001	<0.0001	---
Bismuth	mg/L	0.0005	<0.0005	<0.0005	---
Boron	mg/L	0.002	0.202	0.197	3%
Cadmium	mg/L	0.00001	0.00017	0.00015	13%
Chromium (VI)	mg/L	0.0005	<0.0005	<0.0005	---
Cobalt	mg/L	0.0001	0.0047	0.0043	9%
Copper	mg/L	0.001	0.001	0.001	<5x MDL
Lead	mg/L	0.0001	<0.0001	<0.0001	---
Lithium	mg/L	0.001	0.183	0.177	3%
Mercury	mg/L	0.000005	<0.000005	<0.000005	---
Molybdenum	mg/L	0.001	0.003	0.004	<5x MDL
Nickel	mg/L	0.0005	0.0115	0.0104	10%
Selenium	mg/L	0.0002	0.0	0.0013	17%
Silicon	mg/L	0.05	8.51	8.25	3%
Silver	mg/L	0.00001	<0.00001	<0.00001	---
Strontium	mg/L	0.001	1.77	1.74	2%
Sulfur	mg/L	0.3	150	152	1%
Thallium	mg/L	0.00005	0.00007	0.00007	<5x MDL
Tin	mg/L	0.001	<0.001	<0.001	---
Titanium	mg/L	0.0005	<0.0005	<0.0005	---
Uranium	mg/L	0.0005	0.0251	0.0252	0%
Vanadium	mg/L	0.0001	0.0001	0.0002	<5x MDL
Zinc	mg/L	0.001	0.003	0.003	<5x MDL
Routine Parameters					
pH	---	1	7.73	7.75	0%
Temperature of Observed pH	°C	---	21.5	21.6	0%
Electrical Conductivity at 25 °C	µS/cm	1.00	1840	1840	0%
Calcium (Dissolved)	mg/L	0.20	285	282	1%
Magnesium (Dissolved)	mg/L	0.20	57	57	0%
Sodium (Dissolved)	mg/L	0.40	60.1	60.7	1%
Potassium (Dissolved)	mg/L	0.40	9.3	9.5	2%
Iron (Dissolved)	mg/L	0.01	<0.01	<0.01	---
Manganese (Dissolved)	mg/L	0.01	1.56	1.47	6%
Chloride (Dissolved)	mg/L	0.40	105	105	0%
Nitrate - N	mg/L	0.01	2.77	3.35	19%
Nitrite - N	mg/L	0.01	0.862	0.809	6%
Nitrate and Nitrite - N	mg/L	0.01	3.64	4.16	13%
Sulfate (Dissolved)	mg/L	0.90	446	450	1%
Hydroxide	mg/L	---	<5	<5	---
Carbonate	mg/L	---	<6	<6	---
Bicarbonate	mg/L	---	585	584	0%
P-Alkalinity (CaCO3)	mg/L	5.00	<5	<5	---
T-Alkalinity (CaCO3)	mg/L	5.00	480	479	0%
TDS	mg/L	1.00	1250	1250	0%
Hardness (CaCO3) (Dissolved)	mg/L	---	947	940	1%
Ionic Balance (Dissolved)	%	---	99	98	1%
Polycyclic Aromatic Hydrocarbons					
Naphthalene	µg/L	0.1	0.1	<0.1	---
Quinoline	µg/L	0.3	<0.3	<0.3	---
Acenaphthylene	µg/L	0.1	<0.1	<0.1	---
Acenaphthene	µg/L	0.1	<0.1	<0.1	---
Fluorene	µg/L	0.1	<0.1	<0.1	---
Phenanthrene	µg/L	0.1	<0.1	<0.1	---
Acridine	µg/L	0.1	<0.1	<0.1	---
Anthracene	µg/L	0.005	<0.005	<0.005	---
Fluoranthene	µg/L	0.01	0.04	0.03	<5x MDL
Pyrene	µg/L	0.01	0.08	0.07	13%
Benzo(a)anthracene	µg/L	0.01	0.01	0.01	<5x MDL
Chrysene	µg/L	0.1	<0.1	<0.1	---
Benzo(b)fluoranthene	µg/L	0.1	<0.1	<0.1	---
Benzo(b+j)fluoranthene	µg/L	0.1	<0.1	<0.1	---
Benzo(k)fluoranthene	µg/L	0.1	<0.1	<0.1	---
Benzo(a)pyrene	µg/L	0.008	0.01	0.021	<5x MDL
Indeno(1,2,3-c,d)pyrene	µg/L	0.05	<0.05	<0.05	---
Dibenzo(a,h)anthracene	µg/L	0.05	<0.05	<0.05	---
Benzo(g,h,i)perylene	µg/L	0.05	<0.05	<0.05	---
Carcinogenic PAHs (as CB(a)P)	µg/L	0.01	0.01	0.02	<5x MDL

Notes:

---	Parameter not analyzed or not calculated or method detection limits.
%	Percent
MDL	Method Detection Limit
RPD	Relative Percent Difference

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APPENDIX F

Laboratory Reports

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Report Transmission Cover Page

Bill To:	Thurber Engineering Ltd.	Project ID:	29532.300	Lot ID:	**1451962**
	4127 Roper Road	Project Name:	Latta Bridge Phase II ESA	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
	T6B 3S5			Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	LSD:		Report Number:	2588529
Sampled By:	SIO	P.O.:	29532.30		
Company:	Thurber	Proj. Acct. code:	29532.30		

Contact	Company	Address
ESDAT	**Thurber Engineering Ltd.**	4127 Roper Road Edmonton, AB T6B 3S5 Phone: (780) 438-1460 Fax: (780) 437-7125 Email: thurber@esdat.net

Delivery	Format	Deliverables
Email - Zip Multiple Formats By Report	Generic ESDAT Chemistry File	Test Report
Email - Zip Multiple Formats By Report	Generic ESDAT Header	Test Report
Email - Zip Multiple Formats By Report	Generic ESDAT Sample File	Test Report

Contact	Company	Address
Sabinus Okafor	**Thurber Engineering Ltd.**	4127 Roper Road Edmonton, AB T6B 3S5 Phone: (780) 438-1460 Fax: (780) 437-7125 Email: sokafor@thurber.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COA
Email - Merge Reports	PDF	COC / COA
Email - Merge Reports	PDF	COC / Invoice
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	Standard Crosstab without Tabs	Test Report

Contact	Company	Address
Sharon Bunn	**Thurber Engineering Ltd.**	4127 Roper Road Edmonton, AB T6B 3S5 Phone: (780) 438-1460 Fax: (780) 437-7125 Email: Sbunn@thurber.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	Invoice

Notes To Clients:

- Oct 16, 2020 - Sample 3: Surrogate recoveries are not available for PAH method because the extract required dilution. The recoveries for undiluted blanks, Quality Control and samples of this extraction batch meet acceptance criteria.
- Nov 02, 2020 - Sample 1451962-5; 7240634: Report was issued to include retest result for Arsenic analysis on sample 5 as requested by Sabinus Okafor on November 2, 2020. Previous report 2556377.
- Nov 03, 2020 - Sample 1451962-5; 7240634: Sample 1451962-5: the repeated result for strong acid extractable Arsenic analysis differs significantly from the original. The cause of the difference cannot be identified. The retest results have been repeated and confirmed.
- Nov 10, 2020 - Report was issued to include additional services requested by Sabinus Okafor of TEL on Nov. 7, 2020:
  MTZN service requested on sample(s) 17, 20, 23, 26, 29, 32, 38.
  Previous report 2566726.
- Jan 20, 2021 - Report was issued to include changes to the sample desctiptions from TH20-1 to TH20-6, TH20-2 to TH20-5 and TH30-3 to TH20-4 as requested by Sabinus Okafor of TEL on Jan. 16, 2021.
  Previous report 2570113.

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

		Reference Number	1451962-1	1451962-2	1451962-3	
		Sample Date	Oct 09, 2020	Oct 09, 2020	Oct 09, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TH20-6 / 0.25 / m	TH20-6 / 0.75 / m	TH20-6 / 1.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L	0.20	0.64	0.92	0.05
Antimony	Strong Acid Extractable	mg/kg	0.8	1.5	0.7	0.2
Arsenic	Strong Acid Extractable	mg/kg	6.0	8.0	6.2	0.2
Barium	Strong Acid Extractable	mg/kg	216	359	332	1
Beryllium	Strong Acid Extractable	mg/kg	0.5	0.8	0.5	0.1
Cadmium	Strong Acid Extractable	mg/kg	0.33	0.43	0.32	0.01
Chromium	Strong Acid Extractable	mg/kg	19.5	23.3	24.7	0.5
Cobalt	Strong Acid Extractable	mg/kg	6.9	8.9	5.9	0.1
Copper	Strong Acid Extractable	mg/kg	20.8	33.8	21.6	1
Lead	Strong Acid Extractable	mg/kg	95.0	147	80.5	0.1
Mercury	Strong Acid Extractable	mg/kg	0.11	0.19	0.14	0.05
Molybdenum	Strong Acid Extractable	mg/kg	<1.0	1.2	<1.0	1
Nickel	Strong Acid Extractable	mg/kg	22.5	29.5	21.2	0.5
Selenium	Strong Acid Extractable	mg/kg	0.4	0.4	0.3	0.3
Silver	Strong Acid Extractable	mg/kg	<0.10	0.1	0.10	0.1
Thallium	Strong Acid Extractable	mg/kg	0.12	0.16	0.10	0.05
Tin	Strong Acid Extractable	mg/kg	2.0	4.4	4.9	1
Uranium	Strong Acid Extractable	mg/kg	1.1	1.1	0.9	0.5
Vanadium	Strong Acid Extractable	mg/kg	23.3	28.1	26.6	0.1
Zinc	Strong Acid Extractable	mg/kg	113	173	115	1
Particle Size Analysis - Wet Sieve						
Texture			Coarse-Grained	Fine-Grained	Coarse-Grained	
75 micron sieve	% Retained	% by weight	53.8	41.8	69.6	0.1
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.81	0.93	0.82	0.01
SAR	Saturated Paste		4.9	5.6	4.1	
% Saturation		%	87	85	96	
Calcium	Saturated Paste	mg/kg	41.1	36.5	46.1	
Magnesium	Saturated Paste	mg/kg	3.8	6.4	8.3	
Sodium	Saturated Paste	mg/kg	115	130	113	
Potassium	Saturated Paste	mg/kg	10	8	12	
Chloride	Saturated Paste	mg/L	44	69	41	2
Chloride	Saturated Paste	mg/kg	38	59	39	
Sulfate (SO4)	Saturated Paste	mg/kg	135	125	193	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	8.3	7.8	7.9	
Water Soluble Parameters						
Chromium (VI)	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

Analyte		Units	Results	Results	Results	Nominal Detection Limit
		Reference Number	1451962-3	1451962-6	1451962-9	
		Sample Date	Oct 09, 2020	Oct 09, 2020	Oct 12, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TH20-6 / 1.5 / m	TH20-6 / 4.5 / m	TH20-5 / 0.5 / m	
		Matrix	Soil	Soil	Soil	
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005	<0.005	<0.005	0.005
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	0.016	<0.005	<0.005	0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	0.15	<0.03	<0.03	0.03
Methanol Field Preservation			Yes	Yes	Yes	
Volatile Petroleum Hydrocarbons - Soil						
F1 C6-C10	Dry Weight	mg/kg	<10	<10	<10	10
F1 -BTEX	Dry Weight	mg/kg	<10	<10	<10	10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		14-Oct-20	14-Oct-20	14-Oct-20	
F2c C10-C16	Dry Weight	mg/kg	178	<25	<25	25
F3c C16-C34	Dry Weight	mg/kg	6160	<50	<50	50
F4c C34-C50	Dry Weight	mg/kg	4460	<100	<100	100
F4HTGCc C34-C50+	Dry Weight	mg/kg	7440	<100	<100	100
% C50+		%	14.9	<5	<5	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	18.20	26.50	27.70	
Polycyclic Aromatic Hydrocarbons - Soil						
Naphthalene	Dry Weight	mg/kg	59.9	<0.01	<0.01	0.010
Acenaphthylene	Dry Weight	mg/kg	14.1	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg	20.7	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg	52.4	<0.05	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg	302	<0.01	0.03	0.01
Anthracene	Dry Weight	mg/kg	40.1	<0.003	0.008	0.003
Fluoranthene	Dry Weight	mg/kg	274	<0.01	0.044	0.010
Pyrene	Dry Weight	mg/kg	318	<0.01	0.039	0.010
Benzo(a)anthracene	Dry Weight	mg/kg	137	<0.01	0.02	0.01
Chrysene	Dry Weight	mg/kg	127	<0.05	<0.05	0.05
Benzo(b+j)fluoranthene	Dry Weight	mg/kg	99.2	<0.05	<0.05	0.05
Benzo(k)fluoranthene	Dry Weight	mg/kg	50.0	<0.05	<0.05	0.05
Benzo(a)pyrene	Dry Weight	mg/kg	91.3	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	25.9	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	8.66	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	28.4	<0.05	<0.05	0.05
CB(a)P	B(a)P Total Potency Equivalents	mg/kg	133	<0.001	0.020	0.001
IACR_Coarse	Index of Additive Cancer		73.9	<0.001	0.003	0.001

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Jan 20, 2021
Sampled By:	SIO	P.O.:	29532.30	Report Number:	2588529
Company:	Thurber	Proj. Acct. code:	29532.30		

		Reference Number	1451962-3	1451962-6	1451962-9	
		Sample Date	Oct 09, 2020	Oct 09, 2020	Oct 12, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TH20-6 / 1.5 / m	TH20-6 / 4.5 / m	TH20-5 / 0.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Polycyclic Aromatic Hydrocarbons - Soil - Continued						
	Risk					
IACR_Fine	Index of Additive Cancer Risk		140	<0.001	0.006	0.001
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	<10	83	105	50-140
2-Fluorobiphenyl	PAH - Surrogate	%	<10	112	114	50-140
p-Terphenyl-d14	PAH - Surrogate	%	>190	138	139	50-140

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Analytical Report

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Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

		Reference Number	1451962-4	1451962-5	1451962-6	
		Sample Date	Oct 09, 2020	Oct 09, 2020	Oct 09, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TH20-6 / 2.25 / m	TH20-6 / 3 / m	TH20-6 / 4.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L	1.09	0.43	0.17	0.05
Antimony	Strong Acid Extractable	mg/kg	0.8	0.6	0.5	0.2
Arsenic	Strong Acid Extractable	mg/kg	8.8	10.4	9.8	0.2
Barium	Strong Acid Extractable	mg/kg	460	277	247	1
Beryllium	Strong Acid Extractable	mg/kg	1.1	0.8	0.7	0.1
Cadmium	Strong Acid Extractable	mg/kg	0.25	0.21	0.26	0.01
Chromium	Strong Acid Extractable	mg/kg	25.7	29.1	21.5	0.5
Cobalt	Strong Acid Extractable	mg/kg	11.2	13.1	11.0	0.1
Copper	Strong Acid Extractable	mg/kg	37.4	32.0	28.5	1
Lead	Strong Acid Extractable	mg/kg	25.4	16.3	14.2	0.1
Mercury	Strong Acid Extractable	mg/kg	0.87	0.08	0.06	0.05
Molybdenum	Strong Acid Extractable	mg/kg	1.5	1.2	1.0	1
Nickel	Strong Acid Extractable	mg/kg	31.5	35.6	29.6	0.5
Selenium	Strong Acid Extractable	mg/kg	0.6	0.4	0.3	0.3
Silver	Strong Acid Extractable	mg/kg	0.2	0.1	0.1	0.1
Thallium	Strong Acid Extractable	mg/kg	0.17	0.22	0.21	0.05
Tin	Strong Acid Extractable	mg/kg	1.6	<1.0	<1.0	1
Uranium	Strong Acid Extractable	mg/kg	1.6	1.0	0.9	0.5
Vanadium	Strong Acid Extractable	mg/kg	35.0	38.9	33.5	0.1
Zinc	Strong Acid Extractable	mg/kg	101	97	89	1
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	1.69	1.38	1.35	0.01
SAR	Saturated Paste		1.1	2.6	2.7	
% Saturation		%	117	121	102	
Calcium	Saturated Paste	mg/kg	228	136	111	
Magnesium	Saturated Paste	mg/kg	81.9	33.7	35.2	
Sodium	Saturated Paste	mg/kg	84	141	131	
Potassium	Saturated Paste	mg/kg	28	18	10	
Chloride	Saturated Paste	mg/L	109	240	188	2
Chloride	Saturated Paste	mg/kg	128	290	192	
Sulfate (SO4)	Saturated Paste	mg/kg	657	176	344	
TGR	Saturated Paste	T/ac	<0.1	<0.1	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.5	7.7	7.9	
Water Soluble Parameters						
Chromium (VI)	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Jan 20, 2021
Sampled By:	SIO	P.O.:	29532.30	Report Number:	2588529
Company:	Thurber	Proj. Acct. code:	29532.30		

		Reference Number	1451962-6	1451962-9	1451962-11	
		Sample Date	Oct 09, 2020	Oct 12, 2020	Oct 12, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TH20-6 / 4.5 / m	TH20-5 / 0.5 / m	TH20-5 / 1.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Particle Size Analysis - Wet Sieve						
Texture			Fine-Grained	Fine-Grained	Fine-Grained	
75 micron sieve	% Retained	% by weight	10	18.2	4.0	0.1

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Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

		Reference Number	1451962-7	1451962-8	1451962-9	
		Sample Date	Oct 09, 2020	Oct 12, 2020	Oct 12, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TH20-6 / 5.25 / m	TH20-6 / 6 / m	TH20-5 / 0.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L	<0.5	0.14	<0.5	0.05
Antimony	Strong Acid Extractable	mg/kg	0.6	0.5	0.4	0.2
Arsenic	Strong Acid Extractable	mg/kg	9.7	10.2	8.4	0.2
Barium	Strong Acid Extractable	mg/kg	278	249	237	1
Beryllium	Strong Acid Extractable	mg/kg	0.8	0.8	0.7	0.1
Cadmium	Strong Acid Extractable	mg/kg	0.28	0.27	0.32	0.01
Chromium	Strong Acid Extractable	mg/kg	25.9	24.6	27.2	0.5
Cobalt	Strong Acid Extractable	mg/kg	11.1	10.7	10.1	0.1
Copper	Strong Acid Extractable	mg/kg	30.4	30.0	24.6	1
Lead	Strong Acid Extractable	mg/kg	15.9	22.2	12.8	0.1
Mercury	Strong Acid Extractable	mg/kg	0.09	0.07	0.06	0.05
Molybdenum	Strong Acid Extractable	mg/kg	1.1	1.1	1.0	1
Nickel	Strong Acid Extractable	mg/kg	34.8	32.2	33.7	0.5
Selenium	Strong Acid Extractable	mg/kg	0.7	0.4	0.6	0.3
Silver	Strong Acid Extractable	mg/kg	0.1	0.1	0.1	0.1
Thallium	Strong Acid Extractable	mg/kg	0.21	0.20	0.15	0.05
Tin	Strong Acid Extractable	mg/kg	<1.0	1.1	<1.0	1
Uranium	Strong Acid Extractable	mg/kg	2.0	1.0	0.8	0.5
Vanadium	Strong Acid Extractable	mg/kg	36.9	34.7	35.4	0.1
Zinc	Strong Acid Extractable	mg/kg	91	97	96	1
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	3.24	1.14	13.6	0.01
SAR	Saturated Paste		1.1	1.3	63.5	
% Saturation		%	97	112	89	
Calcium	Saturated Paste	mg/kg	591	123	188	
Magnesium	Saturated Paste	mg/kg	269	53.9	11	
Sodium	Saturated Paste	mg/kg	126	75	3130	
Potassium	Saturated Paste	mg/kg	20	13	44	
Chloride	Saturated Paste	mg/L	82	51	4600	2
Chloride	Saturated Paste	mg/kg	79	57	4090	
Sulfate (SO4)	Saturated Paste	mg/kg	2220	479	130	
TGR	Saturated Paste	T/ac	<0.1	<0.1	>20.0	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.8	8.0	7.3	
Water Soluble Parameters						
Chromium (VI)	Dry Weight	mg/kg	<0.05	<0.05	0.1	0.05

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		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
				Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	LSD:		Report Number:	2588529
Sampled By:	SIO	P.O.:	29532.30		
Company:	Thurber	Proj. Acct. code:	29532.30		

		Reference Number	1451962-10	1451962-11	1451962-12	
		Sample Date	Oct 12, 2020	Oct 12, 2020	Oct 12, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TH20-5 / 0.75 / m	TH20-5 / 1.5 / m	TH20-5 / 2.25 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L	<0.5	<0.5	<0.5	0.05
Antimony	Strong Acid Extractable	mg/kg	0.3	0.5	0.5	0.2
Arsenic	Strong Acid Extractable	mg/kg	7.4	8.9	9.9	0.2
Barium	Strong Acid Extractable	mg/kg	198	224	353	1
Beryllium	Strong Acid Extractable	mg/kg	0.5	0.8	0.8	0.1
Cadmium	Strong Acid Extractable	mg/kg	0.29	0.25	0.30	0.01
Chromium	Strong Acid Extractable	mg/kg	20.7	26.7	25.1	0.5
Cobalt	Strong Acid Extractable	mg/kg	9.8	12.8	12.5	0.1
Copper	Strong Acid Extractable	mg/kg	21.3	28.8	31.4	1
Lead	Strong Acid Extractable	mg/kg	11.2	12.6	15.3	0.1
Mercury	Strong Acid Extractable	mg/kg	<0.05	0.05	0.05	0.05
Molybdenum	Strong Acid Extractable	mg/kg	<1.0	<1.0	1.1	1
Nickel	Strong Acid Extractable	mg/kg	26.2	36.1	35.0	0.5
Selenium	Strong Acid Extractable	mg/kg	0.6	0.3	0.4	0.3
Silver	Strong Acid Extractable	mg/kg	<0.10	0.10	0.1	0.1
Thallium	Strong Acid Extractable	mg/kg	0.16	0.19	0.22	0.05
Tin	Strong Acid Extractable	mg/kg	<1.0	<1.0	<1.0	1
Uranium	Strong Acid Extractable	mg/kg	0.7	0.8	1.2	0.5
Vanadium	Strong Acid Extractable	mg/kg	34.1	42.3	38.2	0.1
Zinc	Strong Acid Extractable	mg/kg	83	86	94	1
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	8.72	8.41	6.73	0.01
SAR	Saturated Paste		48	20.2	2.8	
% Saturation		%	89	99	105	
Calcium	Saturated Paste	mg/kg	92.5	301	607	
Magnesium	Saturated Paste	mg/kg	8	72	339	
Sodium	Saturated Paste	mg/kg	1700	1490	361	
Potassium	Saturated Paste	mg/kg	19	<10	16	
Chloride	Saturated Paste	mg/L	2950	2880	2280	2
Chloride	Saturated Paste	mg/kg	2630	2840	2400	
Sulfate (SO4)	Saturated Paste	mg/kg	97	140	180	
TGR	Saturated Paste	T/ac	13.8	7.8	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.8	7.8	7.7	
Water Soluble Parameters						
Chromium (VI)	Dry Weight	mg/kg	0.1	<0.05	<0.05	0.05

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Bill To:	Thurber Engineering Ltd.	Project ID:	29532.300	Lot ID:	**1451962**
	4127 Roper Road	Project Name:	Latta Bridge Phase II ESA	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
	T6B 3S5			Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	LSD:		Report Number:	2588529
Sampled By:	SIO	P.O.:	29532.30		
Company:	Thurber	Proj. Acct. code:	29532.30		

		Reference Number	1451962-12	1451962-13	1451962-15	
		Sample Date	Oct 12, 2020	Oct 12, 2020	Oct 12, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TH20-5 / 2.25 / m	TH20-4 / 0.5 / m	TH20-4 / 1.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Particle Size Analysis - Wet Sieve						
Texture			Fine-Grained	Fine-Grained	Fine-Grained	
75 micron sieve	% Retained	% by weight	0.4	12.5	1.6	0.1

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	4127 Roper Road	Project Name:	Latta Bridge Phase II ESA	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
	T6B 3S5			Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	LSD:		Report Number:	2588529
Sampled By:	SIO	P.O.:	29532.30		
Company:	Thurber	Proj. Acct. code:	29532.30		

Reference Number	1451962-13
Sample Date	Oct 12, 2020
Sample Time	NA
Sample Location	
Sample Description	TH20-4 / 0.5 / m
Matrix	Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil						
Benzene	Dry Weight	mg/kg	<0.005			0.005
Toluene	Dry Weight	mg/kg	<0.02			0.02
Ethylbenzene	Dry Weight	mg/kg	<0.005			0.005
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.03			0.03
Methanol Field Preservation			Yes			
Volatile Petroleum Hydrocarbons - Soil						
F1 C6-C10	Dry Weight	mg/kg	<10			10
F1 -BTEX	Dry Weight	mg/kg	<10			10
Extractable Petroleum Hydrocarbons - Soil						
Extraction Date	Total Extractables		14-Oct-20			
F2c C10-C16	Dry Weight	mg/kg	<25			25
F3c C16-C34	Dry Weight	mg/kg	<50			50
F4c C34-C50	Dry Weight	mg/kg	<100			100
F4HTGCc C34-C50+	Dry Weight	mg/kg	<100			100
% C50+		%	<5			
Silica Gel Cleanup						
Silica Gel Cleanup			Done			
Soil % Moisture						
Moisture	Soil % Moisture	% by weight	20.70			
Polycyclic Aromatic Hydrocarbons - Soil						
Naphthalene	Dry Weight	mg/kg	<0.01			0.010
Acenaphthylene	Dry Weight	mg/kg	<0.05			0.05
Acenaphthene	Dry Weight	mg/kg	<0.05			0.05
Fluorene	Dry Weight	mg/kg	<0.05			0.05
Phenanthrene	Dry Weight	mg/kg	<0.01			0.01
Anthracene	Dry Weight	mg/kg	<0.003			0.003
Fluoranthene	Dry Weight	mg/kg	<0.01			0.010
Pyrene	Dry Weight	mg/kg	<0.01			0.010
Benzo(a)anthracene	Dry Weight	mg/kg	<0.01			0.01
Chrysene	Dry Weight	mg/kg	<0.05			0.05
Benzo(b+j)fluoranthene	Dry Weight	mg/kg	<0.05			0.05
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05			0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05			0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05			0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05			0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05			0.05
CB(a)P	B(a)P Total Potency Equivalents	mg/kg	<0.001			0.001
IACR_Coarse	Index of Additive Cancer		<0.001			0.001

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Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

Reference Number	1451962-13
Sample Date	Oct 12, 2020
Sample Time	NA
Sample Location	
Sample Description	TH20-4 / 0.5 / m
Matrix	Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Polycyclic Aromatic Hydrocarbons - Soil - Continued						
	Risk					
IACR_Fine	Index of Additive Cancer Risk		<0.001			0.001
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	85			50-140
2-Fluorobiphenyl	PAH - Surrogate	%	106			50-140
p-Terphenyl-d14	PAH - Surrogate	%	128			50-140

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Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

		Reference Number	1451962-13	1451962-14	1451962-15	
		Sample Date	Oct 12, 2020	Oct 12, 2020	Oct 12, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TH20-4 / 0.5 / m	TH20-4 / 0.75 / m	TH20-4 / 1.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L	1.5	0.7	<0.5	0.05
Antimony	Strong Acid Extractable	mg/kg	0.9	0.6	0.5	0.2
Arsenic	Strong Acid Extractable	mg/kg	9.6	10.4	10.4	0.2
Barium	Strong Acid Extractable	mg/kg	293	195	284	1
Beryllium	Strong Acid Extractable	mg/kg	1.0	1.1	0.9	0.1
Cadmium	Strong Acid Extractable	mg/kg	0.22	0.12	0.29	0.01
Chromium	Strong Acid Extractable	mg/kg	44.8	30.3	25.4	0.5
Cobalt	Strong Acid Extractable	mg/kg	10.3	13.4	13.7	0.1
Copper	Strong Acid Extractable	mg/kg	29.0	32.3	32.1	1
Lead	Strong Acid Extractable	mg/kg	37.8	22.9	15.1	0.1
Mercury	Strong Acid Extractable	mg/kg	0.09	0.07	0.05	0.05
Molybdenum	Strong Acid Extractable	mg/kg	1.3	<1.0	1.3	1
Nickel	Strong Acid Extractable	mg/kg	43.7	35.9	38.7	0.5
Selenium	Strong Acid Extractable	mg/kg	0.4	0.5	0.4	0.3
Silver	Strong Acid Extractable	mg/kg	<0.10	<0.10	0.10	0.1
Thallium	Strong Acid Extractable	mg/kg	0.14	0.19	0.23	0.05
Tin	Strong Acid Extractable	mg/kg	1.1	<1.0	<1.0	1
Uranium	Strong Acid Extractable	mg/kg	0.9	0.9	1.2	0.5
Vanadium	Strong Acid Extractable	mg/kg	45.9	44.0	40.5	0.1
Zinc	Strong Acid Extractable	mg/kg	138	97	103	1
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	8.23	4.56	3.02	0.01
SAR	Saturated Paste		20.7	11.7	2.4	
% Saturation		%	79	105	105	
Calcium	Saturated Paste	mg/kg	261	166	259	
Magnesium	Saturated Paste	mg/kg	104	77	139	
Sodium	Saturated Paste	mg/kg	1390	746	199	
Potassium	Saturated Paste	mg/kg	10	<11	11	
Chloride	Saturated Paste	mg/L	2740	1470	930	2
Chloride	Saturated Paste	mg/kg	2170	1540	977	
Sulfate (SO4)	Saturated Paste	mg/kg	120	120	150	
TGR	Saturated Paste	T/ac	10.6	1.2	<0.1	
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.3	7.7	7.7	
Water Soluble Parameters						
Chromium (VI)	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Jan 20, 2021
Sampled By:	SIO	P.O.:	29532.30	Report Number:	2588529
Company:	Thurber	Proj. Acct. code:	29532.30		

Analyte		Units	Results	Results	Results	Nominal Detection Limit
		Reference Number	1451962-16	1451962-17	1451962-18	
		Sample Date	Oct 11, 2020	Oct 11, 2020	Oct 11, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-1 / 0-0.15 / m	TP20-2 / 0-0.15 / m	TP20-3 / 0-0.15 / m	
		Matrix	Soil	Soil	Soil	
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L	0.23		0.23	0.05
Antimony	Strong Acid Extractable	mg/kg	1.1		1.0	0.2
Arsenic	Strong Acid Extractable	mg/kg	3.6		8.0	0.2
Barium	Strong Acid Extractable	mg/kg	86		217	1
Beryllium	Strong Acid Extractable	mg/kg	0.2		0.6	0.1
Cadmium	Strong Acid Extractable	mg/kg	0.25		0.43	0.01
Chromium	Strong Acid Extractable	mg/kg	22.7		17.8	0.5
Cobalt	Strong Acid Extractable	mg/kg	3.6		9.4	0.1
Copper	Strong Acid Extractable	mg/kg	26.9		27.4	1
Lead	Strong Acid Extractable	mg/kg	39.3	383	495	0.1
Mercury	Strong Acid Extractable	mg/kg	<0.05		<0.05	0.05
Molybdenum	Strong Acid Extractable	mg/kg	1.2		1.0	1
Nickel	Strong Acid Extractable	mg/kg	12.4		24.5	0.5
Selenium	Strong Acid Extractable	mg/kg	<0.3		0.3	0.3
Silver	Strong Acid Extractable	mg/kg	<0.10		0.1	0.1
Thallium	Strong Acid Extractable	mg/kg	0.06		0.17	0.05
Tin	Strong Acid Extractable	mg/kg	1.7		3.0	1
Uranium	Strong Acid Extractable	mg/kg	<0.5		0.8	0.5
Vanadium	Strong Acid Extractable	mg/kg	12.1		26.8	0.1
Zinc	Strong Acid Extractable	mg/kg	724	238	291	1

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
				Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	LSD:		Report Number:	2588529
Sampled By:	SIO	P.O.:	29532.30		
Company:	Thurber	Proj. Acct. code:	29532.30		

		Reference Number	1451962-16	1451962-18	1451962-19	
		Sample Date	Oct 11, 2020	Oct 11, 2020	Oct 11, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-1 / 0-0.15 / m	TP20-3 / 0-0.15 / m	TP20-4 / 0-0.15 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.52			0.01
SAR	Saturated Paste		2.9			
% Saturation		%	48	59	83	
Calcium	Saturated Paste	mg/kg	18.8			
Magnesium	Saturated Paste	mg/kg	2.3			
Sodium	Saturated Paste	mg/kg	35			
Potassium	Saturated Paste	mg/kg	18			
Chloride	Saturated Paste	mg/L	62			2
Chloride	Saturated Paste	mg/kg	30			
Sulfate (SO4)	Saturated Paste	mg/kg	13			
TGR	Saturated Paste	T/ac	<0.1			
Water Soluble Parameters						
Chromium (VI)	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05

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Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Jan 20, 2021
Sampled By:	SIO	P.O.:	29532.30	Report Number:	2588529
Company:	Thurber	Proj. Acct. code:	29532.30		

		Reference Number	1451962-16	1451962-37	1451962-45	
		Sample Date	Oct 11, 2020	Oct 10, 2020	Oct 10, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-1 / 0-0.15 / m	DUP20-1	TH20-6 / 3.75 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Soil Acidity						
pH	1:2 Soil:CaCl2 sol.	pH	7.4	7.8	7.6	

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Bill To:	Thurber Engineering Ltd.	Project ID:	29532.300	Lot ID:	**1451962**
	4127 Roper Road	Project Name:	Latta Bridge Phase II ESA	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
	T6B 3S5			Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	LSD:		Report Number:	2588529
Sampled By:	SIO	P.O.:	29532.30		
Company:	Thurber	Proj. Acct. code:	29532.30		

		Reference Number	1451962-17	1451962-19	1451962-21	
		Sample Date	Oct 11, 2020	Oct 11, 2020	Oct 11, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-2 / 0-0.15 / m	TP20-4 / 0-0.15 / m	TP20-6 / 0-0.15 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Particle Size Analysis - Wet Sieve						
Texture			Fine-Grained	Fine-Grained	Fine-Grained	
75 micron sieve	% Retained	% by weight	32.4	42.5	44.4	0.1

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	4127 Roper Road	Project Name:	Latta Bridge Phase II ESA	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
	T6B 3S5			Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	LSD:		Report Number:	2588529
Sampled By:	SIO	P.O.:	29532.30		
Company:	Thurber	Proj. Acct. code:	29532.30		

		Reference Number	1451962-19	1451962-20	1451962-21	
		Sample Date	Oct 11, 2020	Oct 11, 2020	Oct 11, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-4 / 0-0.15 / m	TP20-5 / 0-0.15 / m	TP20-6 / 0-0.15 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L	0.32		0.21	0.05
Antimony	Strong Acid Extractable	mg/kg	1.0		2.0	0.2
Arsenic	Strong Acid Extractable	mg/kg	7.3		8.3	0.2
Barium	Strong Acid Extractable	mg/kg	234		227	1
Beryllium	Strong Acid Extractable	mg/kg	0.6		0.6	0.1
Cadmium	Strong Acid Extractable	mg/kg	0.54		0.53	0.01
Chromium	Strong Acid Extractable	mg/kg	16.6		20.7	0.5
Cobalt	Strong Acid Extractable	mg/kg	7.5		9.4	0.1
Copper	Strong Acid Extractable	mg/kg	30.1		30.8	1
Lead	Strong Acid Extractable	mg/kg	220	445	526	0.1
Mercury	Strong Acid Extractable	mg/kg	0.09		0.06	0.05
Molybdenum	Strong Acid Extractable	mg/kg	1.0		1.0	1
Nickel	Strong Acid Extractable	mg/kg	20.4		26.6	0.5
Selenium	Strong Acid Extractable	mg/kg	0.3		0.4	0.3
Silver	Strong Acid Extractable	mg/kg	0.1		0.1	0.1
Thallium	Strong Acid Extractable	mg/kg	0.14		0.17	0.05
Tin	Strong Acid Extractable	mg/kg	2.6		5.0	1
Uranium	Strong Acid Extractable	mg/kg	0.7		0.8	0.5
Vanadium	Strong Acid Extractable	mg/kg	26.3		29.9	0.1
Zinc	Strong Acid Extractable	mg/kg	158	373	325	1

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300
Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue
Company:	Thurber	LSD:	
		P.O.:	29532.30
		Proj. Acct. code:	29532.30

Lot ID: **1451962**
Control Number:
Date Received: Oct 13, 2020
Date Reported: Jan 20, 2021
Report Number: 2588529

		Reference Number	1451962-21	1451962-22	1451962-24	
		Sample Date	Oct 11, 2020	Oct 11, 2020	Oct 11, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-6 / 0-0.15 / m	TP20-7 / 0-0.15 / m	TP20-9 / 0-0.15 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Salinity						
% Saturation		%	71	69	79	
Water Soluble Parameters						
Chromium (VI)	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05

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		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Jan 20, 2021
Sampled By:	SIO	P.O.:	29532.30	Report Number:	2588529
Company:	Thurber	Proj. Acct. code:	29532.30		

		Reference Number	1451962-22	1451962-23	1451962-24	
		Sample Date	Oct 11, 2020	Oct 11, 2020	Oct 11, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-7 / 0-0.15 / m	TP20-8 / 0-0.15 / m	TP20-9 / 0-0.15 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L	0.19		0.23	0.05
Antimony	Strong Acid Extractable	mg/kg	0.8		0.9	0.2
Arsenic	Strong Acid Extractable	mg/kg	6.3		8.5	0.2
Barium	Strong Acid Extractable	mg/kg	194		186	1
Beryllium	Strong Acid Extractable	mg/kg	0.5		0.5	0.1
Cadmium	Strong Acid Extractable	mg/kg	0.52		0.42	0.01
Chromium	Strong Acid Extractable	mg/kg	11.4		21.3	0.5
Cobalt	Strong Acid Extractable	mg/kg	5.9		13.8	0.1
Copper	Strong Acid Extractable	mg/kg	22.8		30.0	1
Lead	Strong Acid Extractable	mg/kg	230	215	147	0.1
Mercury	Strong Acid Extractable	mg/kg	0.07		0.05	0.05
Molybdenum	Strong Acid Extractable	mg/kg	1.0		1.3	1
Nickel	Strong Acid Extractable	mg/kg	15.1		24.3	0.5
Selenium	Strong Acid Extractable	mg/kg	<0.3		0.4	0.3
Silver	Strong Acid Extractable	mg/kg	<0.10		0.1	0.1
Thallium	Strong Acid Extractable	mg/kg	0.11		0.15	0.05
Tin	Strong Acid Extractable	mg/kg	2.0		1.9	1
Uranium	Strong Acid Extractable	mg/kg	0.5		0.7	0.5
Vanadium	Strong Acid Extractable	mg/kg	16.5		26.0	0.1
Zinc	Strong Acid Extractable	mg/kg	137	205	182	1

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

		Reference Number	1451962-23	1451962-25	1451962-27	
		Sample Date	Oct 11, 2020	Oct 11, 2020	Oct 10, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-8 / 0-0.15 / m	TP20-10 / 0-0.15 / m	TP20-12 / 0-0.15 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Particle Size Analysis - Wet Sieve						
Texture			Fine-Grained	Fine-Grained	Fine-Grained	
75 micron sieve	% Retained	% by weight	44.7	47.3	47.5	0.1

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		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
				Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	LSD:		Report Number:	2588529
Sampled By:	SIO	P.O.:	29532.30		
Company:	Thurber	Proj. Acct. code:	29532.30		

		Reference Number	1451962-25	1451962-26	1451962-27	
		Sample Date	Oct 11, 2020	Oct 10, 2020	Oct 10, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-10 / 0-0.15 / m	TP20-11 / 0-0.15 / m	TP20-12 / 0-0.15 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L	0.19		0.25	0.05
Antimony	Strong Acid Extractable	mg/kg	1.0		0.9	0.2
Arsenic	Strong Acid Extractable	mg/kg	7.0		5.2	0.2
Barium	Strong Acid Extractable	mg/kg	228		197	1
Beryllium	Strong Acid Extractable	mg/kg	0.6		0.4	0.1
Cadmium	Strong Acid Extractable	mg/kg	0.51		0.41	0.01
Chromium	Strong Acid Extractable	mg/kg	17.8		16.9	0.5
Cobalt	Strong Acid Extractable	mg/kg	8.0		6.4	0.1
Copper	Strong Acid Extractable	mg/kg	27.8		26.2	1
Lead	Strong Acid Extractable	mg/kg	181	150	275	0.1
Mercury	Strong Acid Extractable	mg/kg	0.10		0.12	0.05
Molybdenum	Strong Acid Extractable	mg/kg	1.2		<1.0	1
Nickel	Strong Acid Extractable	mg/kg	21.6		20.2	0.5
Selenium	Strong Acid Extractable	mg/kg	0.4		<0.3	0.3
Silver	Strong Acid Extractable	mg/kg	0.1		0.1	0.1
Thallium	Strong Acid Extractable	mg/kg	0.13		0.11	0.05
Tin	Strong Acid Extractable	mg/kg	2.5		2.7	1
Uranium	Strong Acid Extractable	mg/kg	0.7		0.6	0.5
Vanadium	Strong Acid Extractable	mg/kg	23.0		19.3	0.1
Zinc	Strong Acid Extractable	mg/kg	122	284	170	1

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Analytical Report

Bill To:	Thurber Engineering Ltd.	Project ID:	29532.300	Lot ID:	**1451962**
	4127 Roper Road	Project Name:	Latta Bridge Phase II ESA	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
	T6B 3S5			Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	LSD:		Report Number:	2588529
Sampled By:	SIO	P.O.:	29532.30		
Company:	Thurber	Proj. Acct. code:	29532.30		

		Reference Number	1451962-25	1451962-27	1451962-28	
		Sample Date	Oct 11, 2020	Oct 10, 2020	Oct 10, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-10 / 0-0.15 / m	TP20-12 / 0-0.15 / m	TP20-13 / 0-0.15 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Salinity						
% Saturation		%	66	72	83	
Water Soluble Parameters						
Chromium (VI)	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05

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Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

		Reference Number	1451962-28	1451962-29	1451962-30	
		Sample Date	Oct 10, 2020	Oct 10, 2020	Oct 10, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-13 / 0-0.15 / m	TP20-14 / 0-0.15 / m	TP20-15 / 0-0.15 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L	0.40		0.37	0.05
Antimony	Strong Acid Extractable	mg/kg	1.2		0.6	0.2
Arsenic	Strong Acid Extractable	mg/kg	7.7		6.5	0.2
Barium	Strong Acid Extractable	mg/kg	263		153	1
Beryllium	Strong Acid Extractable	mg/kg	0.7		0.5	0.1
Cadmium	Strong Acid Extractable	mg/kg	0.39		0.32	0.01
Chromium	Strong Acid Extractable	mg/kg	18.7		20.2	0.5
Cobalt	Strong Acid Extractable	mg/kg	9.3		8.7	0.1
Copper	Strong Acid Extractable	mg/kg	34.9		23.4	1
Lead	Strong Acid Extractable	mg/kg	142	43.4	40.6	0.1
Mercury	Strong Acid Extractable	mg/kg	0.22		0.07	0.05
Molybdenum	Strong Acid Extractable	mg/kg	<1.0		<1.0	1
Nickel	Strong Acid Extractable	mg/kg	24.5		26.5	0.5
Selenium	Strong Acid Extractable	mg/kg	0.4		0.4	0.3
Silver	Strong Acid Extractable	mg/kg	0.2		<0.10	0.1
Thallium	Strong Acid Extractable	mg/kg	0.16		0.14	0.05
Tin	Strong Acid Extractable	mg/kg	3.4		1.0	1
Uranium	Strong Acid Extractable	mg/kg	0.7		0.8	0.5
Vanadium	Strong Acid Extractable	mg/kg	29.2		23.8	0.1
Zinc	Strong Acid Extractable	mg/kg	149	102	108	1

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		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Jan 20, 2021
Sampled By:	SIO	P.O.:	29532.30	Report Number:	2588529
Company:	Thurber	Proj. Acct. code:	29532.30		

		Reference Number	1451962-29	1451962-31	1451962-33	
		Sample Date	Oct 10, 2020	Oct 10, 2020	Oct 10, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-14 / 0-0.15 / m	TP20-16 / 0-0.15 / m	TP20-18 / 0-0.15 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Particle Size Analysis - Wet Sieve						
Texture			Fine-Grained	Coarse-Grained	Coarse-Grained	
75 micron sieve	% Retained	% by weight	48.8	73.0	50.3	0.1

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300
Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue
Company:	Thurber	LSD:	
		P.O.:	29532.30
		Proj. Acct. code:	29532.30

Lot ID:	**1451962**
Control Number:	
Date Received:	Oct 13, 2020
Date Reported:	Jan 20, 2021
Report Number:	2588529

		Reference Number	1451962-30	1451962-31	1451962-33	
		Sample Date	Oct 10, 2020	Oct 10, 2020	Oct 10, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-15 / 0-0.15 / m	TP20-16 / 0-0.15 / m	TP20-18 / 0-0.15 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Salinity						
% Saturation		%	87	75	60	
Water Soluble Parameters						
Chromium (VI)	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05

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Analytical Report

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		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
				Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	LSD:		Report Number:	2588529
Sampled By:	SIO	P.O.:	29532.30		
Company:	Thurber	Proj. Acct. code:	29532.30		

		Reference Number	1451962-31	1451962-32	1451962-33	
		Sample Date	Oct 10, 2020	Oct 10, 2020	Oct 10, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-16 / 0-0.15 / m	TP20-17 / 0-0.15 / m	TP20-18 / 0-0.15 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L	0.75		1.25	0.05
Antimony	Strong Acid Extractable	mg/kg	0.8		0.9	0.2
Arsenic	Strong Acid Extractable	mg/kg	7.0		5.9	0.2
Barium	Strong Acid Extractable	mg/kg	204		204	1
Beryllium	Strong Acid Extractable	mg/kg	0.5		0.5	0.1
Cadmium	Strong Acid Extractable	mg/kg	0.30		0.56	0.01
Chromium	Strong Acid Extractable	mg/kg	12.7		14.1	0.5
Cobalt	Strong Acid Extractable	mg/kg	7.5		5.9	0.1
Copper	Strong Acid Extractable	mg/kg	22.6		24.4	1
Lead	Strong Acid Extractable	mg/kg	35.5	28.5	439	0.1
Mercury	Strong Acid Extractable	mg/kg	<0.05		0.11	0.05
Molybdenum	Strong Acid Extractable	mg/kg	<1.0		<1.0	1
Nickel	Strong Acid Extractable	mg/kg	20.4		17.1	0.5
Selenium	Strong Acid Extractable	mg/kg	0.4		0.3	0.3
Silver	Strong Acid Extractable	mg/kg	<0.10		<0.10	0.1
Thallium	Strong Acid Extractable	mg/kg	0.12		0.11	0.05
Tin	Strong Acid Extractable	mg/kg	1.5		3.0	1
Uranium	Strong Acid Extractable	mg/kg	1.1		0.6	0.5
Vanadium	Strong Acid Extractable	mg/kg	23.5		21.3	0.1
Zinc	Strong Acid Extractable	mg/kg	81	79	239	1

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

		Reference Number	1451962-34	1451962-35	1451962-36	
		Sample Date	Oct 10, 2020	Oct 10, 2020	Oct 11, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-19 / 0-0.15 / m	TP20-20 / 0-0.15 / m	TP20-21 / 0-0.15 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L	1.76	<1	0.06	0.05
Antimony	Strong Acid Extractable	mg/kg	0.8	0.7	0.9	0.2
Arsenic	Strong Acid Extractable	mg/kg	6.3	5.6	2.7	0.2
Barium	Strong Acid Extractable	mg/kg	174	141	52	1
Beryllium	Strong Acid Extractable	mg/kg	0.3	0.4	0.1	0.1
Cadmium	Strong Acid Extractable	mg/kg	0.51	0.20	0.15	0.01
Chromium	Strong Acid Extractable	mg/kg	16.0	21.1	28.0	0.5
Cobalt	Strong Acid Extractable	mg/kg	7.6	6.5	2.9	0.1
Copper	Strong Acid Extractable	mg/kg	25.7	14.6	20.0	1
Lead	Strong Acid Extractable	mg/kg	188	52.5	11.0	0.1
Mercury	Strong Acid Extractable	mg/kg	0.13	<0.05	<0.05	0.05
Molybdenum	Strong Acid Extractable	mg/kg	<1.0	1.0	1.4	1
Nickel	Strong Acid Extractable	mg/kg	19.8	20.6	8.9	0.5
Selenium	Strong Acid Extractable	mg/kg	0.4	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	mg/kg	<0.10	<0.10	<0.10	0.1
Thallium	Strong Acid Extractable	mg/kg	0.11	0.10	<0.05	0.05
Tin	Strong Acid Extractable	mg/kg	1.8	1.8	1.4	1
Uranium	Strong Acid Extractable	mg/kg	2.0	0.6	<0.5	0.5
Vanadium	Strong Acid Extractable	mg/kg	25.4	15.9	9.2	0.1
Zinc	Strong Acid Extractable	mg/kg	156	106	235	1
Salinity						
% Saturation		%	77	37	37	
Water Soluble Parameters						
Chromium (VI)	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Jan 20, 2021
Sampled By:	SIO	P.O.:	29532.30	Report Number:	2588529
Company:	Thurber	Proj. Acct. code:	29532.30		

Reference Number	1451962-35
Sample Date	Oct 10, 2020
Sample Time	NA
Sample Location	
Sample Description	TP20-20 / 0-0.15 / m
Matrix	Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Particle Size Analysis - Wet Sieve						
Texture			Coarse-Grained			
75 micron sieve	% Retained	% by weight	76.8			0.1

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Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

Analyte		Units	Results	Results	Results	Nominal Detection Limit
		Reference Number	1451962-37	1451962-38	1451962-39	
		Sample Date	Oct 10, 2020	Oct 11, 2020	Oct 11, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	DUP20-1	DUP20-5	DUP20-6	
		Matrix	Soil	Soil	Soil	
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L	0.67		0.20	0.05
Antimony	Strong Acid Extractable	mg/kg	1.6		1.0	0.2
Arsenic	Strong Acid Extractable	mg/kg	5.8		7.2	0.2
Barium	Strong Acid Extractable	mg/kg	301		198	1
Beryllium	Strong Acid Extractable	mg/kg	0.6		0.5	0.1
Cadmium	Strong Acid Extractable	mg/kg	0.41		0.53	0.01
Chromium	Strong Acid Extractable	mg/kg	15.9		15.6	0.5
Cobalt	Strong Acid Extractable	mg/kg	6.7		7.0	0.1
Copper	Strong Acid Extractable	mg/kg	28.3		28.8	1
Lead	Strong Acid Extractable	mg/kg	239	399	215	0.1
Mercury	Strong Acid Extractable	mg/kg	0.11		0.08	0.05
Molybdenum	Strong Acid Extractable	mg/kg	<1.0		1.1	1
Nickel	Strong Acid Extractable	mg/kg	19.5		20.4	0.5
Selenium	Strong Acid Extractable	mg/kg	0.4		0.3	0.3
Silver	Strong Acid Extractable	mg/kg	0.1		0.10	0.1
Thallium	Strong Acid Extractable	mg/kg	0.12		0.12	0.05
Tin	Strong Acid Extractable	mg/kg	3.5		2.4	1
Uranium	Strong Acid Extractable	mg/kg	1.0		0.6	0.5
Vanadium	Strong Acid Extractable	mg/kg	22.5		22.5	0.1
Zinc	Strong Acid Extractable	mg/kg	144	314	134	1

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		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
				Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	LSD:		Report Number:	2588529
Sampled By:	SIO	P.O.:	29532.30		
Company:	Thurber	Proj. Acct. code:	29532.30		

		Reference Number	1451962-37	1451962-39	1451962-45	
		Sample Date	Oct 10, 2020	Oct 11, 2020	Oct 10, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	DUP20-1	DUP20-6	TH20-6 / 3.75 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Salinity						
Electrical Conductivity	Saturated Paste	dS/m	0.91		0.65	0.01
SAR	Saturated Paste		5.7		0.8	
% Saturation		%	71	83	106	
Calcium	Saturated Paste	mg/kg	30.9		75.2	
Magnesium	Saturated Paste	mg/kg	5.6		18.6	
Sodium	Saturated Paste	mg/kg	111		30	
Potassium	Saturated Paste	mg/kg	9		11	
Chloride	Saturated Paste	mg/L	74		66	2
Chloride	Saturated Paste	mg/kg	53		70	
Sulfate (SO4)	Saturated Paste	mg/kg	84.4		145	
TGR	Saturated Paste	T/ac	<0.1		<0.1	
Water Soluble Parameters						
Chromium (VI)	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05

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Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

		Reference Number	1451962-40	1451962-41	1451962-42	
		Sample Date	Oct 10, 2020	Oct 10, 2020	Oct 10, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	PA20-1	PA20-2	PA20-3	
		Matrix	Waste - industrial	Waste - industrial	Waste - industrial	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Lead	Strong Acid Extractable	mg/kg	38600	472	41.3	0.1

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Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

		Reference Number	1451962-43	1451962-44	1451962-45	
		Sample Date	Oct 10, 2020	Oct 10, 2020	Oct 10, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	PA20-4	PA20-5	TH20-6 / 3.75 / m	
		Matrix	Waste - industrial	Waste - industrial	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L			0.21	0.05
Antimony	Strong Acid Extractable	mg/kg			0.6	0.2
Arsenic	Strong Acid Extractable	mg/kg			10.2	0.2
Barium	Strong Acid Extractable	mg/kg			239	1
Beryllium	Strong Acid Extractable	mg/kg			1.0	0.1
Cadmium	Strong Acid Extractable	mg/kg			0.14	0.01
Chromium	Strong Acid Extractable	mg/kg			23.7	0.5
Cobalt	Strong Acid Extractable	mg/kg			14.1	0.1
Copper	Strong Acid Extractable	mg/kg			31.2	1
Lead	Strong Acid Extractable	mg/kg	4.8	940	26.1	0.1
Mercury	Strong Acid Extractable	mg/kg			0.07	0.05
Molybdenum	Strong Acid Extractable	mg/kg			1.2	1
Nickel	Strong Acid Extractable	mg/kg			34.5	0.5
Selenium	Strong Acid Extractable	mg/kg			<0.3	0.3
Silver	Strong Acid Extractable	mg/kg			0.1	0.1
Thallium	Strong Acid Extractable	mg/kg			0.21	0.05
Tin	Strong Acid Extractable	mg/kg			<1.0	1
Uranium	Strong Acid Extractable	mg/kg			0.9	0.5
Vanadium	Strong Acid Extractable	mg/kg			37.1	0.1
Zinc	Strong Acid Extractable	mg/kg			93	1

Approved by:

Darlene Lintott, MSc
Consulting Scientist

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Quality Control

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

Extractable Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	0	-10	10	yes
F3c C16-C34	µg/mL	0	-30	30	yes
F4c C34-C50	µg/mL	0	-20	20	yes
F4HTGCc C34-C50+	µg/mL	0	-20	20	yes

Date Acquired: October 14, 2020

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
F2c C10-C16	µg/mL	98.84	80	120	yes
F3c C16-C34	µg/mL	102.86	80	120	yes
F4c C34-C50	µg/mL	100.99	80	120	yes
F4HTGCc C34-C50+	µg/mL	101.59	80	120	yes

Date Acquired: October 14, 2020

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	-0.00480603	-0.05	0.07	yes
Antimony	µg/L	0.000463045	-0.1	0.2	yes
Arsenic	µg/L	-0.00486429	-0.2	0.2	yes
Barium	µg/L	0.0428096	-1	1	yes
Beryllium	µg/L	0	-0.1	0.1	yes
Cadmium	µg/L	0.00316438	-0.01	0.01	yes
Chromium	µg/L	-0.0290349	-0.5	0.5	yes
Cobalt	µg/L	0.000908356	-0.1	0.1	yes
Copper	µg/L	0.00867538	-0.6	1.2	yes
Lead	µg/L	0.0130708	-5.0	5.0	yes
Mercury	µg/L	0.00218805	-0.04	0.04	yes
Molybdenum	µg/L	0.00790846	-1.0	1.0	yes
Nickel	µg/L	-0.0067924	-0.4	0.7	yes
Selenium	µg/L	0.00246114	-0.3	0.3	yes
Silver	µg/L	-0.000350216	-0.09	0.14	yes
Thallium	µg/L	0.00683633	-0.04	0.04	yes
Tin	µg/L	0.00616579	-0.4	0.4	yes
Uranium	µg/L	0.00155273	-0.5	0.5	yes
Vanadium	µg/L	-0.00288545	-0.1	0.1	yes
Zinc	µg/L	0.121341	-1	1	yes

Date Acquired: October 14, 2020

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Antimony	mg/kg	0.6	0.6	20	0.4	yes
Arsenic	mg/kg	11.1	11.6	20	0.4	yes
Barium	mg/kg	243	248	20	2	yes
Beryllium	mg/kg	0.5	0.5	20	0.2	yes
Cadmium	mg/kg	0.24	0.25	20	0.02	yes
Chromium	mg/kg	15.9	16.1	20	1.1	yes
Cobalt	mg/kg	14.6	15.1	20	0.2	yes

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Quality Control

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		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
				Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	LSD:		Report Number:	2588529
Sampled By:	SIO	P.O.:	29532.30		
Company:	Thurber	Proj. Acct. code:	29532.30		

Metals Strong Acid Digestion - Continued

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Copper	mg/kg	17.1	18.1	20	2.2	yes
Lead	mg/kg	9.1	9.8	20	0.2	yes
Mercury	mg/kg	0.06	0.06	20	0.05	yes
Molybdenum	mg/kg	<1.0	<1.0	20	2.2	yes
Nickel	mg/kg	38.2	39.8	20	1.1	yes
Selenium	mg/kg	0.4	0.5	20	0.7	yes
Silver	mg/kg	<0.10	<0.10	20	0.22	yes
Thallium	mg/kg	0.15	0.15	20	0.11	yes
Tin	mg/kg	<1.0	<1.0	20	2.2	yes
Uranium	mg/kg	2.2	2.1	20	1.1	yes
Vanadium	mg/kg	18.6	19.3	20	0.2	yes
Zinc	mg/kg	67	68	20	2	yes
Date Acquired:	October 14, 2020					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Antimony	mg/kg	39.9	37.8	42.2	yes
Arsenic	mg/kg	40.2	36.3	43.9	yes
Barium	mg/kg	202	188	212	yes
Beryllium	mg/kg	19.6	17.4	22.2	yes
Cadmium	mg/kg	2.05	1.88	2.28	yes
Chromium	mg/kg	99.8	93.2	107.0	yes
Cobalt	mg/kg	19.9	18.2	21.2	yes
Copper	mg/kg	201	183.1	212.7	yes
Lead	mg/kg	19.7	18.5	21.5	yes
Mercury	mg/kg	2.97	2.64	3.36	yes
Molybdenum	mg/kg	197	185.1	222.3	yes
Nickel	mg/kg	100	92.4	106.2	yes
Selenium	mg/kg	38.8	35.2	44.2	yes
Silver	mg/kg	20.1	18.20	22.40	yes
Thallium	mg/kg	9.82	9.02	10.82	yes
Tin	mg/kg	204	191.2	215.2	yes
Uranium	mg/kg	100	86.0	116.0	yes
Vanadium	mg/kg	19.8	18.0	21.6	yes
Zinc	mg/kg	200	186	210	yes
Date Acquired:	October 14, 2020				
Antimony	mg/kg	4.0	3.2	4.7	yes
Arsenic	mg/kg	4.3	3.4	4.9	yes
Barium	mg/kg	109	91	118	yes
Beryllium	mg/kg	0.4	0.2	0.5	yes
Cadmium	mg/kg	0.92	0.78	1.20	yes
Chromium	mg/kg	90.5	70.9	98.5	yes
Cobalt	mg/kg	7.4	5.8	8.2	yes
Copper	mg/kg	137	108.4	148.0	yes
Lead	mg/kg	287	199.1	308.9	yes
Mercury	mg/kg	0.07	0.04	0.08	yes

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W: www.element.com

Quality Control

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Jan 20, 2021
Sampled By:	SIO	P.O.:	29532.30	Report Number:	2588529
Company:	Thurber	Proj. Acct. code:	29532.30		

Metals Strong Acid Digestion - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Molybdenum	mg/kg	1.2	0.9	1.4	yes
Nickel	mg/kg	28.8	22.5	32.1	yes
Selenium	mg/kg	<0.3	0.3	0.3	yes
Silver	mg/kg	4.7	2.28	6.00	yes
Thallium	mg/kg	0.08	0.06	0.09	yes
Tin	mg/kg	11.3	8.4	12.6	yes
Uranium	mg/kg	<0.5	0.3	0.7	yes
Vanadium	mg/kg	33.2	17.8	46.9	yes
Zinc	mg/kg	355	283	390	yes

Date Acquired: October 14, 2020

Mono-Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.005	0.005	yes
Toluene	ng	0	-0.06	0.06	yes
Ethylbenzene	ng	0	-0.030	0.030	yes
Total Xylenes (m,p,o)	ng	0	-0.09	0.09	yes
Styrene	ng	0	-0.030	0.030	yes

Date Acquired: October 14, 2020

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	84.40	80	120	yes
Toluene	ng	83.39	80	120	yes
Ethylbenzene	ng	84.27	80	120	yes
m,p-Xylene	ng	84.41	80	120	yes
Total Xylenes (m,p,o)	ng	94.41	80	120	yes
Styrene	ng	80.04	80	120	yes

Date Acquired: October 14, 2020

PAH - Soil - Surrogate Recovery

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Nitrobenzene-d5	%	70.6385	50	140	yes
2-Fluorobiphenyl	%	105.812	50	140	yes
p-Terphenyl-d14	%	127.35	50	140	yes

Date Acquired: October 14, 2020

Particle Size Analysis - Wet Sieve

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
75 micron sieve	% by weight	13.5	12.3	16.7	yes

Date Acquired: October 15, 2020

Polycyclic Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Naphthalene	ng/mL	0	-0.010	0.010	yes
Acenaphthylene	ng/mL	0	-0.05	0.05	yes

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Quality Control

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
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Attn:	Sharon Bunn	LSD:		Date Reported:	Jan 20, 2021
Sampled By:	SIO	P.O.:	29532.30	Report Number:	2588529
Company:	Thurber	Proj. Acct. code:	29532.30		

Polycyclic Aromatic Hydrocarbons - Soil - Continued

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Acenaphthene	ng/mL	0	-0.05	0.05	yes
Fluorene	ng/mL	0	-0.05	0.05	yes
Phenanthrene	ng/mL	0	-0.01	0.01	yes
Anthracene	ng/mL	0	-0.003	0.003	yes
Fluoranthene	ng/mL	0	-0.010	0.010	yes
Pyrene	ng/mL	0	-0.010	0.010	yes
Benzo(a)anthracene	ng/mL	0	-0.01	0.01	yes
Chrysene	ng/mL	0	-0.05	0.05	yes
Benzo(b)fluoranthene	ng/mL	0	-0.05	0.05	yes
Benzo(b+j)fluoranthene	ng/mL	0	-0.05	0.05	yes
Benzo(k)fluoranthene	ng/mL	0	-0.05	0.05	yes
Benzo(a)pyrene	ng/mL	0	-0.05	0.05	yes
Indeno(1,2,3-c,d)pyrene	ng/mL	0	-0.05	0.05	yes
Dibenzo(a,h)anthracene	ng/mL	0	-0.05	0.05	yes
Benzo(g,h,i)perylene	ng/mL	0	-0.05	0.05	yes

Date Acquired: October 14, 2020

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Naphthalene	ng/mL	94.40	80	120	yes
Acenaphthylene	ng/mL	96.60	80	120	yes
Acenaphthene	ng/mL	101.20	80	120	yes
Fluorene	ng/mL	99.40	80	120	yes
Phenanthrene	ng/mL	101.60	80	120	yes
Anthracene	ng/mL	105.00	80	120	yes
Fluoranthene	ng/mL	102.60	80	120	yes
Pyrene	ng/mL	106.80	80	120	yes
Benzo(a)anthracene	ng/mL	95.80	80	120	yes
Chrysene	ng/mL	100.60	80	120	yes
Benzo(b)fluoranthene	ng/mL	88.00	80	120	yes
Benzo(k)fluoranthene	ng/mL	86.80	80	120	yes
Benzo(a)pyrene	ng/mL	97.00	80	120	yes
Indeno(1,2,3-c,d)pyrene	ng/mL	93.00	80	120	yes
Dibenzo(a,h)anthracene	ng/mL	93.80	80	120	yes
Benzo(g,h,i)perylene	ng/mL	92.80	80	120	yes

Date Acquired: October 14, 2020

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.00881702	-0.4	0.5	yes
Magnesium	mg/L	0.0331234	-0.1	0.1	yes
Sodium	mg/L	-0.0316132	-0	2	yes
Potassium	mg/L	-0.107875	-0.5	0.7	yes
Chloride	mg/L	2.2371	0	5	yes
Sulfate-S	mg/L	0.00727428	-0	1	yes

Date Acquired: October 14, 2020

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Quality Control

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Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

Salinity - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Electrical Conductivity	dS/m	1.59	1.31	1.79	yes
% Saturation	%	60	55	67	yes
Calcium	mg/L	316	253.0	319.0	yes
Magnesium	mg/L	49.6	43.6	55.6	yes
Sodium	mg/L	23	20	26	yes
Potassium	mg/L	11.0	9.6	13.2	yes
Chloride	mg/L	30	25	33	yes
Sulfate-S	mg/L	220	176	239	yes
Date Acquired:	October 14, 2020				
Electrical Conductivity	dS/m	32.6	26.80	35.20	yes
Calcium	mg/L	243	231.3	256.5	yes
Magnesium	mg/L	97.0	92.1	104.1	yes
Sodium	mg/L	244	225	264	yes
Potassium	mg/L	246	222.6	270.6	yes
Chloride	mg/L	2120	1852	2229	yes
Sulfate-S	mg/L	147	138	156	yes
Date Acquired:	October 14, 2020				

Soil Acidity

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH	pH	8.0	8.0	0	0.3	yes
Date Acquired:	October 14, 2020					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH	pH	6.4	6.3	6.9	yes
Date Acquired:	October 14, 2020				

Volatile Petroleum Hydrocarbons - Soil

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	ng	0	-10	10	yes
Date Acquired:	October 14, 2020				

Water Soluble Parameters

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chromium (VI)	mg/L	0	-0.10	0.10	yes
Date Acquired:	October 15, 2020				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Chromium (VI)	mg/kg	0.2	0.1	10	0.01	yes
Date Acquired:	October 15, 2020					

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Methodology and Notes

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1451962**
Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
1:5 Water Soluble Extraction	APHA	*	Colorimetric Method, 3500-Cr B	Oct 15, 2020	Element Edmonton - Roper Road
1:5 Water Soluble Extraction	APHA	*	Colorimetric Method, 3500-Cr B	Nov 4, 2020	Element Edmonton - Roper Road
1:5 Water Soluble Extraction	McKeague	*	Soluble Salts in Extracts of 1:5 Soil:Water Mixtures, 3.23	Oct 15, 2020	Element Edmonton - Roper Road
1:5 Water Soluble Extraction	McKeague	*	Soluble Salts in Extracts of 1:5 Soil:Water Mixtures, 3.23	Nov 4, 2020	Element Edmonton - Roper Road
BTEX-CCME - Soil	CCME	*	Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Oct 14, 2020	Element Calgary
BTEX-CCME - Soil	US EPA	*	Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Oct 14, 2020	Element Calgary
Metals ICP (Hot Block) in soil	EPA	*	Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Elements, October 1999, 200.2	Oct 14, 2020	Element Edmonton - Roper Road
Metals ICP (Hot Block) in soil	EPA	*	Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Elements, October 1999, 200.2	Oct 15, 2020	Element Edmonton - Roper Road
Metals ICP (Hot Block) in soil	EPA	*	Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Elements, October 1999, 200.2	Nov 3, 2020	Element Edmonton - Roper Road
Metals ICP (Hot Block) in soil	EPA	*	Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Elements, October 1999, 200.2	Nov 4, 2020	Element Edmonton - Roper Road
Metals ICP (Hot Block) in soil	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Oct 14, 2020	Element Edmonton - Roper Road
Metals ICP (Hot Block) in soil	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Oct 15, 2020	Element Edmonton - Roper Road
Metals ICP (Hot Block) in soil	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Nov 3, 2020	Element Edmonton - Roper Road
Metals ICP (Hot Block) in soil	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Nov 4, 2020	Element Edmonton - Roper Road
PAH - Soil	AEP		Index of Additive Cancer Risk (IACR), IACR	Oct 14, 2020	Element Calgary
PAH - Soil	US EPA	*	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry, 8270	Oct 14, 2020	Element Calgary
Particle Size by Wet Sieve	ASTM	*	Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing, C 117-17	Oct 15, 2020	Element Edmonton - Roper Road

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Methodology and Notes

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Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Avenue	Date Received:	Oct 13, 2020
Company:	Thurber	LSD:		Date Reported:	Jan 20, 2021
		P.O.:	29532.30	Report Number:	2588529
		Proj. Acct. code:	29532.30		

Method Name	Reference		Method	Date Analysis Started	Location
Particle Size by Wet Sieve	Carter	*	Procedure for Particle Size Separation, 55.2.3	Oct 15, 2020	Element Edmonton - Roper Road
pH by CaCl2 (1:2 ratio) in soil	McKeague	*	pH in 0.01M Calcium Chloride, 3.11	Oct 14, 2020	Element Edmonton - Roper Road
pH by CaCl2 (1:2 ratio) in soil	McKeague	*	pH in 0.01M Calcium Chloride, 3.11	Oct 19, 2020	Element Edmonton - Roper Road
pH by CaCl2 (1:2 ratio) in soil	McKeague	*	pH in 0.01M Calcium Chloride, 3.11	Nov 4, 2020	Element Edmonton - Roper Road
Saturated Paste in General Soil	APHA	*	Automated Ferricyanide Method, 4500-Cl-E	Oct 14, 2020	Element Edmonton - Roper Road
Saturated Paste in General Soil	APHA	*	Automated Ferricyanide Method, 4500-Cl-E	Nov 4, 2020	Element Edmonton - Roper Road
Saturated Paste in General Soil	Carter	*	Electrical Conductivity and Soluble Ions, Chapter 15	Oct 14, 2020	Element Edmonton - Roper Road
Saturated Paste in General Soil	Carter	*	Electrical Conductivity and Soluble Ions, Chapter 15	Nov 4, 2020	Element Edmonton - Roper Road
TEH-CCME-Soil (Shake)	CCME	*	Reference Method for Canada-Wide Standard for PHC in Soil, CWS PHCS TIER 1	Oct 14, 2020	Element Calgary

** Reference Method Modified*

References

AEP	Alberta Tier 1 Soil and Groundwater Remediation Guidelines
APHA	Standard Methods for the Examination of Water and Wastewater
ASTM	Annual Book of ASTM Standards
Carter	Soil Sampling and Methods of Analysis.
CCME	Canadian Council of Ministers of the Environment
EPA	Environmental Protection Agency Test Methods - US
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Comments:

- Oct 16, 2020 - Sample 3: Surrogate recoveries are not available for PAH method because the extract required dilution. The recoveries for undiluted blanks, Quality Control and samples of this extraction batch meet acceptance criteria.
- Nov 02, 2020 - Sample 1451962-5; 7240634: Report was issued to include retest result for Arsenic analysis on sample 5 as requested by Sabinus Okafor on November 2, 2020. Previous report 2556377.
- Nov 03, 2020 - Sample 1451962-5; 7240634: Sample 1451962-5: the repeated result for strong acid extractable Arsenic analysis differs significantly from the original. The cause of the difference cannot be identified. The retest results have been repeated and confirmed.
- Nov 10, 2020 - Report was issued to include additional services requested by Sabinus Okafor of TEL on Nov. 7, 2020:
  MTZN service requested on sample(s) 17, 20, 23, 26, 29, 32, 38.
  Previous report 2566726.
- Jan 20, 2021 - Report was issued to include changes to the sample desctiptions from TH20-1 to TH20-6, TH20-2 to TH20-5 and TH30-3 to TH20-4 as requested by Sabinus Okafor of TEL on Jan. 16, 2021.
  Previous report 2570113.

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Methodology and Notes

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Project Name:	Latta Bridge Phase II ESA
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Quote #:	

Invoice To

Company:	Thurber Engineering Ltd.
Address:	4127 Roper Road
	Edmonton, AB T6B 3S5, Canada
Attention:	Sharon Bunn
Phone:	(780) 438-1460
Cell:	
Fax:	(780) 437-7125
E-mail:	Sbunn@thurber.ca
Agreement ID:	83102
Copy of Report:	YES / NO

Report To

Company:	Thurber Engineering Ltd.
Address:	4127 Roper Road
	Edmonton, AB T6B 3S5, Canada
Attention:	Sabinus Okafor
Phone:	(780) 438-1460
Cell:	
Fax:	(780) 437-7125
E-mail 1:	sokafor@thurber.ca
E-mail 2:	
Copy of Invoice:	YES / NO

Additional Reports to

1) Name:
E-mail:
2) Name:
E-mail:

Sample Custody

Sampled by: Sabinus Okafor
Company: TEL
I authorize Element to proceed with the work indicated on this form:
Signature: Sabinus okaofr
Date/Time:

RUSH Priority

- ☐ Same Day (200%)
- ☐ Next Day/Two Day (100%)
- ☐ Three or Four Days (50%)
- ☐ Five to Seven Days (Regular TAT)

Date Required

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples. If not all samples require RUSH, please indicate in the special instructions.

Report Results

- ☐ Email ☐ QA/QC
- ☐ Online ☐ PDF
- ☐ Fax ☐ Excel

Requirements

- ☐ HCDWOR ☐ SPIGEC
- ☐ AB Tier 1 ☐ BCCSR

Other (list below)

Special Instructions/Comments (please include contact information including phone number if different from above).

Enter tests above (✓ relevant samples below)

	Site I.D.	Sample Description	Depth Range	Unit	Date/Time sampled	Matrix	Sampling method	Number of Containers #	MeOH Field Preserved? ✓	05 - Drying,Grinding, 2mm si	10 - Drying	ABT1MET-S - Extended AB	ABT1SAL-S - Alberta Tier 1	CCMEC - CCME Hydrocarbo	CPDI - Digest for ICP metal a	DISP - Environmental Dispos	MTPB - Lead, excluding ICP	MTZN - Zinc, excluding ICP	PAH2 - PAHs in soil	PBPT - Lead in Paint	PS24 - Wet sieve 75 microns
1		TH20-6	0.25	m	2020-10-09 0	Soil	Grab	3		x		x	x			x					x
2		TH20-6	0.75	m	2020-10-09 0	Soil	Grab	3		x		x	x			x					x
3		TH20-6	1.5	m	2020-10-09 0	Soil	Grab	7	x	x		x	x	x		x			x		x
4		TH20-6	2.25	m	2020-10-09 0	Soil	Grab	2		x		x	x			x					
5		TH20-6	3	m	2020-10-09 0	Soil	Grab	2		x		x	x			x					
6		TH20-6	4.5	m	2020-10-09 0	Soil	Grab	7	x	x		x	x	x		x			x		x
7		TH20-6	5.25	m	2020-10-09 0	Soil	Grab	2		x		x	x			x					
8		TH20-6	6	m	2020-10-12 0	Soil	Grab	2		x		x	x			x					
9		TH20-5	0.5	m	2020-10-12 0	Soil	Grab	7	x	x	x	x	x	x		x			x		x
10		TH20-5	0.75	m	2020-10-12 0	Soil	Grab	2		x		x	x			x					
11		TH20-5	1.5	m	2020-10-12 0	Soil	Grab	3		x		x	x			x					x
12		TH20-5	2.25	m	2020-10-12 0	Soil	Grab	3		x		x	x			x					x
13		TH20-4	0.5	m	2020-10-12 0	Soil	Grab	7	x	x	x	x	x	x		x			x		x
14		TH20-4	0.75	m	2020-10-12 0	Soil	Grab	2		x		x	x			x					
15		TH20-4	1.5	m	2020-10-12 0	Soil	Grab	3		x		x	x			x					x

Please indicate any potentially hazardous samples

Indicate lot # or affix barcode here

1451962

Temp. received: °C
Date/Time stamp:
Delivery Method:
Waybill:
Received by:

Control # 1451962 - P1
ED 120-005

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Project Information

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Agreement ID:	83102
Copy of Report:	YES / NO

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E-mail 2:	
Copy of Invoice:	YES / NO

Additional Reports to

1) Name:
E-mail:
2) Name:
E-mail:

Sample Custody

Sampled by: Sabinus Okafor
Company: TEL
I authorize Element to proceed with the work indicated on this form:
Signature: Sabinus okaofr
Date/Time:

RUSH Priority

☐ Same Day (200%)
☐ Next Day/Two Day (100%)
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16		TP20-1	0-0.15	m	2020-10-11 0	Soil	Grab	2		x		x	x			x					
17		TP20-2	0-0.15	m	2020-10-11 0	Soil	Grab	3		x					x	x	x	x			x
18		TP20-3	0-0.15	m	2020-10-11 0	Soil	Grab	2		x		x				x					
19		TP20-4	0-0.15	m	2020-10-11 0	Soil	Grab	3		x		x				x					x
20		TP20-5	0-0.15	m	2020-10-11 0	Soil	Grab	2		x					x	x	x	x			
21		TP20-6	0-0.15	m	2020-10-11 0	Soil	Grab	3		x		x				x					x
22		TP20-7	0-0.15	m	2020-10-11 0	Soil	Grab	2		x		x				x					
23		TP20-8	0-0.15	m	2020-10-11 0	Soil	Grab	3		x					x	x	x	x			x
24		TP20-9	0-0.15	m	2020-10-11 0	Soil	Grab	2		x		x				x					
25		TP20-10	0-0.15	m	2020-10-11 0	Soil	Grab	3		x		x				x					x
26		TP20-11	0-0.15	m	2020-10-10 0	Soil	Grab	2		x					x	x	x	x			
27		TP20-12	0-0.15	m	2020-10-10 0	Soil	Grab	3		x		x				x					x
28		TP20-13	0-0.15	m	2020-10-10 0	Soil	Grab	2		x		x				x					
29		TP20-14	0-0.15	m	2020-10-10 0	Soil	Grab	3		x					x	x	x	x			x
30		TP20-15	0-0.15	m	2020-10-10 0	Soil	Grab	2		x		x				x					

Please indicate any potentially hazardous samples

Indicate lot # or affix barcode here

1451962

Temp. received: °C
Date/Time stamp:
Delivery Method:
Waybill:
Received by:

Control # 1451962 - P2
ED 120-005

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Project Information

Project ID:	29532.300
Project Name:	Latta Bridge Phase II ESA
Project Location:	91 Street and Jasper Avenue
Legal Location:	
PO/AFE#:	29532.30
Proj. Acct. Code:	29532.30
Quote #:	

Invoice To

Company:	Thurber Engineering Ltd.
Address:	4127 Roper Road
	Edmonton, AB T6B 3S5, Canada
Attention:	Sharon Bunn
Phone:	(780) 438-1460
Cell:	
Fax:	(780) 437-7125
E-mail:	Sbunn@thurber.ca
Agreement ID:	83102
Copy of Report:	YES / NO

Report To

Company:	Thurber Engineering Ltd.
Address:	4127 Roper Road
	Edmonton, AB T6B 3S5, Canada
Attention:	Sabinus Okafor
Phone:	(780) 438-1460
Cell:	
Fax:	(780) 437-7125
E-mail 1:	sokafor@thurber.ca
E-mail 2:	
Copy of Invoice:	YES / NO

Additional Reports to

1) Name:
E-mail:
2) Name:
E-mail:

Sample Custody

Sampled by: Sabinus Okafor
Company: TEL

I authorize Element to proceed with the work indicated on this form:

Signature: Sabinus okaofr
Date/Time:

RUSH Priority

- ☐ Same Day (200%)
- ☐ Next Day/Two Day (100%)
- ☐ Three or Four Days (50%)
- ☐ Five to Seven Days (Regular TAT)

Date Required

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples. If not all samples require RUSH, please indicate in the special instructions.

Report Results

- ☐ Email ☐ QA/QC
- ☐ Online ☐ PDF
- ☐ Fax ☐ Excel

Requirements

- ☐ HCDWOR ☐ SPIGEC
- ☐ AB Tier 1 ☐ BCCSR

Other (list below)

Special Instructions/Comments (please include contact information including phone number if different from above).

Enter tests above (✓ relevant samples below)

	Site I.D.	Sample Description	Depth Range	Depth Unit	Date/Time sampled	Matrix	Sampling method	Number of Containers #	MeOH Field Preserved? ✓	05 - Drying,Grinding, 2mm si	10 - Drying	ABT1MET-S - Extended AB	ABT1SAL-S - Alberta Tier 1 S	CCMEC - CCME Hydrocarbo	CPDI - Digest for ICP metal a	DISP - Environmental Dispos	MTPB - Lead, excluding ICP	MTZN - Zinc, excluding ICP s	PAH2 - PAHs in soil	PBPT - Lead in Paint	PS24 - Wet sieve 75 microns
31		TP20-16	0-0.15	m	2020-10-10 0	Soil	Grab	3		x		x				x					x
32		TP20-17	0-0.15	m	2020-10-10 0	Soil	Grab	2		x					x	x	x	x			
33		TP20-18	0-0.15	m	2020-10-10 0	Soil	Grab	3		x		x				x					x
34		TP20-19	0-0.15	m	2020-10-10 0	Soil	Grab	2		x		x				x					
35		TP20-20	0-0.15	m	2020-10-10 0	Soil	Grab	3		x		x				x					x
36		TP20-21	0-0.15	m	2020-10-11 0	Soil	Grab	2		x		x				x					
37		DUP20-1			2020-10-10 0	Soil	Grab	2		x		x	x			x					
38		DUP20-5			2020-10-11 0	Soil	Grab	2		x					x	x	x	x			
39		DUP20-6			2020-10-11 0	Soil	Grab	2		x		x				x					
40		PA20-1			2020-10-10 0	Waste -	Grab	1								x				x	
41		PA20-2			2020-10-10 0	Waste -	Grab	1								x				x	
42		PA20-3			2020-10-10 0	Waste -	Grab	1								x				x	
43		PA20-4			2020-10-10 0	Waste -	Grab	1								x				x	
44		PA20-5			2020-10-10 0	Waste -	Grab	1								x				x	
45		TH20-6	3.75	m	2020-10-10 0	Soil	Grab	2		x		x	x			x					

Please indicate any potentially hazardous samples

Indicate lot # or affix barcode here

1451962

Temp. received: °C

Date/Time stamp:

Delivery Method:

Waybill:

Received by:

Control # 1451962 - P3

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Report Transmission Cover Page

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1458342**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Ave	Date Received:	Nov 9, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Nov 16, 2020
Sampled By:	SIO	P.O.:	29532.300	Report Number:	2570015
Company:	Thurber	Proj. Acct. code:	29532.300		

Contact	Company	Address			
ESDAT	**Thurber Engineering Ltd.**	4127 Roper Road Edmonton, AB T6B 3S5			
		Phone:	(780) 438-1460	Fax:	(780) 437-7125
		Email:	thurber@esdat.net		

Delivery	Format	Deliverables
Email - Zip Multiple Formats By Report	Generic ESDAT Chemistry File	Test Report
Email - Zip Multiple Formats By Report	Generic ESDAT Header	Test Report
Email - Zip Multiple Formats By Report	Generic ESDAT Sample File	Test Report

Contact	Company	Address			
Sabinus Okafor	**Thurber Engineering Ltd.**	4127 Roper Road Edmonton, AB T6B 3S5			
		Phone:	(780) 438-1460	Fax:	(780) 437-7125
		Email:	sokafor@thurber.ca		

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / COA
Email - Merge Reports	PDF	COC / Invoice
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	Standard Crosstab without Tabs	Test Report

Contact	Company	Address			
Sharon Bunn	**Thurber Engineering Ltd.**	4127 Roper Road Edmonton, AB T6B 3S5			
		Phone:	(780) 438-1460	Fax:	(780) 437-7125
		Email:	Sbunn@thurber.ca		

Delivery	Format	Deliverables
Email - Merge Reports	PDF	Invoice

Notes To Clients:

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1458342**
Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Ave	Date Received:	Nov 9, 2020
Company:	Thurber	LSD:		Date Reported:	Nov 16, 2020
		P.O.:	29532.300	Report Number:	2570015
		Proj. Acct. code:	29532.300		

		Reference Number	1458342-1	1458342-2	1458342-3	
		Sample Date	Oct 11, 2020	Oct 11, 2020	Oct 11, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-1 / 0.3-0.5 / m	TP20-2 / 0.3-0.5 / m	TP20-3 / 0.3-0.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L		0.73		0.05
Antimony	Strong Acid Extractable	mg/kg		1.1		0.2
Arsenic	Strong Acid Extractable	mg/kg		9.0		0.2
Barium	Strong Acid Extractable	mg/kg		213		1
Beryllium	Strong Acid Extractable	mg/kg		0.6		0.1
Cadmium	Strong Acid Extractable	mg/kg		0.40		0.01
Chromium	Strong Acid Extractable	mg/kg		18.2		0.5
Cobalt	Strong Acid Extractable	mg/kg		10.3		0.1
Copper	Strong Acid Extractable	mg/kg		29.0		1
Lead	Strong Acid Extractable	mg/kg		466	411	0.1
Mercury	Strong Acid Extractable	mg/kg		0.06		0.05
Molybdenum	Strong Acid Extractable	mg/kg		1.1		1
Nickel	Strong Acid Extractable	mg/kg		27.3		0.5
Selenium	Strong Acid Extractable	mg/kg		0.4		0.3
Silver	Strong Acid Extractable	mg/kg		0.1		0.1
Thallium	Strong Acid Extractable	mg/kg		0.20		0.05
Tin	Strong Acid Extractable	mg/kg		2.6		1
Uranium	Strong Acid Extractable	mg/kg		1.1		0.5
Vanadium	Strong Acid Extractable	mg/kg		28.6		0.1
Zinc	Strong Acid Extractable	mg/kg	875	236	370	1

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1458342**
Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Ave	Date Received:	Nov 9, 2020
Company:	Thurber	LSD:		Date Reported:	Nov 16, 2020
		P.O.:	29532.300	Report Number:	2570015
		Proj. Acct. code:	29532.300		

		Reference Number	1458342-1	1458342-4	1458342-7	
		Sample Date	Oct 11, 2020	Oct 11, 2020	Oct 11, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-1 / 0.3-0.5 / m	TP20-4 / 0.15-0.3 / m	TP20-7 / 0.3-0.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Particle Size Analysis - Wet Sieve						
Texture			Fine-Grained	Fine-Grained	Fine-Grained	
75 micron sieve	% Retained	% by weight	40.8	48.8	18.0	0.1

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1458342**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Ave	Date Received:	Nov 9, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Nov 16, 2020
Sampled By:	SIO	P.O.:	29532.300	Report Number:	2570015
Company:	Thurber	Proj. Acct. code:	29532.300		

		Reference Number	1458342-2	1458342-5	1458342-8	
		Sample Date	Oct 11, 2020	Oct 11, 2020	Oct 11, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-2 / 0.3-0.5 / m	TP20-5 / 0.3-0.5 / m	TP20-8 / 0.3-0.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Salinity						
% Saturation		%	77	62	69	
Water Soluble Parameters						
Chromium (VI)	Dry Weight	mg/kg	0.06	0.06	<0.05	0.05

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5
Attn:	Sharon Bunn
Sampled By:	SIO
Company:	Thurber

Project ID:	29532.300
Project Name:	Latta Bridge Phase II ESA
Project Location:	91 Street and Jasper Ave
LSD:	
P.O.:	29532.300
Proj. Acct. code:	29532.300

Lot ID:	**1458342**
Control Number:	
Date Received:	Nov 9, 2020
Date Reported:	Nov 16, 2020
Report Number:	2570015

		Reference Number	1458342-4	1458342-5	1458342-6	
		Sample Date	Oct 11, 2020	Oct 11, 2020	Oct 11, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-4 / 0.15-0.3 / m	TP20-5 / 0.3-0.5 / m	TP20-6 / 0.3-0.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L		0.25		0.05
Antimony	Strong Acid Extractable	mg/kg		1.1		0.2
Arsenic	Strong Acid Extractable	mg/kg		8.3		0.2
Barium	Strong Acid Extractable	mg/kg		178		1
Beryllium	Strong Acid Extractable	mg/kg		0.6		0.1
Cadmium	Strong Acid Extractable	mg/kg		0.64		0.01
Chromium	Strong Acid Extractable	mg/kg		22.2		0.5
Cobalt	Strong Acid Extractable	mg/kg		8.1		0.1
Copper	Strong Acid Extractable	mg/kg		32.4		1
Lead	Strong Acid Extractable	mg/kg	190	474	447	0.1
Mercury	Strong Acid Extractable	mg/kg		0.07		0.05
Molybdenum	Strong Acid Extractable	mg/kg		1.3		1
Nickel	Strong Acid Extractable	mg/kg		23.4		0.5
Selenium	Strong Acid Extractable	mg/kg		0.4		0.3
Silver	Strong Acid Extractable	mg/kg		0.1		0.1
Thallium	Strong Acid Extractable	mg/kg		0.15		0.05
Tin	Strong Acid Extractable	mg/kg		2.4		1
Uranium	Strong Acid Extractable	mg/kg		0.7		0.5
Vanadium	Strong Acid Extractable	mg/kg		26.0		0.1
Zinc	Strong Acid Extractable	mg/kg		348	215	1

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1458342**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Ave	Date Received:	Nov 9, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Nov 16, 2020
Sampled By:	SIO	P.O.:	29532.300	Report Number:	2570015
Company:	Thurber	Proj. Acct. code:	29532.300		

		Reference Number	1458342-7	1458342-8	1458342-9	
		Sample Date	Oct 11, 2020	Oct 11, 2020	Oct 11, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-7 / 0.3-0.5 / m	TP20-8 / 0.3-0.5 / m	TP20-9 / 0.3-0.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L		0.44		0.05
Antimony	Strong Acid Extractable	mg/kg		0.9		0.2
Arsenic	Strong Acid Extractable	mg/kg		8.5		0.2
Barium	Strong Acid Extractable	mg/kg		191		1
Beryllium	Strong Acid Extractable	mg/kg		0.4		0.1
Cadmium	Strong Acid Extractable	mg/kg		0.55		0.01
Chromium	Strong Acid Extractable	mg/kg		19.2		0.5
Cobalt	Strong Acid Extractable	mg/kg		8.9		0.1
Copper	Strong Acid Extractable	mg/kg		31.0		1
Lead	Strong Acid Extractable	mg/kg	124	311	284	0.1
Mercury	Strong Acid Extractable	mg/kg		0.06		0.05
Molybdenum	Strong Acid Extractable	mg/kg		1.2		1
Nickel	Strong Acid Extractable	mg/kg		24.5		0.5
Selenium	Strong Acid Extractable	mg/kg		0.4		0.3
Silver	Strong Acid Extractable	mg/kg		0.1		0.1
Thallium	Strong Acid Extractable	mg/kg		0.17		0.05
Tin	Strong Acid Extractable	mg/kg		2.5		1
Uranium	Strong Acid Extractable	mg/kg		0.8		0.5
Vanadium	Strong Acid Extractable	mg/kg		26.3		0.1
Zinc	Strong Acid Extractable	mg/kg		299		1

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Analytical Report

Bill To:	Thurber Engineering Ltd.	Project ID:	29532.300	Lot ID:	**1458342**
	4127 Roper Road	Project Name:	Latta Bridge Phase II ESA	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 Street and Jasper Ave	Date Received:	Nov 9, 2020
	T6B 3S5			Date Reported:	Nov 16, 2020
Attn:	Sharon Bunn	LSD:		Report Number:	2570015
Sampled By:	SIO	P.O.:	29532.300		
Company:	Thurber	Proj. Acct. code:	29532.300		

		Reference Number	1458342-10	1458342-11	1458342-12	
		Sample Date	Oct 11, 2020	Oct 10, 2020	Oct 10, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-10 / 0.3-0.5 / m	TP20-11 / 0.3-0.5 / m	TP20-12 / 0.3-0.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Boron	Saturated Paste	mg/L		0.43		0.05
Antimony	Strong Acid Extractable	mg/kg		0.8		0.2
Arsenic	Strong Acid Extractable	mg/kg		6.2		0.2
Barium	Strong Acid Extractable	mg/kg		196		1
Beryllium	Strong Acid Extractable	mg/kg		0.7		0.1
Cadmium	Strong Acid Extractable	mg/kg		0.46		0.01
Chromium	Strong Acid Extractable	mg/kg		14.3		0.5
Cobalt	Strong Acid Extractable	mg/kg		6.5		0.1
Copper	Strong Acid Extractable	mg/kg		18.7		1
Lead	Strong Acid Extractable	mg/kg	113	561	135	0.1
Mercury	Strong Acid Extractable	mg/kg		0.06		0.05
Molybdenum	Strong Acid Extractable	mg/kg		<1.0		1
Nickel	Strong Acid Extractable	mg/kg		18.2		0.5
Selenium	Strong Acid Extractable	mg/kg		0.4		0.3
Silver	Strong Acid Extractable	mg/kg		<0.10		0.1
Thallium	Strong Acid Extractable	mg/kg		0.11		0.05
Tin	Strong Acid Extractable	mg/kg		2.5		1
Uranium	Strong Acid Extractable	mg/kg		0.9		0.5
Vanadium	Strong Acid Extractable	mg/kg		21.0		0.1
Zinc	Strong Acid Extractable	mg/kg		296		1

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1458342**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Ave	Date Received:	Nov 9, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Nov 16, 2020
Sampled By:	SIO	P.O.:	29532.300	Report Number:	2570015
Company:	Thurber	Proj. Acct. code:	29532.300		

		Reference Number	1458342-10	1458342-13	1458342-15	
		Sample Date	Oct 11, 2020	Oct 10, 2020	Oct 10, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-10 / 0.3-0.5 / m	TP20-13 / 0.3-0.5 / m	TP20-19 / 0.3-0.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Particle Size Analysis - Wet Sieve						
Texture			Fine-Grained	Fine-Grained	Coarse-Grained	
75 micron sieve	% Retained	% by weight	23.9	28.6	72.6	0.1

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Analytical Report

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1458342**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Ave	Date Received:	Nov 9, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Nov 16, 2020
Sampled By:	SIO	P.O.:	29532.300	Report Number:	2570015
Company:	Thurber	Proj. Acct. code:	29532.300		

Reference Number	1458342-11
Sample Date	Oct 10, 2020
Sample Time	NA
Sample Location	
Sample Description	TP20-11 / 0.3-0.5 / m
Matrix	Soil

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Salinity						
% Saturation		%	56			
Water Soluble Parameters						
Chromium (VI)	Dry Weight	mg/kg	<0.05			0.05

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Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Ave	Date Received:	Nov 9, 2020
Company:	Thurber	LSD:		Date Reported:	Nov 16, 2020
		P.O.:	29532.300	Report Number:	2570015
		Proj. Acct. code:	29532.300		

		Reference Number	1458342-13	1458342-14	1458342-15	
		Sample Date	Oct 10, 2020	Oct 10, 2020	Oct 10, 2020	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	TP20-13 / 0.3-0.5 / m	TP20-18 / 0.3-0.5 / m	TP20-19 / 0.3-0.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Lead	Strong Acid Extractable	mg/kg	107	109	106	0.1

Approved by:

Darlene Lintott, MSc
Consulting Scientist

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Quality Control

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1458342**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Ave	Date Received:	Nov 9, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Nov 16, 2020
Sampled By:	SIO	P.O.:	29532.300	Report Number:	2570015
Company:	Thurber	Proj. Acct. code:	29532.300		

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Boron	mg/L	0.00187553	-0.05	0.07	yes
Antimony	µg/L	-0.00141859	-0.1	0.2	yes
Arsenic	µg/L	-0.0106271	-0.2	0.2	yes
Barium	µg/L	0.00120068	-1	1	yes
Beryllium	µg/L	-0.00665652	-0.1	0.1	yes
Cadmium	µg/L	0.000998486	-0.01	0.01	yes
Chromium	µg/L	-0.0124144	-0.5	0.5	yes
Cobalt	µg/L	0.00138293	-0.1	0.1	yes
Copper	µg/L	0.00516088	-0.6	1.2	yes
Lead	µg/L	-0.000308417	-5.0	5.0	yes
Mercury	µg/L	0.00346529	-0.04	0.04	yes
Molybdenum	µg/L	0.0159999	-1.0	1.0	yes
Nickel	µg/L	0.0175979	-0.4	0.7	yes
Selenium	µg/L	0.00907573	-0.3	0.3	yes
Silver	µg/L	0.00075089	-0.09	0.14	yes
Thallium	µg/L	0.00162762	-0.04	0.04	yes
Tin	µg/L	-0.0331473	-0.4	0.4	yes
Uranium	µg/L	0.00131729	-0.5	0.5	yes
Vanadium	µg/L	-0.0586695	-0.1	0.1	yes
Zinc	µg/L	0.120853	-1	1	yes

Date Acquired: November 10, 2020

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Antimony	mg/kg	0.3	0.3	20	0.4	yes
Arsenic	mg/kg	6.0	6.9	20	0.4	yes
Barium	mg/kg	126	122	20	2	yes
Beryllium	mg/kg	0.4	0.3	20	0.2	yes
Cadmium	mg/kg	0.20	0.21	20	0.02	yes
Chromium	mg/kg	13.3	12.6	20	1.1	yes
Cobalt	mg/kg	6.1	6.5	20	0.2	yes
Copper	mg/kg	12.4	13.1	20	2.2	yes
Lead	mg/kg	6.0	5.8	20	0.2	yes
Mercury	mg/kg	<0.05	<0.05	20	0.05	yes
Molybdenum	mg/kg	<1.0	<1.0	20	2.2	yes
Nickel	mg/kg	16.6	17.4	20	1.1	yes
Selenium	mg/kg	0.3	0.3	20	0.7	yes
Silver	mg/kg	<0.10	<0.10	20	0.22	yes
Thallium	mg/kg	0.17	0.16	20	0.11	yes
Tin	mg/kg	<1.0	<1.0	20	2.2	yes
Uranium	mg/kg	1.0	1.0	20	1.1	yes
Vanadium	mg/kg	21.3	20.9	20	0.2	yes
Zinc	mg/kg	72	69	20	2	yes

Date Acquired: November 10, 2020

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Antimony	mg/kg	39.5	37.8	42.2	yes

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Quality Control

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1458342**
Attn:	Sharon Bunn	Project Name:	Latta Bridge Phase II ESA	Control Number:	
Sampled By:	SIO	Project Location:	91 Street and Jasper Ave	Date Received:	Nov 9, 2020
Company:	Thurber	LSD:		Date Reported:	Nov 16, 2020
		P.O.:	29532.300	Report Number:	2570015
		Proj. Acct. code:	29532.300		

Metals Strong Acid Digestion - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Arsenic	mg/kg	40.0	36.3	43.9	yes
Barium	mg/kg	198	188	212	yes
Beryllium	mg/kg	19.8	17.4	22.2	yes
Cadmium	mg/kg	2.03	1.88	2.28	yes
Chromium	mg/kg	100	93.2	107.0	yes
Cobalt	mg/kg	19.8	18.2	21.2	yes
Copper	mg/kg	198	183.1	212.7	yes
Lead	mg/kg	19.9	18.5	21.5	yes
Mercury	mg/kg	3.06	2.64	3.36	yes
Molybdenum	mg/kg	204	185.1	222.3	yes
Nickel	mg/kg	99.7	92.4	106.2	yes
Selenium	mg/kg	42.2	35.2	44.2	yes
Silver	mg/kg	19.8	18.20	22.40	yes
Thallium	mg/kg	10.1	9.02	10.82	yes
Tin	mg/kg	205	191.2	215.2	yes
Uranium	mg/kg	100	86.0	116.0	yes
Vanadium	mg/kg	19.8	18.0	21.6	yes
Zinc	mg/kg	200	186	210	yes
Date Acquired:	November 10, 2020				
Antimony	mg/kg	4.2	3.2	4.7	yes
Arsenic	mg/kg	4.7	3.4	4.9	yes
Barium	mg/kg	106	91	118	yes
Beryllium	mg/kg	0.4	0.2	0.5	yes
Cadmium	mg/kg	0.98	0.78	1.20	yes
Chromium	mg/kg	89.1	70.9	98.5	yes
Cobalt	mg/kg	7.3	5.8	8.2	yes
Copper	mg/kg	137	108.4	148.0	yes
Lead	mg/kg	283	199.1	308.9	yes
Mercury	mg/kg	0.08	0.04	0.08	yes
Molybdenum	mg/kg	1.2	0.9	1.4	yes
Nickel	mg/kg	29.3	22.5	32.1	yes
Selenium	mg/kg	<0.3	0.3	0.3	yes
Silver	mg/kg	3.4	2.28	6.00	yes
Thallium	mg/kg	0.08	0.06	0.09	yes
Tin	mg/kg	10.8	8.4	12.6	yes
Uranium	mg/kg	0.5	0.3	0.7	yes
Vanadium	mg/kg	32.4	17.8	46.9	yes
Zinc	mg/kg	367	283	390	yes
Date Acquired:	November 10, 2020				

Particle Size Analysis - Wet Sieve

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
75 micron sieve	% by weight	15.9	12.3	16.7	yes
Date Acquired:	November 10, 2020				

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Quality Control

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1458342**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Ave	Date Received:	Nov 9, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Nov 16, 2020
Sampled By:	SIO	P.O.:	29532.300	Report Number:	2570015
Company:	Thurber	Proj. Acct. code:	29532.300		

Salinity

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0275979	-0.4	0.5	yes
Magnesium	mg/L	0.00123299	-0.1	0.1	yes
Sodium	mg/L	0.0170882	-0	2	yes
Potassium	mg/L	0.0122921	-0.5	0.7	yes
Chloride	mg/L	2.6881	0	5	yes
Sulfate-S	mg/L	0.0411499	-0	1	yes
Date Acquired:	November 10, 2020				

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Electrical Conductivity	dS/m	1.54	1.31	1.79	yes
% Saturation	%	60	55	67	yes
Calcium	mg/L	301	253.0	319.0	yes
Magnesium	mg/L	51.0	43.6	55.6	yes
Sodium	mg/L	23	20	26	yes
Potassium	mg/L	11.5	9.6	13.2	yes
Chloride	mg/L	28	25	33	yes
Sulfate-S	mg/L	213	176	239	yes
Date Acquired:	November 10, 2020				
Electrical Conductivity	dS/m	32.7	26.80	35.20	yes
Calcium	mg/L	245	231.3	256.5	yes
Magnesium	mg/L	95.0	92.7	101.7	yes
Sodium	mg/L	245	225	264	yes
Potassium	mg/L	249	222.6	270.6	yes
Chloride	mg/L	2010	1852	2229	yes
Sulfate-S	mg/L	146	138	156	yes
Date Acquired:	November 10, 2020				

Water Soluble Parameters

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chromium (VI)	mg/L	0.002	-0.10	0.10	yes
Date Acquired:	November 10, 2020				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Chromium (VI)	mg/kg	<0.6	<0.6	10	0.01	yes
Date Acquired:	November 10, 2020					

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Methodology and Notes

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.300	Lot ID:	**1458342**
		Project Name:	Latta Bridge Phase II ESA	Control Number:	
		Project Location:	91 Street and Jasper Ave	Date Received:	Nov 9, 2020
Attn:	Sharon Bunn	LSD:		Date Reported:	Nov 16, 2020
Sampled By:	SIO	P.O.:	29532.300	Report Number:	2570015
Company:	Thurber	Proj. Acct. code:	29532.300		

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
1:5 Water Soluble Extraction	APHA	*	Colorimetric Method, 3500-Cr B	Nov 10, 2020	Element Edmonton - Roper Road
1:5 Water Soluble Extraction	McKeague	*	Soluble Salts in Extracts of 1:5 Soil:Water Mixtures, 3.23	Nov 10, 2020	Element Edmonton - Roper Road
Metals ICP (Hot Block) in soil	EPA	*	Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Elements, October 1999, 200.2	Nov 10, 2020	Element Edmonton - Roper Road
Metals ICP (Hot Block) in soil	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Nov 10, 2020	Element Edmonton - Roper Road
Particle Size by Wet Sieve	ASTM	*	Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing, C 117-17	Nov 10, 2020	Element Edmonton - Roper Road
Particle Size by Wet Sieve	Carter	*	Procedure for Particle Size Separation, 55.2.3	Nov 10, 2020	Element Edmonton - Roper Road
Saturated Paste in General Soil	Carter	*	Electrical Conductivity and Soluble Ions, Chapter 15	Nov 10, 2020	Element Edmonton - Roper Road

** Reference Method Modified*

References

APHA	Standard Methods for the Examination of Water and Wastewater
ASTM	Annual Book of ASTM Standards
Carter	Soil Sampling and Methods of Analysis.
EPA	Environmental Protection Agency Test Methods - US
McKeague	Manual on Soil Sampling and Methods of Analysis
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted.
The test report shall not be reproduced except in full, without the written approval of the laboratory.

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Project Information

Project ID:	29532.300
Project Name:	Latta Bridge Phase II ESA
Project Location:	91 Street and Jasper Ave
Legal Location:	
PO/AFE#:	29532.30
Proj. Acct. Code:	29532.30
Quote #:	

Invoice To

Company:	Thurber Engineering Ltd.
Address:	4127 Roper Road
	Edmonton, AB T6E 3S5
Attention:	Sharon Bunn
Phone:	780-438-1460
Cell:	
Fax:	
E-mail:	sbunn@thurber.ca
Agreement ID:	
Copy of Report:	YES / **NO**

Report To

Company:	Thurber Engineering Ltd.
Address:	4127 Roper Road NW
	Edmonton, AB T6B 3S5
Attention:	Sabinus Okafor
Phone:	780-438-1460
Cell:	780.267.6256
Fax:	780-437-7125
E-mail 1:	sokafor@thurber.ca
E-mail 2:	
Copy of Invoice:	**YES** / NO

Additional Reports to

1) Name:	
E-mail:	
2) Name:	
E-mail:	

Sample Custody

Sampled by: SIO
Company: Thurber Engineering Ltd.
I authorize Element to proceed with the work indicated on this form:
Signature:
Date/Time: Nov 9th, 2020

RUSH Priority

- [ ] Same Day (200%)
- [ ] Next Day/Two Day (100%)
- [ ] Three or Four Days (50%)
- [x] 5 to 7 Days (Regular TAT)

Date Required

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples. If not all samples require RUSH, please indicate in the special instructions.

Report Results

- [x] Email
- [x] QA/QC
- [x] Online
- [x] PDF
- [ ] Fax
- [x] Excel

Requirements

- [ ] HCDWORG
- [x] SPIGEC
- [x] AB Tier 1
- [ ] BCCSR

Other (list below)

Special Instructions/Comments (please include contact information including phone number if different from above).

Enter tests above (✓ relevant samples below)

	Site I.D.	Sample Description	Depth start (in cm m)	Depth end (in cm m)	Date/Time sampled	Matrix	Sampling method	# Number of Containers	✓ MeOH Field Preserved?	Total Lead	Total Zinc	PHC F2 -F4	ABT1SAL-S (Soil Salinity)	ABT1MET-S (Metals)	CCMEC (BTEX, F1-F4)	PAH2 (PAHs)	PSA(Fine/coarse)				HOLD
1		TP20-1 (0.3 -0.5 m)			Oct.11/20	Soil	Grab	1			X						X				
1		TP20-2 (0.3 -0.5 m)			Oct.11/20	Soil	Grab	1						X							
2		TP20-3 (0.3 -0.5 m)			Oct.11/20	"	"	1		X	X										
3		TP20-4 (0.15 -0.3 m)			Oct.11/20	"	"	1		X							X				
4		TP20-5 (0.3 -0.5 m)			Oct.11/20	"	"	1						X							
5		TP20-6 (0.3 -0.5 m)			Oct.11/20	"	"	1		X	X										
6		TP20-7 (0.3 -0.5 m)			Oct.11/20	"	"	1		X							X				
7		TP20-8 (0.3 -0.5 m)			Oct.11/20	"	"	1						X							
8		TP20-9 (0.3 -0.5 m)			Oct.11/20	"	"	1		X											
8		TP20-10 (0.3 -0.5 m)			Oct.11/20	"	"	1		X							X				
9		TP20-11 (0.3 -0.5 m)			Oct.10/20	"	"	1						X							
10		TP20-12 (0.3 -0.5 m)			Oct.10/20	"	"	1		X											
8		TP20-13 (0.3 -0.5 m)			Oct.10/20	"	"	1		X							X				
11		TP20-18 (0.3 -0.5 m)			Oct.10/20	"	"	1		X											
12		TP20-19 (0.3 -0.5 m)			Oct.10/20	"	"	1		X							X				
13		DUP20-3			Oct.10/20	"	"	1													X
14																					
15																					

Please indicate any potentially hazardous samples

Submission of this form acknowledges acceptance of Element's Standard of terms and conditions (https://www.element.com/terms/terms-and-conditions)

Lot: 1458342 COC

Temp. received: 4.6 °C
Date/Time stamp: NOV 9 PM 2:09
Delivery Method:
Waybill:
Received by: SW

Page 1 of 1
Control #
ED 120-005

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Report Transmission Cover Page

Bill To:	Thurber Engineering Ltd.	Project ID:	29532.40	Lot ID:	**1455048**
	4127 Roper Road	Project Name:	BPTEC GW Sampling	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 St & Jasper Ave	Date Received:	Oct 24, 2020
	T6B 3S5	LSD:		Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	P.O.:	29532.40	Report Number:	2588530
Sampled By:	JNS	Proj. Acct. code:	29532.40		
Company:	Thurber Engineering Ltd.				

Contact	Company	Address
ESDAT	**Thurber Engineering Ltd.**	4127 Roper Road Edmonton, AB T6B 3S5 Phone: (780) 438-1460 Fax: (780) 437-7125 Email: thurber@esdat.net

Delivery	Format	Deliverables
Email - Zip Multiple Formats By Report	Generic ESDAT Chemistry File	Test Report
Email - Zip Multiple Formats By Report	Generic ESDAT Header	Test Report
Email - Zip Multiple Formats By Report	Generic ESDAT Sample File	Test Report

Contact	Company	Address
Sabinus Okafor	**Thurber Engineering Ltd.**	4127 Roper Road Edmonton, AB T6B 3S5 Phone: (780) 438-1460 Fax: (780) 437-7125 Email: sokafor@thurber.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / COA
Email - Merge Reports	PDF	COC / Invoice
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	Standard Crosstab without Tabs	Test Report

Contact	Company	Address
Sharon Bunn	**Thurber Engineering Ltd.**	4127 Roper Road Edmonton, AB T6B 3S5 Phone: (780) 438-1460 Fax: (780) 437-7125 Email: Sbunn@thurber.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	Invoice

Notes To Clients:

- Nov 09, 2020 - Report was issued to include retest result for dissolved metals analysis on samples 2 and 3 as requested by Sabinus Okafor on Nov. 7, 2020.
- Nov 12, 2020 - Sample 1455048-2; 7261887: Sample 1455048-2: the repeated result for ICP-MS dissolved metals analysis did not differ significantly from the original; it is within expected precision of the test.
- Nov 12, 2020 - Sample 1455048-3; 7261888: Sample 1455048-3: the repeated result for ICP-MS dissolved metals analysis differs significantly from the original. The cause of the difference is wrong sample.
- Nov 13, 2020 - Samples 1455048-2 and -3: the repeated result for trace dissolved analysis did not differ significantly from the original; it is within expected precision of the test.
- Jan 20, 2021 - Report was issued to include changes to the sample descriptions from MW20-2 to MW20-5 and MW30-3 to MW20-4 to as requested by Sabinus Okafor of TEL on Jan. 16, 2021.
  Previous report 2569731.

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Analytical Report

Bill To:	Thurber Engineering Ltd.
	4127 Roper Road
	Edmonton, AB, Canada
	T6B 3S5
Attn:	Sharon Bunn
Sampled By:	JNS
Company:	Thurber Engineering Ltd.

Project ID:	29532.40
Project Name:	BPTEC GW Sampling
Project Location:	91 St & Jasper Ave
LSD:	
P.O.:	29532.40
Proj. Acct. code:	29532.40

Lot ID:	**1455048**
Control Number:	
Date Received:	Oct 24, 2020
Date Reported:	Jan 20, 2021
Report Number:	2588530

		Reference Number	1455048-1	1455048-2	1455048-3	
		Sample Date	Oct 24, 2020	Oct 24, 2020	Oct 24, 2020	
		Sample Time	11:30	12:30	13:30	
		Sample Location				
		Sample Description	MW20-5 / 2.8 °C	MW20-4 / 2.8 °C	DUP 1 / 2.8 °C	
		Matrix	Water	Water	Water	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Dissolved						
Silicon	Dissolved	mg/L	11.4	8.51	8.25	0.05
Sulfur	Dissolved	mg/L	507	150	152	0.3
Mercury	Dissolved	mg/L	<0.000005	<0.000005	<0.000005	0.000005
Aluminum	Dissolved	mg/L	<0.010	<0.002	<0.002	0.002
Antimony	Dissolved	mg/L	<0.001	0.0003	0.0003	0.0002
Arsenic	Dissolved	mg/L	<0.001	0.0011	0.0010	0.0002
Barium	Dissolved	mg/L	0.061	0.066	0.067	0.001
Beryllium	Dissolved	mg/L	<0.0005	<0.0001	<0.0001	0.0001
Bismuth	Dissolved	mg/L	<0.002	<0.0005	<0.0005	0.0005
Boron	Dissolved	mg/L	0.165	0.202	0.197	0.002
Cadmium	Dissolved	mg/L	0.0003	0.00017	0.00015	0.00001
Chromium	Dissolved	mg/L	<0.002	<0.0005	<0.0005	0.0005
Cobalt	Dissolved	mg/L	0.004	0.0047	0.0043	0.0001
Copper	Dissolved	mg/L	<0.005	0.001	0.001	0.001
Lead	Dissolved	mg/L	<0.0005	<0.0001	<0.0001	0.0001
Lithium	Dissolved	mg/L	0.378	0.183	0.177	0.001
Molybdenum	Dissolved	mg/L	<0.005	0.003	0.004	0.001
Nickel	Dissolved	mg/L	0.017	0.0115	0.0104	0.0005
Selenium	Dissolved	mg/L	0.002	0.0011	0.0013	0.0002
Silver	Dissolved	mg/L	<0.00005	<0.00001	<0.00001	0.00001
Strontium	Dissolved	mg/L	4.01	1.77	1.74	0.001
Thallium	Dissolved	mg/L	<0.0003	0.00007	0.00007	0.00005
Tin	Dissolved	mg/L	<0.005	<0.001	<0.001	0.001
Titanium	Dissolved	mg/L	<0.002	<0.0005	<0.0005	0.0005
Uranium	Dissolved	mg/L	0.047	0.0251	0.0252	0.0005
Vanadium	Dissolved	mg/L	<0.0005	0.0001	0.0002	0.0001
Zinc	Dissolved	mg/L	0.008	0.003	0.003	0.001
Subsample			Lab Filtered	Lab Filtered	Lab Filtered	
Routine Water						
pH			7.56	7.73	7.75	1
Temperature of observed pH		°C	21.3	21.5	21.6	
Electrical Conductivity	at 25 °C	µS/cm	3800	1840	1840	1
Calcium	Dissolved	mg/L	720	291	285	0.2
Magnesium	Dissolved	mg/L	182	59.1	58.5	0.2
Sodium	Dissolved	mg/L	59.0	61.3	60.8	0.4
Potassium	Dissolved	mg/L	17	9.7	9.4	0.4
Iron	Dissolved	mg/L	<0.05	<0.01	<0.01	0.01
Manganese	Dissolved	mg/L	1.34	1.33	1.12	0.005

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Analytical Report

Bill To:	Thurber Engineering Ltd.	Project ID:	29532.40	Lot ID:	**1455048**
	4127 Roper Road	Project Name:	BPTEC GW Sampling	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 St & Jasper Ave	Date Received:	Oct 24, 2020
	T6B 3S5	LSD:		Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	P.O.:	29532.40	Report Number:	2588530
Sampled By:	JNS	Proj. Acct. code:	29532.40		
Company:	Thurber Engineering Ltd.				

		Reference Number	1455048-1	1455048-2	1455048-3	
		Sample Date	Oct 24, 2020	Oct 24, 2020	Oct 24, 2020	
		Sample Time	11:30	12:30	13:30	
		Sample Location				
		Sample Description	MW20-5 / 2.8 °C	MW20-4 / 2.8 °C	DUP 1 / 2.8 °C	
		Matrix	Water	Water	Water	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Routine Water - Continued						
Chloride	Dissolved	mg/L	279	105	105	0.4
Nitrate - N		mg/L	0.75	2.77	3.35	0.01
Nitrite - N		mg/L	0.051	0.862	0.809	0.005
Nitrate and Nitrite - N		mg/L	0.80	3.64	4.16	0.01
Sulfate (SO4)	Dissolved	mg/L	1520	450	457	0.9
Hydroxide		mg/L	<5	<5	<5	
Carbonate		mg/L	<6	<6	<6	
Bicarbonate		mg/L	726	585	584	
P-Alkalinity	as CaCO3	mg/L	<5	<5	<5	5
T-Alkalinity	as CaCO3	mg/L	596	480	479	5
Total Dissolved Solids	Calculated	mg/L	3130	1260	1260	1
Hardness	Dissolved as CaCO3	mg/L	2550	970	952	
Ionic Balance	Dissolved	%	105	101	98	
Mono-Aromatic Hydrocarbons - Water						
Benzene		mg/L	<0.001	<0.001	<0.001	0.001
Toluene		mg/L	<0.0004	<0.0004	<0.0004	0.0004
Ethylbenzene		mg/L	<0.0010	<0.0010	<0.0010	0.0010
Total Xylenes (m,p,o)		mg/L	<0.001	<0.001	<0.001	0.001
Volatile Petroleum Hydrocarbons - Water						
F1 -BTEX		mg/L	<0.1	<0.1	<0.1	0.1
F1 C6-C10		mg/L	<0.1	<0.1	<0.1	0.1
F2 C10-C16		mg/L	<0.1	<0.1	<0.1	0.1
Polycyclic Aromatic Hydrocarbons - Water						
Naphthalene		µg/L	<0.1	0.1	<0.1	0.1
Quinoline		µg/L	<0.3	<0.3	<0.3	0.3
Acenaphthylene		µg/L	<0.1	<0.1	<0.1	0.1
Acenaphthene		µg/L	<0.1	<0.1	<0.1	0.1
Fluorene		µg/L	<0.1	<0.1	<0.1	0.1
Phenanthrene		µg/L	<0.1	<0.1	<0.1	0.1
Acridine		µg/L	<0.1	<0.1	<0.1	0.1
Anthracene		µg/L	<0.005	<0.005	<0.005	0.005
Fluoranthene		µg/L	0.01	0.04	0.03	0.01
Pyrene		µg/L	0.02	0.08	0.07	0.01
Benzo(a)anthracene		µg/L	<0.01	0.01	0.01	0.01
Chrysene		µg/L	<0.1	<0.1	<0.1	0.1
Benzo(b)fluoranthene		µg/L	<0.1	<0.1	<0.1	0.1
Benzo(b+j)fluoranthene		µg/L	<0.1	<0.1	<0.1	0.1
Benzo(k)fluoranthene		µg/L	<0.1	<0.1	<0.1	0.1
Benzo(a)pyrene		µg/L	<0.008	0.010	0.021	0.008

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Analytical Report

Bill To:	Thurber Engineering Ltd.	Project ID:	29532.40	Lot ID:	**1455048**
	4127 Roper Road	Project Name:	BPTEC GW Sampling	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 St & Jasper Ave	Date Received:	Oct 24, 2020
	T6B 3S5	LSD:		Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	P.O.:	29532.40	Report Number:	2588530
Sampled By:	JNS	Proj. Acct. code:	29532.40		
Company:	Thurber Engineering Ltd.				

		Reference Number	1455048-1	1455048-2	1455048-3	
		Sample Date	Oct 24, 2020	Oct 24, 2020	Oct 24, 2020	
		Sample Time	11:30	12:30	13:30	
		Sample Location				
		Sample Description	MW20-5 / 2.8 °C	MW20-4 / 2.8 °C	DUP 1 / 2.8 °C	
		Matrix	Water	Water	Water	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Polycyclic Aromatic Hydrocarbons - Water - Continued						
Indeno(1,2,3-c,d)pyrene		µg/L	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene		µg/L	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene		µg/L	<0.05	<0.05	<0.05	0.05
CB(a)P	B(a)P Total Potency Equivalents	µg/L	<0.01	0.01	0.02	0.01
PAH - Water - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	100	95	78	50-140
2-Fluorobiphenyl	PAH - Surrogate	%	65	68	66	50-140
p-Terphenyl-d14	PAH - Surrogate	%	77	90	92	50-140

Approved by:

Darlene Lintott, MSc
Consulting Scientist

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Quality Control

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.40	Lot ID:	**1455048**
		Project Name:	BPTEC GW Sampling	Control Number:	
		Project Location:	91 St & Jasper Ave	Date Received:	Oct 24, 2020
		LSD:		Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	P.O.:	29532.40	Report Number:	2588530
Sampled By:	JNS	Proj. Acct. code:	29532.40		
Company:	Thurber Engineering Ltd.				

Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.0074007	-0.04	0.05	yes
Sulfur	mg/L	0.020717	-0.3	0.2	yes
Mercury	µg/L	0.0002645	-0.038000	0.064000	yes
Aluminum	µg/L	0.332897	-2	2	yes
Antimony	µg/L	8.99562e-005	-0.2	0.2	yes
Arsenic	µg/L	-0.0112851	-0.2	0.2	yes
Barium	µg/L	0.00967819	-1	1	yes
Beryllium	µg/L	0	-0.0	0.1	yes
Boron	µg/L	0.841032	-2	2	yes
Cadmium	µg/L	0.000147949	-0.01	0.01	yes
Chromium	µg/L	-0.0558765	-0.3	0.3	yes
Cobalt	µg/L	0.00058505	-0.1	0.1	yes
Copper	µg/L	0.0791952	-1	1	yes
Lead	µg/L	0.00105155	-0.1	0.1	yes
Lithium	µg/L	0.00859499	-1	1	yes
Molybdenum	µg/L	0.0200494	-1	1	yes
Nickel	µg/L	0.0308376	-0.5	0.5	yes
Selenium	µg/L	0.00243535	-0.2	0.2	yes
Silver	µg/L	0.000477584	-0.10	0.10	yes
Strontium	µg/L	0.0111498	-1	1	yes
Thallium	µg/L	0.00158848	-0.05	0.05	yes
Tin	µg/L	-0.00177557	-1	1	yes
Titanium	µg/L	-0.0708534	-0.5	0.5	yes
Uranium	µg/L	0.00137621	-0.5	0.5	yes
Vanadium	µg/L	-0.0747921	-0.1	0.1	yes
Zinc	µg/L	0.0933391	-0	2	yes

Date Acquired: November 02, 2020

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Sulfur	mg/L	962	958	10	0.1	yes
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Aluminum	µg/L	<2	<2	10	11	yes
Antimony	µg/L	0.3	0.3	10	0.4	yes
Arsenic	µg/L	1.0	0.9	10	0.4	yes
Barium	µg/L	67	66	10	2	yes
Beryllium	µg/L	<0.1	<0.1	10	0.2	yes
Bismuth	µg/L	<0.5	<0.5	10	1.1	yes
Boron	µg/L	197	195	10	4	yes
Cadmium	µg/L	0.15	0.16	10	0.02	yes
Chromium	µg/L	<0.5	<0.5	10	1.1	yes
Cobalt	µg/L	4.3	4.2	10	0.2	yes
Copper	µg/L	1	2	10	2	yes
Lead	µg/L	<0.1	<0.1	10	0.2	yes
Lithium	µg/L	177	178	10	2	yes
Molybdenum	µg/L	4	4	10	2	yes
Nickel	µg/L	10.4	10.6	10	1.1	yes

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Quality Control

Bill To:	Thurber Engineering Ltd.	Project ID:	29532.40	Lot ID:	**1455048**
	4127 Roper Road	Project Name:	BPTEC GW Sampling	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 St & Jasper Ave	Date Received:	Oct 24, 2020
	T6B 3S5	LSD:		Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	P.O.:	29532.40	Report Number:	2588530
Sampled By:	JNS	Proj. Acct. code:	29532.40		
Company:	Thurber Engineering Ltd.				

Metals Dissolved - Continued

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Selenium	µg/L	1.3	1.3	10	0.4	yes
Silver	µg/L	<0.01	<0.01	10	0.22	yes
Strontium	µg/L	1740	1750	10	2	yes
Thallium	µg/L	0.07	0.07	10	0.11	yes
Tin	µg/L	<1	<1	10	2	yes
Titanium	µg/L	<0.5	<0.5	10	1.1	yes
Uranium	µg/L	25.2	25.9	10	1.1	yes
Vanadium	µg/L	158000	164000	10	0.2	yes
Zinc	µg/L	3	3	10	2	yes
Date Acquired:	November 12, 2020					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	993	917	1067	yes
Antimony	µg/L	39.7	36.4	44.2	yes
Arsenic	µg/L	39.3	36.7	43.3	yes
Barium	µg/L	195	182	211	yes
Beryllium	µg/L	20.0	17.3	22.1	yes
Bismuth	µg/L	93.8	89.1	108.3	yes
Boron	µg/L	389	344	434	yes
Cadmium	µg/L	2.09	1.86	2.25	yes
Chromium	µg/L	98.9	92.2	110.2	yes
Cobalt	µg/L	19.7	18.4	21.2	yes
Copper	µg/L	201	185	209	yes
Lead	µg/L	19.5	18.4	22.0	yes
Lithium	µg/L	200	175	223	yes
Molybdenum	µg/L	191	182	218	yes
Nickel	µg/L	98.9	93.3	105.9	yes
Selenium	µg/L	39.6	35.8	43.0	yes
Silver	µg/L	19.8	18.40	22.00	yes
Strontium	µg/L	195	180	216	yes
Thallium	µg/L	9.79	8.80	10.60	yes
Tin	µg/L	201	180	220	yes
Titanium	µg/L	99.4	92.4	110.4	yes
Uranium	µg/L	97.6	90.9	106.5	yes
Vanadium	µg/L	19.6	18.0	22.0	yes
Zinc	µg/L	197	183	219	yes
Date Acquired:	November 02, 2020				
Mercury	mg/L	0.000091	0.000070	0.000130	yes
Date Acquired:	November 02, 2020				
Mercury	mg/L	0.000020	0.000006	0.000036	yes
Aluminum	µg/L	53	45	55	yes
Antimony	µg/L	1.9	1.8	2.3	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes

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Quality Control

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.40	Lot ID:	**1455048**
		Project Name:	BPTEC GW Sampling	Control Number:	
		Project Location:	91 St & Jasper Ave	Date Received:	Oct 24, 2020
		LSD:		Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	P.O.:	29532.40	Report Number:	2588530
Sampled By:	JNS	Proj. Acct. code:	29532.40		
Company:	Thurber Engineering Ltd.				

Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Bismuth	µg/L	4.8	4.1	5.5	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.10	0.09	0.11	yes
Chromium	µg/L	5.0	4.5	5.5	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10	9	11	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	5.1	4.4	5.5	yes
Selenium	µg/L	2.0	1.7	2.2	yes
Silver	µg/L	1.00	0.84	1.08	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.50	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.1	4.5	5.5	yes
Uranium	µg/L	5.0	4.5	5.5	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	10	9	11	yes
Date Acquired:	November 02, 2020				
Silicon	mg/L	9.63	8.98	10.78	yes
Sulfur	mg/L	146	138.5	155.3	yes
Date Acquired:	November 02, 2020				
Silicon	mg/L	2.02	1.88	2.24	yes
Sulfur	mg/L	10.1	9.2	11.0	yes
Date Acquired:	November 02, 2020				
Silicon	mg/L	0.20	0.19	0.23	yes
Sulfur	mg/L	2.9	2.8	3.3	yes
Date Acquired:	November 02, 2020				

Mono-Aromatic Hydrocarbons - Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-0.002	0.002	yes
Toluene	ng	0	-0.0015	0.0015	yes
Ethylbenzene	ng	0	-0.0015	0.0015	yes
Total Xylenes (m,p,o)	ng	0	-0.002	0.002	yes
Styrene	ng	0	-0.002	0.002	yes
Date Acquired:	October 27, 2020				

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	91.94	80	120	yes
Toluene	ng	85.05	80	120	yes
Ethylbenzene	ng	81.64	80	120	yes
m,p-Xylene	ng	87.13	80	120	yes
Total Xylenes (m,p,o)	ng	87.48	80	120	yes

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Quality Control

Bill To:	Thurber Engineering Ltd.	Project ID:	29532.40	Lot ID:	**1455048**
	4127 Roper Road	Project Name:	BPTEC GW Sampling	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 St & Jasper Ave	Date Received:	Oct 24, 2020
	T6B 3S5	LSD:		Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	P.O.:	29532.40	Report Number:	2588530
Sampled By:	JNS	Proj. Acct. code:	29532.40		
Company:	Thurber Engineering Ltd.				

Mono-Aromatic Hydrocarbons - Water - Continued

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit		Passed QC
Styrene	ng	85.47	80	120		yes
Date Acquired:	October 27, 2020					

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	mg/L	<0.001	<0.001	30	0.002	yes
Toluene	mg/L	<0.0004	<0.0004	30	0.0020	yes
Ethylbenzene	mg/L	<0.0010	<0.0010	30	0.0020	yes
Total Xylenes (m,p,o)	mg/L	<0.001	<0.001	30	0.002	yes
Styrene	mg/L	<0.001	<0.001	30	0.002	yes
Date Acquired:	October 27, 2020					

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit		Passed QC
Benzene	mg/L	92	70	130		yes
Toluene	mg/L	85	70	130		yes
Ethylbenzene	mg/L	82	70	130		yes
Total Xylenes (m,p,o)	mg/L	87	70	130		yes
Styrene	mg/L	85	70	130		yes
Date Acquired:	October 27, 2020					

PAH - Water - Surrogate Recovery

Blanks	Units	Measured	Lower Limit	Upper Limit		Passed QC
Nitrobenzene-d5	%	100.05	50	140		yes
2-Fluorobiphenyl	%	86.16	50	140		yes
p-Terphenyl-d14	%	100.79	50	140		yes
Date Acquired:	October 29, 2020					

Polycyclic Aromatic Hydrocarbons - Water

Blanks	Units	Measured	Lower Limit	Upper Limit		Passed QC
Naphthalene	ng/mL	0	-0.1	0.1		yes
Quinoline	ng/mL	0	-0.1	0.1		yes
1-Methylnaphthalene	ng/mL	0	-0.1	0.1		yes
2-Methylnaphthalene	ng/mL	0	-0.1	0.1		yes
Acenaphthylene	ng/mL	0	-0.1	0.1		yes
Acenaphthene	ng/mL	0	-0.1	0.1		yes
Fluorene	ng/mL	0	-0.1	0.1		yes
Phenanthrene	ng/mL	0	-0.1	0.1		yes
Acridine	ng/mL	0	-0.1	0.1		yes
Anthracene	ng/mL	0	-0.005	0.005		yes
Fluoranthene	ng/mL	0	-0.01	0.01		yes
Pyrene	ng/mL	0	-0.01	0.01		yes
Benzo(a)anthracene	ng/mL	0	-0.01	0.01		yes
Chrysene	ng/mL	0	-0.1	0.1		yes
Benzo(b)fluoranthene	ng/mL	0	-0.1	0.1		yes
Benzo(b+j)fluoranthene	ng/mL	0	-0.1	0.1		yes

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Quality Control

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5
Attn:	Sharon Bunn
Sampled By:	JNS
Company:	Thurber Engineering Ltd.

Project ID:	29532.40
Project Name:	BPTEC GW Sampling
Project Location:	91 St & Jasper Ave
LSD:	
P.O.:	29532.40
Proj. Acct. code:	29532.40

Lot ID:	**1455048**
Control Number:	
Date Received:	Oct 24, 2020
Date Reported:	Jan 20, 2021
Report Number:	2588530

Polycyclic Aromatic Hydrocarbons - Water - Continued

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzo(k)fluoranthene	ng/mL	0	-0.1	0.1	yes
Benzo(a)pyrene	ng/mL	0	-0.008	0.008	yes
Indeno(1,2,3-c,d)pyrene	ng/mL	0	-0.05	0.05	yes
Dibenzo(a,h)anthracene	ng/mL	0	-0.05	0.05	yes
Benzo(g,h,i)perylene	ng/mL	0	-0.05	0.05	yes

Date Acquired: October 29, 2020

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Naphthalene	ng/mL	105.00	80	120	yes
Quinoline	ng/mL	98.00	80	120	yes
1-Methylnaphthalene	ng/mL	105.60	80	120	yes
2-Methylnaphthalene	ng/mL	106.78	80	120	yes
Acenaphthylene	ng/mL	93.80	80	120	yes
Acenaphthene	ng/mL	101.40	80	120	yes
Fluorene	ng/mL	98.40	80	120	yes
Phenanthrene	ng/mL	100.40	80	120	yes
Acridine	ng/mL	97.80	80	120	yes
Anthracene	ng/mL	97.60	80	120	yes
Fluoranthene	ng/mL	96.80	80	120	yes
Pyrene	ng/mL	97.20	80	120	yes
Benzo(a)anthracene	ng/mL	92.80	80	120	yes
Chrysene	ng/mL	102.40	80	120	yes
Benzo(b)fluoranthene	ng/mL	84.00	80	120	yes
Benzo(b+j)fluoranthene	ng/mL	94.40	80	120	yes
Benzo(k)fluoranthene	ng/mL	101.00	80	120	yes
Benzo(a)pyrene	ng/mL	98.40	80	120	yes
Indeno(1,2,3-c,d)pyrene	ng/mL	93.60	80	120	yes
Dibenzo(a,h)anthracene	ng/mL	95.00	80	120	yes
Benzo(g,h,i)perylene	ng/mL	97.60	80	120	yes

Date Acquired: October 29, 2020

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Naphthalene	µg/L	86	50	140	yes
Acenaphthylene	µg/L	94	50	140	yes
Acenaphthene	µg/L	96	50	140	yes
Fluorene	µg/L	100	50	140	yes
Phenanthrene	µg/L	100	50	140	yes
Acridine	µg/L	103	50	140	yes
Anthracene	µg/L	98	50	140	yes
Fluoranthene	µg/L	105	50	140	yes
Pyrene	µg/L	101	50	140	yes
Benzo(a)anthracene	µg/L	108	50	140	yes
Chrysene	µg/L	107	50	140	yes
Benzo(b)fluoranthene	µg/L	102	50	140	yes
Benzo(k)fluoranthene	µg/L	95	50	140	yes

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Quality Control

Bill To:	Thurber Engineering Ltd.	Project ID:	29532.40	Lot ID:	**1455048**
	4127 Roper Road	Project Name:	BPTEC GW Sampling	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 St & Jasper Ave	Date Received:	Oct 24, 2020
	T6B 3S5	LSD:		Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	P.O.:	29532.40	Report Number:	2588530
Sampled By:	JNS	Proj. Acct. code:	29532.40		
Company:	Thurber Engineering Ltd.				

Polycyclic Aromatic Hydrocarbons - Water - Continued

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzo(a)pyrene	µg/L	95	50	140	yes
Indeno(1,2,3-c,d)pyrene	µg/L	103	50	140	yes
Dibenzo(a,h)anthracene	µg/L	106	50	140	yes
Benzo(g,h,i)perylene	µg/L	97	50	140	yes

Date Acquired: October 29, 2020

Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.0272101	-0.2	0.2	yes
Magnesium	mg/L	0.00525677	-0.1	0.1	yes
Sodium	mg/L	0.0107038	-0.4	0.4	yes
Potassium	mg/L	0.0105915	-0.4	0.4	yes
Iron	mg/L	-0.00113673	-0.01	0.01	yes
Manganese	mg/L	-0.000186339	-0.004	0.004	yes
Chloride	mg/L	0.28	-0.4	0.4	yes
Nitrate - N	mg/L	0	-0.01	0.01	yes
Nitrite - N	mg/L	0	-0.005	0.005	yes

Date Acquired: November 01, 2020

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		5.49	5.40	0	0.10	yes
Electrical Conductivity	dS/m	1.99	1.98	10	0.002	yes
Calcium	mg/L	528	528	10	0.6	yes
Magnesium	mg/L	246	244	10	0.7	yes
Sodium	mg/L	1260	1260	10	1.2	yes
Potassium	mg/L	13	13	10	1.2	yes
Iron	mg/L	<0.05	<0.05	10	0.05	yes
Manganese	mg/L	5.20	5.22	10	0.010	yes
Chloride	mg/L	2.6	2.7	10	0.5	yes
Nitrate - N	mg/L	2.1	2.1	10	0.01	yes
Nitrite - N	mg/L	0.55	0.57	10	0.010	yes
Hydroxide	mg/L	<5	<5	10		yes
Carbonate	mg/L	10	9	10	6	yes
Bicarbonate	mg/L	<5	<5	10	6	yes
P-Alkalinity	mg/L	<5	<5	10	5	yes
T-Alkalinity	mg/L	8	8	10	5	yes

Date Acquired: October 30, 2020

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Electrical Conductivity	dS/m	32.7	27.200	36.800	yes

Date Acquired: October 30, 2020

pH		9.15	8.90	9.44	yes
Temperature of observed	°C	21.3	18.0	25.0	yes
Electrical Conductivity	dS/m	2.75	2.641	2.839	yes
Calcium	mg/L	243	230.0	260.0	yes

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Quality Control

Bill To:	Thurber Engineering Ltd.	Project ID:	29532.40	Lot ID:	**1455048**
	4127 Roper Road	Project Name:	BPTEC GW Sampling	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 St & Jasper Ave	Date Received:	Oct 24, 2020
	T6B 3S5	LSD:		Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	P.O.:	29532.40	Report Number:	2588530
Sampled By:	JNS	Proj. Acct. code:	29532.40		
Company:	Thurber Engineering Ltd.				

Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Magnesium	mg/L	95.0	91.3	103.3	yes
Sodium	mg/L	241	233.3	257.3	yes
Potassium	mg/L	245	229.0	259.0	yes
Iron	mg/L	9.53	8.91	10.20	yes
Manganese	mg/L	2.37	2.240	2.540	yes
Nitrate - N	mg/L	10.4	9.03	11.13	yes
Nitrite - N	mg/L	9.96	9.460	10.600	yes
Nitrate and Nitrite - N	mg/L	20.4	19.30	21.10	yes
P-Alkalinity	mg/L	528	442	584	yes
T-Alkalinity	mg/L	1020	926	1106	yes
Date Acquired:	October 30, 2020				
pH		6.88	6.79	6.97	yes
Temperature of observed	°C	21.1	18.0	25.0	yes
Electrical Conductivity	dS/m	0.078	0.069	0.085	yes
Calcium	mg/L	50.7	44.9	56.9	yes
Magnesium	mg/L	19.8	17.9	22.0	yes
Sodium	mg/L	50.7	47.7	55.5	yes
Potassium	mg/L	50.5	45.8	55.8	yes
Iron	mg/L	2.00	1.89	2.25	yes
Manganese	mg/L	0.510	0.468	0.552	yes
Chloride	mg/L	81.5	74.9	86.9	yes
Nitrate - N	mg/L	4.92	4.37	5.33	yes
Nitrite - N	mg/L	4.78	4.370	5.330	yes
Nitrate and Nitrite - N	mg/L	9.70	8.80	10.60	yes
P-Alkalinity	mg/L	51	28	72	yes
T-Alkalinity	mg/L	133	114	140	yes
Date Acquired:	October 30, 2020				
Calcium	mg/L	4.9	4.7	5.8	yes
Magnesium	mg/L	1.9	1.8	2.2	yes
Sodium	mg/L	5.0	4.7	5.7	yes
Potassium	mg/L	4.9	4.7	5.7	yes
Iron	mg/L	0.19	0.19	0.24	yes
Manganese	mg/L	0.051	0.048	0.058	yes
Chloride	mg/L	15.2	13.3	16.5	yes
Nitrate - N	mg/L	0.48	0.42	0.57	yes
Nitrite - N	mg/L	0.470	0.424	0.564	yes
Nitrate and Nitrite - N	mg/L	0.95	0.85	1.15	yes
Date Acquired:	November 01, 2020				

Volatile Petroleum Hydrocarbons - Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
F1 -BTEX	ng	0	-0.3	0.3	yes
F1 C6-C10	ng	0	-0.300	0.300	yes
F2 C10-C16	ng	0	-0.3	0.3	yes
Date Acquired:	October 27, 2020				

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Quality Control

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.40	Lot ID:	**1455048**
		Project Name:	BPTEC GW Sampling	Control Number:	
		Project Location:	91 St & Jasper Ave	Date Received:	Oct 24, 2020
		LSD:		Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	P.O.:	29532.40	Report Number:	2588530
Sampled By:	JNS	Proj. Acct. code:	29532.40		
Company:	Thurber Engineering Ltd.				

Volatile Petroleum Hydrocarbons - Water - Continued

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit		Passed QC
F2 C10-C16	ng	93.92	80	120		yes

Date Acquired: October 27, 2020

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
F1 C6-C10	mg/L	<0.1	<0.1	30		yes
F2 C10-C16	mg/L	<0.1	<0.1	30		yes

Date Acquired: October 27, 2020

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Methodology and Notes

Bill To:	Thurber Engineering Ltd.	Project ID:	29532.40	Lot ID:	**1455048**
	4127 Roper Road	Project Name:	BPTEC GW Sampling	Control Number:	
	Edmonton, AB, Canada	Project Location:	91 St & Jasper Ave	Date Received:	Oct 24, 2020
	T6B 3S5	LSD:		Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	P.O.:	29532.40	Report Number:	2588530
Sampled By:	JNS	Proj. Acct. code:	29532.40		
Company:	Thurber Engineering Ltd.				

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	*	Alkalinity - Titration Method, 2320 B	Oct 30, 2020	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	*	Conductivity, 2510 B	Oct 30, 2020	Element Edmonton - Roper Road
Alkalinity, pH, and EC in water	APHA	*	pH - Electrometric Method, 4500-H+ B	Oct 30, 2020	Element Edmonton - Roper Road
Anions (Routine) by Ion Chromatography	APHA	*	Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Nov 1, 2020	Element Edmonton - Roper Road
Approval-Edmonton	APHA		Checking Correctness of Analyses, 1030 E	Nov 3, 2020	Element Edmonton - Roper Road
Approval-Edmonton	APHA		Checking Correctness of Analyses, 1030 E	Nov 13, 2020	Element Edmonton - Roper Road
BTEX-CCME - Water	US EPA	*	Volatile Organic Compounds in Various Sample Matrices Using Equilibrium Headspace Analysis/Gas Chromatography Mass Spectrometry, 5021/8260	Oct 27, 2020	Element Calgary
Chloride in Water	APHA	*	Automated Ferricyanide Method, 4500-Cl- E	Nov 2, 2020	Element Edmonton - Roper Road
Mercury (Dissolved) in water	APHA	*	Cold Vapour Atomic Absorption Spectrometric Method, 3112 B	Nov 2, 2020	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	*	Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Nov 2, 2020	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	APHA/USEPA	*	Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	Nov 12, 2020	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Nov 2, 2020	Element Edmonton - Roper Road
Metals ICP-MS (Dissolved) in water	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Nov 12, 2020	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA		Hardness by Calculation, 2340 B	Nov 1, 2020	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA		Hardness by Calculation, 2340 B	Nov 12, 2020	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	Nov 1, 2020	Element Edmonton - Roper Road
Metals Trace (Dissolved) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	Nov 12, 2020	Element Edmonton - Roper Road
PAH - Water	AEP		Carcinogenic PAHs Toxic Potency Equivalence (as B(a)P TPE), PAHw	Oct 29, 2020	Element Calgary
PAH - Water	US EPA	*	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry, 8270	Oct 29, 2020	Element Calgary

** Reference Method Modified*

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Methodology and Notes

Bill To:	Thurber Engineering Ltd. 4127 Roper Road Edmonton, AB, Canada T6B 3S5	Project ID:	29532.40	Lot ID:	**1455048**
		Project Name:	BPTEC GW Sampling	Control Number:	
		Project Location:	91 St & Jasper Ave	Date Received:	Oct 24, 2020
		LSD:		Date Reported:	Jan 20, 2021
Attn:	Sharon Bunn	P.O.:	29532.40	Report Number:	2588530
Sampled By:	JNS	Proj. Acct. code:	29532.40		
Company:	Thurber Engineering Ltd.				

References

AEP	Alberta Tier 1 Soil and Groundwater Remediation Guidelines
APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
US EPA	US Environmental Protection Agency Test Methods

Comments:

- Nov 09, 2020 - Report was issued to include retest result for dissolved metals analysis on samples 2 and 3 as requested by Sabinus Okafor on Nov. 7, 2020.
- Nov 12, 2020 - Sample 1455048-2; 7261887: Sample 1455048-2: the repeated result for ICP-MS dissolved metals analysis did not differ significantly from the original; it is within expected precision of the test.
- Nov 12, 2020 - Sample 1455048-3; 7261888: Sample 1455048-3: the repeated result for ICP-MS dissolved metals analysis differs significantly from the original. The cause of the difference is wrong sample.
- Nov 13, 2020 - Samples 1455048-2 and -3: the repeated result for trace dissolved analysis did not differ significantly from the original; it is within expected precision of the test.
- Jan 20, 2021 - Report was issued to include changes to the sample descriptions from MW20-2 to MW20-5 and MW30-3 to MW20-4 to as requested by Sabinus Okafor of TEL on Jan. 16, 2021.
  Previous report 2569731.

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Project Information

Project ID:	29532.40
Project Name:	BPTEC GW Sampling
Project Location:	91 St & Jasper Ave
Legal Location:	
PO/AFE#:	29532.40
Proj. Acct. Code:	29532.40
Quote #:	

Invoice To

Company:	Thurber Engineering Ltd.
Address:	4127 Roper Road
	Edmonton, AB T6B 3S5, Canada
Attention:	Sharon Bunn
Phone:	(780) 438-1460
Cell:	
Fax:	(780) 437-7125
E-mail:	Sbunn@thurber.ca
Agreement ID:	83102
Copy of Report:	YES / NO

Report To

Company:	Thurber Engineering Ltd.
Address:	4127 Roper Road
	Edmonton, AB T6B 3S5, Canada
Attention:	Sabinus Okafor
Phone:	(780) 438-1460
Cell:	
Fax:	(780) 437-7125
E-mail 1:	sokafor@thurber.ca
E-mail 2:	
Copy of Invoice:	YES / NO

Additional Reports to

1) Name:
E-mail:
2) Name:
E-mail:

Sample Custody

Sampled by: Jaclyn Sommers
Company: TEL
I authorize Element to proceed with the work indicated on this form:
Signature: Sabinus okaofr
Date/Time:

RUSH Priority

- ☐ Same Day (200%)
- ☐ Next Day/Two Day (100%)
- ☐ Three or Four Days (50%)
- ☐ Five to Seven Days (Regular TAT)

Date Required

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples. If not all samples require RUSH, please indicate in the special instructions.

Report Results

- ☐ Email ☐ QA/QC
- ☐ Online ☐ PDF
- ☐ Fax ☐ Excel

Requirements

- ☐ HCDWOR ☐ SPIGEC
- ☐ AB Tier 1 ☐ BCCSR

Other (list below)

Special Instructions/Comments (please include contact information including phone number if different from above).

	Site I.D.	Sample Description	Depth Range	Depth Unit	Date/Time sampled	Matrix	Sampling method	Number of Containers #	MeOH Field Preserved? ✓	CCMEBF12W - CCME BTEX	DISP - Environmental Dispos	PAH1 - PAHs in water	TW33 - Dissolved metals plu
1		MW20-5			2020-10-24 1	Water	Grab	8		x	x	x	x
2		MW20-4			2020-10-24 1:	Water	Grab	8		x	x	x	x
3		DUP 1			2020-10-24 1:	Water	Grab	8		x	x	x	x

Enter tests above (✓ relevant samples below)

Please indicate any potentially hazardous samples

Submission of this form acknowledges acceptance of Element's Standard of terms and conditions (https://www.element.com/terms/terms-and-conditions)

Page 1 of 1
ED 120-005
Control # 1455048 - P1

Indicate lot # or affix barcode here
1455048

Temp. received: °C
Date/Time stamp:
Delivery Method:
Waybill:
Received by:

Appendix G: Construction Management Plan (City of Edmonton 2021)

Integrated Infrastructure Services
Infrastructure Planning and Design

City of Edmonton
11004 - 190 Street NW
Edmonton, AB T5S 0G9

edmonton.ca

Construction Management Plan for the Replacement of the Latta Bridge, Edmonton, Alberta

Integrated Infrastructure Services | Infrastructure Planning and Design
City of Edmonton

July 2021

Prepared by:
Jesse Buswell, G.I.T.

Reviewed by:
Zsolt Margitai, M.Sc., P.Geol., P.Eng.

V 1.0 210707

1. Introduction

The City of Edmonton (the City) Integrated Infrastructure Services intends to replace the Latta Bridge in Edmonton, Alberta (the Project). The Latta Bridge was originally built in 1911 over the Latta Ravine but subsidence related to nearby coal mines caused significant settling of the bridge structure. The bridge was replaced with the current steel structure with concrete and steel foundations in 1936 and rehabilitated in 1977 and 2004. Jasper Avenue currently uses the Latta Bridge to cross the remaining Latta Ravine.

An Environmental overview and Phase II Environmental Site Assessment completed by Thurber Engineering Ltd. from January 2021 (2021 Environmental Overview and Phase II) identified concentrations of lead, zinc, petroleum hydrocarbons fractions F2 to F4, polycyclic aromatic hydrocarbons, and salinity based parameters that exceeded the Alberta Tier 1 Soil and Groundwater Remediation Guidelines (the Guidelines) for fine grained soil and parkland/residential land uses. Exceedances of the relevant guidelines were noted at 18 testhole locations. In addition, the bridge coating material was also sampled and three samples exceeded the Surface Coating Materials Regulation (Government of Canada, 2016) guidelines. Groundwater was also assessed and the noted exceedances of the Guidelines were indicative of natural conditions expected in the Edmonton area.

This Construction Management Plan has been developed to address the concerns associated with the presence of contaminated soil during construction. This document details the management measures required during construction to ensure the safety of workers, the public, and to ensure the proper handling and disposal of excavated soil during the replacement of the Latta Bridge.

2. Project Description

The Latta Bridge replacement project intends to replace the current bridge over Latta Ravine built in 1936 and rehabilitated in 1977 and 2004. It is proposed that the replacement span will be a single-span steel plate girder bridge which will require demolition of the existing structure. It is understood that the City intends to pursue a full closure of Jasper Avenue to allow for the demolition of the existing bridge prior to construction of the new structure. All existing structures and foundations will be removed during demolition. The new bridge structure will be supported by the abutments on the east and west sides and there is also a proposed pile wall beneath the bridge. Project laydown areas have been proposed on and adjacent to Jasper Avenue to the east and west of the bridge as well as adjacent to 91 Street.

3. Risk Evaluation & Recommended Mitigation Measures

The findings of the 2021 Environmental Overview and Phase II indicated that the soil beneath the roadway on Jasper Avenue adjacent to the Latta Bridge consisted of clay till containing sand layers and extended to depths ranging from 12.2 meters below ground surface (mbgs) to 13.1 mbgs. The soil encountered at the bottom of the ravine consists of clay fill underlain by loose gravel fill, a clay fill layer, a clay till layer, and finally a sand and gravel layer noted to extend to a depth of 12.4 mbgs which was the maximum depth of the testholes. In addition, waste material such as bricks, glass and debris were noted in the fill at the bottom of the ravine.

Full horizontal and vertical delineation was not part of the scope of the 2021 Phase II and was therefore not achieved during this investigation. In soil, lead and/or zinc Guideline exceedances extended to at least 0.5 mbgs depth (the maximum depth of investigation) in hand auger testholes and 0.75 mbgs depth in deeper boreholes with the exception of at the 5 and 10 meter step outs from the bridge where lead exceeded guidelines to a depth range of 0.3 mbgs to 0.5 mbgs but no zinc exceedances were identified. Lead concentrations exceeding the Guidelines ranged from 142 mg/kg to 561 mg/kg while zinc ranged from 284 mg/kg to 875 mg/kg. The fill material at the base of the ravine at TH20-6 exceeded the Guidelines for petroleum hydrocarbon fractions F2 to F4 and polycyclic aromatic hydrocarbons at a depth of 1.5 mbgs. Salt impacts likely related to winter maintenance activities were also noted in surficial fill samples near the bridge abutments where concentrations of salinity parameters such as electrical conductivity and the sodium adsorption ratio were rated as poor to unsuitable.

In groundwater, samples met the relevant guidelines for BTEX, petroleum hydrocarbons fractions F1 to F4, and PAHs. Concentrations of chloride, manganese, sodium, sulfate, TDS, and uranium exceeded the Guidelines however these concentrations were observed to be similar to natural elevated concentrations seen in the Edmonton area.

Environmental risk exists when the three elements of risk - contaminants, receptors, and pathways - are present and are linked. The contaminant of concern on this site is lead, zinc, petroleum hydrocarbon fractions F2-F4, and polycyclic aromatic hydrocarbons and for the purposes of this Construction Management Plan the receptors of concern are humans, both workers and the public. Due to the concentrations of lead and zinc observed in samples collected, the applicable exposure pathway is direct soil contact while the freshwater aquatic life and domestic use aquifer pathways are applicable for polycyclic aromatic hydrocarbons. The vapour inhalation pathway is also applicable for petroleum hydrocarbon fractions F2 to F4 within coarse grained soils. The main method of risk mitigation proposed in this document will be to manage the pathway of direct soil contact though the means explained below while further evaluation will be conducted on the remaining pathways and they will be mitigated if necessary.

The vegetative cover across the site currently provides a sufficient barrier to limit direct soil contact for public and workers. However, during construction, it may be necessary to remove vegetation for construction activities and laydown areas and thus mitigative measures need to be taken to ensure the safety of the workers and public in the area. Public access to the site during construction must not be permitted and the contractor should have mitigative measures in place to prevent access to the site such as signage and/or fencing.

Where vegetation removal occurs to facilitate the creation of a suitable workspace, the contractor should only remove the minimum volume of soil required to develop their workspace. All disturbed soils should be handled following the recommendations in Section 4: Recommended Handling Procedures for Contaminated Soil. Workers must wear appropriate Personal Protective Equipment (PPE) in order to prevent contact with contaminated soil and measures must be taken to prevent wind and water-borne erosion. Recommendations regarding these measures are included in Section 4 — Recommended Handling Procedures for Contaminated Soil and Section 5 — Recommended Personal Protective Equipment and Worker Protection. In locations where vegetation and soil are removed and underlying soils will be exposed for several days, a physical barrier such as a geotextile liner, clean soil or aggregate or rig matting should be utilized to prevent direct contact with the soil. All areas where soil was removed will be restored or landscaped as per the project specifications using topsoil and backfill materials free of contaminants as determined by laboratory chemical analyses prior to placement.

Additional soil sampling is planned prior to detailed design and this document may be updated in the future if required.

It is understood that not all contaminated soils will be removed during the course of the Project. The City will further address the remaining contamination when the site activities associated with the bridge replacement project are completed. Additional soil sampling is planned post-construction but prior to final landscaping to determine the most appropriate follow-up remedial measures.

4. Recommended Handling Procedures for Contaminated Soil

When excavation, soil disturbance, or vegetation removal is planned within the areas of known lead soil contamination, the following procedures must be employed. If these procedures cannot be employed then consultation with Engineering Services is required.

- Minimize the disturbance area and the duration of soil disturbance as much as practical to what is necessary to construct the project.
- Areas of soil disturbance shall be fenced and include adequate signage to prevent public entry.
- Excavation shall not occur during periods of high precipitation or high winds.

- Excavated soil must be directly loaded onto equipment, stockpiled on a liner and covered with an appropriate material to prevent water and wind borne erosion, or placed in a soil bag.
    - Stockpiles and soil bags must be located in a secured, fenced area. The stockpile cover shall be secured to ensure that it stays in place through the duration of work until the pile is removed. All runoff from the stockpile must be contained to the stockpile area through the use of berms and liners.
    - Efforts shall be taken to ensure liners are not compromised during stockpile or stockpile removal activities.
    - Samples shall be collected from the stockpile or as the stockpile is generated and submitted for laboratory analysis to determine characterization for landfill disposal.
- Where possible, locations where vegetation and topsoil are removed should be covered with a physical barrier, such as clean backfill, aggregate, an impermeable liner or rig matting, that prevents access to the soils below.
- Site grading should be designed and conducted in such a way that prevents surface water or wind-borne erosion of exposed soils while maintaining slope stability.
- Dust generation must be prevented at all times. Any soils with the potential to produce dust as a result of a low moisture content may require the addition of moisture or an environmentally friendly dust suppressant to reduce the ability of the soil to produce dust. If moisture is added, it shall be added sparingly as to not produce runoff or generate any excess water. Any excess water generated as a result shall be controlled and managed accordingly and shall be contained within the area of the stockpile.
- Excavated soil must be disposed of at an approved facility following industry standard soil disposal practices.
- Excavations will be backfilled with clean soil as per project specifications.

- Best Management Practices in accordance with the City of Edmonton Erosion and Sedimentation Control Guidelines (2005) and the contractors Erosion and Sediment Control plan should be followed.

5. Recommended Personal Protective Equipment & Worker Protection

Depending on work location, workers must wear PPE to prevent contact with contaminated soil. PPE may include, but is not limited to:

- Disposable nitrile gloves;
- Safety glasses/goggles;
- Full length coveralls covering arms and legs
- CSA approved steel-toed work boots; and
- Dust masks or half face respirator with suitable dust cartridges to be worn during dusty conditions.

Laundering of coveralls may also be required if disposable coveralls are not provided and on-site handwashing facilities are required to prevent accidental ingestion of soil.

6. Closure

The results of this investigation and the discussion and recommendations provided in this report were based on the subsoil and groundwater conditions identified at the borehole locations on the subject site as described in the 2021 Environmental Overview and Phase II. Should different subsurface conditions be encountered during construction, Engineering Services should be notified and the recommendations submitted herein will be reviewed, and revised as necessary.

This report was prepared for the exclusive use of the City of Edmonton, and other persons authorized by the City of Edmonton in writing, for specific application to the replacement of the Latta Bridge. It has been prepared in accordance with generally accepted environmental practices. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. The City of Edmonton will accept no responsibility for any damages incurred by a third party as a result of decisions made or actions taken based on the information contained in this report.

7. References

- Alberta Environment and Parks (AEP). 2019. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land Policy Branch, Policy and Planning Division. 198 pp.
- City of Edmonton. 2005. Erosion and Sedimentation Control Guidelines. Drainage Services.
- Thurber Engineering Ltd. 2021. Environmental Overview and Phase II Environmental Site Assessment Latta Bridge (B027) Replacement Project Edmonton, Alberta.

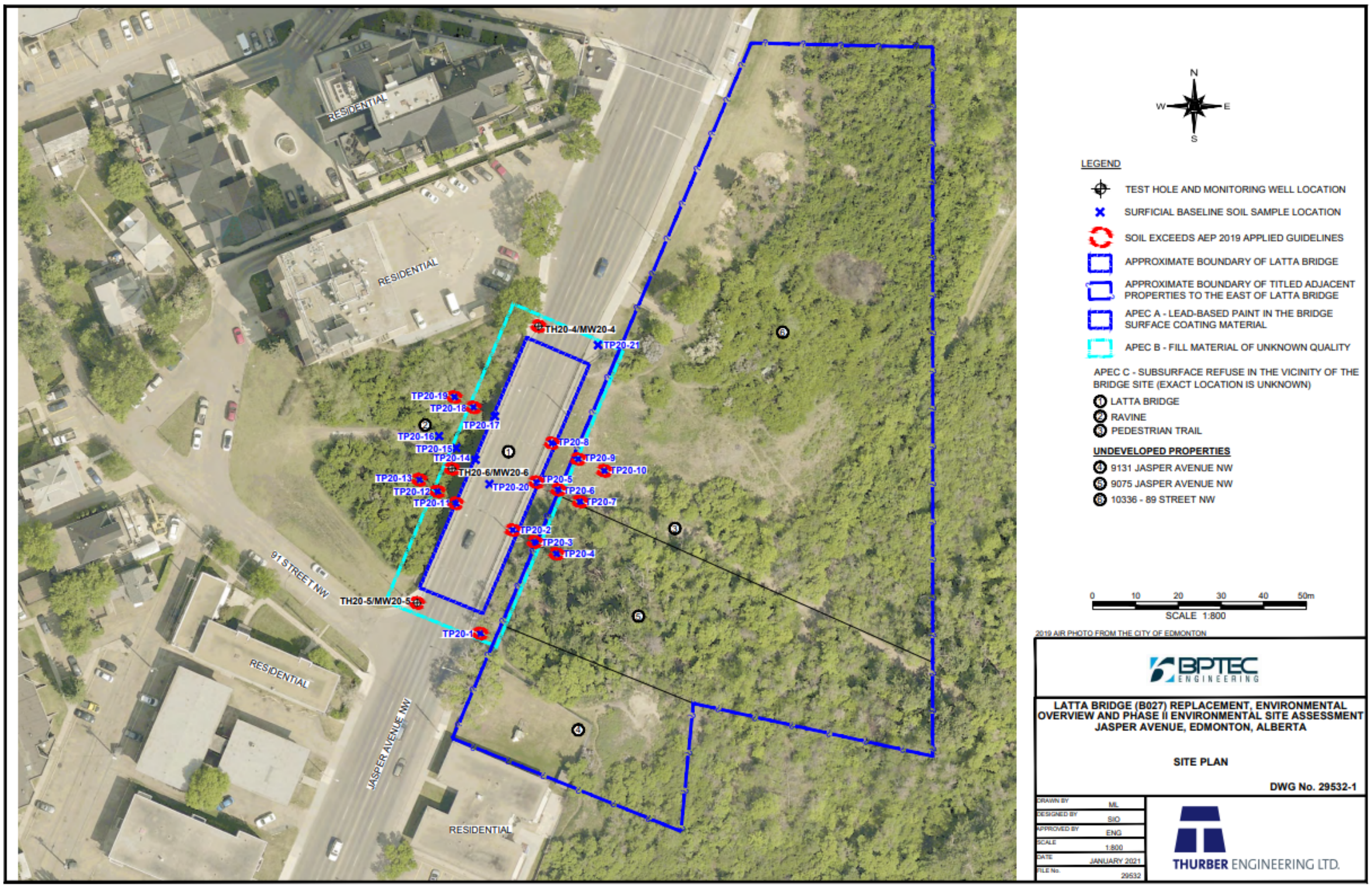

Figure 1.0 (Thurber, 2021): Testhole locations adjacent and beneath the Latta Bridge

Appendix H: Soil Quality Assessment – Latta Bridge Site (Crimson Environmental Limited 2021)

Soil Quality Assessment
Latta Bridge Site
Edmonton, Alberta

Prepared by

CRIMSON Environmental Limited
PO Box 24 - #314 – 222 Baseline Road
Sherwood Park, Alberta, T8H 1S8
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The Association of Professional Engineers and Geoscientists of Alberta
Permit to Practice P08305

for

The City of Edmonton
Engineering Services Section
Integrated Infrastructure Services
Infrastructure Planning and Design
11004 - 190 Street NW
Edmonton, Alberta
T5S 0G9

Project Number: CEL-37557
August 24, 2021

EXECUTIVE SUMMARY

CRIMSON Environmental Limited (CRIMSON) was retained by the City of Edmonton to conduct a Soil Quality Assessment of the area immediately underlying and/or adjacent to the Latta Bridge in the city's Riverdale and River Valley Kinnaird Neighbourhoods. There is no municipal address for the bridge site. However, the bridge is located along Jasper Avenue NW near its intersection with 91 Street NW (Figures 1 and 2). This report summarizes the scope of work, methodology and findings of the investigation.

The assessment was completed specifically to ascertain the quality of the surface soils that are situated immediately adjacent to and/or underlying the existing bridge structure. It is CRIMSON's understanding that the bridge is scheduled for replacement in the near future.

The intrusive portions of this investigation were completed on July 21 and 28, 2021 as well as August 8, 2021. A total of thirty-one boreholes were advanced using one of several different pieces of equipment. These included a hand auger operated by CRIMSON staff as well as a track mounted drill rig equipped with solid stem augers and/or a hand-held mechanical auger. All mechanical equipment was operated by Mobile Augers and Research Limited. All of the boreholes were drilled to approximate depths ranging between 0.5 and 1.3 mbgl and were backfilled with drill cuttings upon completion. All of the collected soil samples were transported to the Element Materials Technology Canada Inc. Laboratory in Edmonton with the appropriate chain-of-custody information.

With regards to lead, the results of the analytical testing indicate the presence of impacts to the surface soil present under and/or immediately adjacent to the Latta Bridge. This includes the areas that are slated to be used as laydown and/or easement areas east and west of the bridge structure. Based on the results of the assessment as well as the placement of adjacent infrastructure including high-rise apartment buildings and parking lots, the lead impacts appear to have been adequate delineated horizontally. Vertically delineation has not been achieved in the areas of the boreholes labelled 21-04, 21-05, 21-06, 21-07 and 21-17. A drill rig would be required in order to complete additional soil sampling.

With regards to zinc, the results of the analytical testing indicate the presence of impacts to the surface soil present under and/or immediately adjacent to the Latta Bridge. Based on the results of the assessment, the zinc impacts appear to have been adequately delineated horizontally. Vertically delineation has not been achieved in the area of the borehole labelled 21-03. A drill rig would be required in order to complete additional soil sampling.

With regards to PAHs, the results of the assessment reconfirm the presence of several parameters in surface soil situated adjacent to the Latta Bridge. The results of assessment are limited to one sample collected from the borehole labelled 21-21 at a depth of 1.3 mbgl. The PAH impacts have not been delineated either horizontally or vertically.

It is recommended that the proposed construction plans be consulted to determine the future cut depths and excavation areas in order to determine whether additional soil sampling will be required at that time.

Table of Contents

LIST OF FIGURES, TABLES AND APPENDICES

Figures

Tables

Appendices

1.0 INTRODUCTION

CRIMSON Environmental Limited (CRIMSON) was retained by the City of Edmonton to conduct a Soil Quality Assessment of the area immediately underlying and/or adjacent to the Latta Bridge in the city's Riverdale and River Valley Kinnard Neighbourhoods. There is no municipal address for the bridge site. However, the bridge is located along Jasper Avenue NW near its intersection with 91 Street NW (Figures 1 and 2). This report summarizes the scope of work, methodology and findings of the investigation.

The assessment was completed specifically to ascertain the quality of the surface soils that are situated immediately adjacent to and/or underlying the existing bridge structure. It is CRIMSON's understanding that the bridge is scheduled for replacement in the near future.

1.1 Scope of Work

The scope of work for the assessment was divided into two sections. The first portion of the scope of work was completed to determine the soil quality of the laydown and easement areas prior to construction. The second portion of the scope of was completed in order to delineate impacts from lead, zinc and/or polycyclic aromatic hydrocarbons (PAHs) that were noted to be present during a previous assessment completed by Thurber Engineering Ltd. in October 2020 (Project Number: 29532).

1.1.1 Laydown and Easement Areas

The final scope of work for this portion of the project included the following tasks:

- Complete the location of public underground utilities prior to undertaking the fieldwork. The public utilities were located by Alberta-1-Call.

- Advance fourteen boreholes in the proposed Laydown and/or Easement Areas at the approximate locations shown on the attached Figure 4. The boreholes were completed to approximate depths ranging between 0.1 and 1.3 mbgl.

- Complete a soil-sampling program during drilling for the purpose of quantifying potential impacts. This included the collection of soil samples from each borehole at surface as well as at the approximate depths of 0.5, 1.0 and/or 1.3 metres below ground level (mbgl). Final collection depths were determined in the field and were dependent upon field conditions; and

- Submit a total of twenty nine soil samples to an accredited laboratory for chemical analysis of lead and zinc. The remaining samples that were collected at depths of greater than 0.5 mbgl were placed on hold at the lab.

1.1.2 Delineation

The final scope of work for this portion of the project included the following tasks:

- Complete the location of public underground utilities prior to undertaking the fieldwork. The public utilities were located by Alberta-1-Call;

- Advance seventeen boreholes in the areas adjacent to and underlying the existing bridge structure. The completion locations are provided on the attached Figure 4. The boreholes were completed to approximate depths ranging between 0.1 and 1.0 mbgl;

- Collect three surface soil samples at the locations labelled 21-02, 21-08 and/or 21-15 on the attached Figure 4;

- Complete a soil-sampling program during drilling for the purpose of quantifying potential impacts. This included the collection of soil samples from each borehole at surface as well as at the approximate depths of 0.5, 0.75 and/or 1.0 mbgl. Final collection depths were determined in the field and were dependent upon field conditions; and

- Submit a total of thirty-eight soil samples to an accredited laboratory for chemical analysis of lead, zinc and/or polycyclic aromatic hydrocarbons (PAHs). The remaining samples collected at depths of greater than 0.5 mbgl were placed on hold at the lab.

1.2 Methodology

This investigation was completed following the recommended procedures outlined in the Canadian Standards Association (CSA) Publication Z769-00 Phase II Environmental Site Assessment and the Alberta Environmental Site Assessment Standard (2016) provided by Alberta Environment and Parks (AEP). These documents are considered to be the standards for Phase II ESAs in Alberta and it is CRIMSON's experience that investigations completed in accordance with these documents are generally acceptable to AEP as well as major financial institutions. It should be noted that this investigation was limited to an assessment of soil quality and was not intended to meet all of the requirements of a Phase II ESA.

The field portion of the investigation was completed on July 21 and 28, 2021 as well as August 8, 2021. The information contained in this report, including all conclusions and recommendations, is subject to the limitations presented in Section 9.

2.0 SITE DESCRIPTION

The subject site (also referred to as the bridge site) is comprised of the area located immediately underlying and/or adjacent to the Latta Bridge in the city's Riverdale and River Valley Kinnaird Neighbourhoods. This includes the proposed Laydown and Easement areas situated along Jasper Avenue to the north, south and west of the actual bridge structure. There is no municipal address for the bridge site. However, the bridge is located along Jasper Avenue NW near its intersection with 91 Street NW (Figures 1 and 2).
With regards to adjacent properties, Dawson Park is present immediately east and northeast of the bridge structure. A mix of residential and commercial properties are present to the southeast and southwest of the bridge structure and landscaped areas are present immediately to west. A mix of residential and commercial properties are also present to the northwest of the bridge. This includes several high-rise apartment buildings with commercial operations present at ground level.

The topography of the subject property is sloped to the east towards the North Saskatchewan River. Surface water runoff is controlled by the site grading and/or the City of Edmonton's municipal drainage infrastructure.

The closest water body to the site is the North Saskatchewan River which is located approximately 250 metres east of the bridge structure.

The subject property and all areas within 30 metres of the borehole locations are zoned A (Metropolitan Recreational Zone). The properties located within 50 metres to the southwest of the subject site are zoned RA7 (Low Rise Apartment Zone). The properties to the west and northwest are zoned RA9 (High Rise Apartment Zone). The on-site and surrounding land-use zonings are provided in Figure 3 (Appendix A).

2.1 Geology

As indicated by Kathol and McPherson (1975), the surficial geology in the general area of the subject property is reported to be comprised of glacial lacustrine and/or erosional features. These deposits are reported to consist of clay, silt, sand and/or gravel. Alluvial deposits are also reported to be present in the general area of the subject site.

The upper bedrock underlying the subject property is reported to be the Cretaceous aged Horseshoe Canyon Formation (also known as the Edmonton Formation). The bedrock is reported to be comprised of highly variable layers of sandstone, siltstone and mudstone as well as laterally continuous coal deposited in a non-marine to marginal marine environment (AGS, 2013).

3.0 REGULATORY GUIDELINES

The Alberta Tier 1 Soil and Groundwater Remediation Guidelines, (2019) provided by AEP are considered to be the applicable regulatory guidelines to determine impacts from trace metals and/or polycyclic aromatic hydrocarbons (PAHs) in soil. This document summarizes the regulatory requirements in Alberta and provides a site management process for soil and groundwater contamination. Based on the current, on-site land use as well as the subject site's location, the Alberta Tier 1 Guidelines for Residential and/or Parkland land uses have been applied to the entire site. Based on the results of this assessment, the lowest guideline for either coarse grained or fine-grained sediments has been provided for assessment purposes. This is considered to be a conservative measure and is based on the limited amount of site specific geological data that is available at the time of publication.

4.0 METHODOLOGY

4.1 Intrusive Investigation

The intrusive portions of this investigation were completed on July 21 and 28, 2021 as well as August 8, 2021. A total of thirty-one boreholes were advanced using one of several different pieces of equipment. These included a hand auger operated by CRIMSON staff as well as a track mounted drill rig equipped with solid stem augers and/or a hand-held mechanical auger. All mechanical equipment was operated by Mobile Augers and Research Limited. All of the boreholes were drilled to approximate depths ranging between 0.5 and 1.3 mbgl and were backfilled with drill cuttings upon completion. The completion locations of all of the boreholes are provided on Figure 4 in Appendix A and borehole logs are provided in Appendix C. Three additional surface soil samples to a maximum depth of 0.1 mbgl were also collected at the locations labelled 21-02, 21-08 and 21-15 (Figure 4).

4.2 Soil Sampling

A total of sixty-seven soil samples were collected during this assessment at the depth intervals indicated on the borehole logs (Appendix C). At each sampling point, the soil sample for each depth interval was placed directly into a clearly labeled polyethylene bag. Sampling gloves were changed prior to the collection of every soil sample. One additional sample was collected for analyses of Alberta Tier 1 PAHs. That sample was immediately placed into a 125 ml glass jar complete with a Teflon lined lid.

All of the collected soil samples were transported to the Element Materials Technology Canada Inc. Laboratory in Edmonton with the appropriate chain-of-custody information. All soil samples were transported in chilled coolers.

5.0 RESULTS OF THE INVESTIGATION

5.1 Stratigraphy

The soil profile observed during this investigation included varying thicknesses of fill materials including sand, silt, organics, gravel, organics and clay. Detailed descriptions are provided on the borehole logs in Appendix C.

5.2 Chemical Analyses

The results of chemical analyses completed on the soil samples collected during this investigation are provided on Tables 1 - 3 in Appendix B. Copies of the laboratory reports are provided in Appendix D. The results are summarized in the following subsections. With respect to analytical samples, selection was based upon the location of the borehole, geology, on-site observations, field screening results and professional judgment.

5.2.1 Lead

Sixty-seven soil samples were submitted for chemical analyses of lead. The results of the analyses are provided on Table 1 (Appendix B) and indicate that the concentrations of lead in the analysed soil samples ranged between 7.5 and 1,530 parts per million (ppm). A total of four of the samples exceeded the applicable *Ecological Direct Soil Contact Guideline* of 300 ppm for Residential/Parkland land uses. This includes samples collected from the boreholes labelled as 2021-05, 2021-06, 2021-07 and 2021-17. Seven additional samples exceeded the applicable *Human Direct Soil Contact Guideline* of 140 ppm for Residential/Parkland land uses. This includes samples collected from the boreholes labelled as 2021-01, 2021-04, 2021-05, 2021-06, 2021-09 and 2021-19. An exceedence plan is provided on Figure 5 in Appendix A. All other reported lead concentrations for all other analysed samples were below the applicable Alberta Tier 1 Guidelines for Residential and/or Parkland land uses.

5.2.2 Zinc

Sixty-seven soil samples were submitted for chemical analyses of zinc. The results of the analyses are provided on Table 2 (Appendix B) and indicate that the concentrations of zinc in the analysed soil samples ranged between 47 and 444 ppm. Two of the samples exceeded the applicable *Ecological Direct Soil Contact Guideline* of 260 ppm for Residential/Parkland land uses. These includes samples collected from the boreholes labelled as 2021-03 and 2021-04. All other reported zinc concentrations for all other analysed samples were below the applicable Alberta Tier 1 Guidelines for Residential and/or Parkland land uses. An exceedence plan is provided on Figure 6 in Appendix A.

It should also be noted that none of the analysed samples exceeded the applicable *Human Direct Soil Contact Guideline* of 10,000 ppm for Residential/Parkland land uses.

5.2.3 Polycyclic Aromatic Hydrocarbons (PAHs)

One soil sample collected from the borehole labelled 21-21 at a depth of 1.3 mbgl was submitted for chemical analyses of Alberta Tier 1 PAHs. The results of the analyses are provided on Table 3 (Appendix B) and indicate that the concentrations of acenaphthene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene and pyrene exceeded the applicable *Ecological Direct Soil Contact Guideline* of 260 ppm for Residential/Parkland land uses.

It should also be noted that none of the analysed samples exceeded their respective *Human Direct Soil Contact Guidelines* for Residential/Parkland land uses. However the calculated Index of Additive Cancer Risk (IACR) for both coarse and fine grained soils exceeded the Alberta Tier 1 Guideline of 1 ppm.

6.0 CONCLUSIONS

With regards to lead, the results of the analytical testing indicate the presence of impacts to the surface soil present under and/or immediately adjacent to the Latta Bridge. This includes the areas that are slated to be used as laydown and/or easement areas east and west of the bridge structure. Based on the results of the assessment as well as the placement of adjacent infrastructure including high-rise apartment buildings and parking lots, the lead impacts appear to have been adequate delineated horizontally. Vertically delineation has not been achieved in the areas of the boreholes labelled 21-04, 21-05, 21-06, 21-07 and 21-17. A drill rig would be required in order to complete additional soil sampling.

With regards to zinc, the results of the analytical testing indicate the presence of impacts to the surface soil present under and/or immediately adjacent to the Latta Bridge. Based on the results of the assessment, the zinc impacts appear to have been adequately delineated horizontally. Vertically delineation has not been achieved in the area of the borehole labelled 21-03. A drill rig would be required in order to complete additional soil sampling.

With regards to PAHs, the results of the assessment reconfirm the presence of several parameters in surface soil situated adjacent to the Latta Bridge. The results of assessment are limited to one sample collected from the borehole labelled 21-21 at a depth of 1.3 mbgl. The PAH impacts have not been delineated either horizontally or vertically.

It is recommended that the proposed construction plans be consulted to determine the future cut depths and excavation areas in order to determine whether additional soil sampling will be required at that time.

7.0 QUALIFICATIONS OF THE ASSESSOR

This report was completed by Mr. Douglas Pankewich of CRIMSON Environmental Limited. Mr. Pankewich has over twenty five years of professional and project management experience as an environmental geologist in both the private and public sectors. He has worked on over 500 projects including Phase I, II, and III ESAs, contaminant delineation investigations, hydrogeological investigations and remediation projects for both soil and groundwater. Mr. Pankewich is a graduate of Laval University and the University of Québec at the National Institute for Scientific Research. He holds undergraduate degrees in Geology and Geological Engineering as well as a Master of Sciences degree in Earth Sciences.

8.0 REFERENCES

1. Alberta Environment and Parks. *Alberta Environmental Site Assessment Standard,* 2016;

2. Alberta Geological Survey. Map 600. *Bedrock Geology Map of Alberta.* Edmonton, Alberta. March, 2013;

3. City of Edmonton. *Environmental Site Assessment Guidebook.* Edmonton, Alberta. March, 2016;

4. CSA International Standard Z768-01. *Phase I Environmental Site Assessment.* Toronto, Ontario. 2016;

5. Kathol and McPherson. *Urban Geology of Edmonton.* Alberta Research Council. Bulletin 32. Edmonton, Alberta. 1975;

6. Thurber Engineering Ltd. Environmental Overview and Phase II Environmental Site Assessment, Latta Bridge (B027) Replacement Project, Edmonton, Alberta. Project Number: 29532. January 21, 2021.

9.0 STATEMENT OF LIMITATIONS

Subject to the following conditions and limitations, the investigation described in this report has been conducted in a manner consistent with a reasonable level of care and skill normally exercised by members of the health, safety and environmental consulting profession currently practicing under similar conditions in the area:

1. This report has been prepared for the exclusive use of the City of Edmonton. The report is intended to provide an assessment of known or potential environmental concerns and liabilities associated with past and current practices of the subject properties;
2. The report is based on data and information collected from available records, personal interviews and a site investigation conducted by CRIMSON personnel. CRIMSON has relied in good faith on information provided by individuals and sources noted in this report. We accept no responsibility for any deficiency, misstatements, or inaccuracy contained in this report as a result of omissions, misstatements, or fraudulent acts of persons interviewed;
3. The site investigation is based solely on the site conditions at the site at the time of the field investigation as described in this report;
4. The service provided by CRIMSON in completing the investigation is intended to assist the Client with a business decision. The liability of this site is not transferred to CRIMSON as a result of such services, and CRIMSON does not make recommendations regarding the purchase, sale or investment of the property;
5. The scope of the investigation described in this report has been limited by the budget set for the investigation in our contract. The scope of the investigation has been reasonable having regard to that budget constraint;
6. The investigation described in this report has relied upon information provided by third parties concerning the history of the site. Except as stated in this report, we have not made an independent verification of such historical information;
7. The investigation described in this report has been made in the context of existing government regulations generally promulgated at the date of this report. The investigation did not take account of any government regulations not in effect or not generally promulgated at the date of this report;
8. Where indicated or implied in this report, or where mandated by the condition of the site and its attendant structures, the conclusions of this report are based on visual observation of the site and a limited amount of sampling. The conclusions of this report do not apply to any areas of the site not available for inspection or areas not sampled;
9. The investigation was limited in scope. As such, the potential remains for the presence of unknown, unidentified, or unforeseen surface or subsurface contamination. If further evidence suggests potential contamination, a follow-up investigation including sampling and analysis would be recommended; and
10. This report is intended for the exclusive use of the company, organization or individual to whom it is addressed. It may not be used or relied upon in any manner whatsoever, or for any purpose whatsoever, by any other party. The Consultant makes no representation of fact or opinion of any nature whatsoever to any person or entity other than the company, organization or individual to whom this report is addressed.

10.0 CLOSURE

We trust that this report meets with your current requirements. Should you have any questions or concerns please do not hesitate to contact the undersigned.

Respectfully Submitted,

CRIMSON Environmental Limited

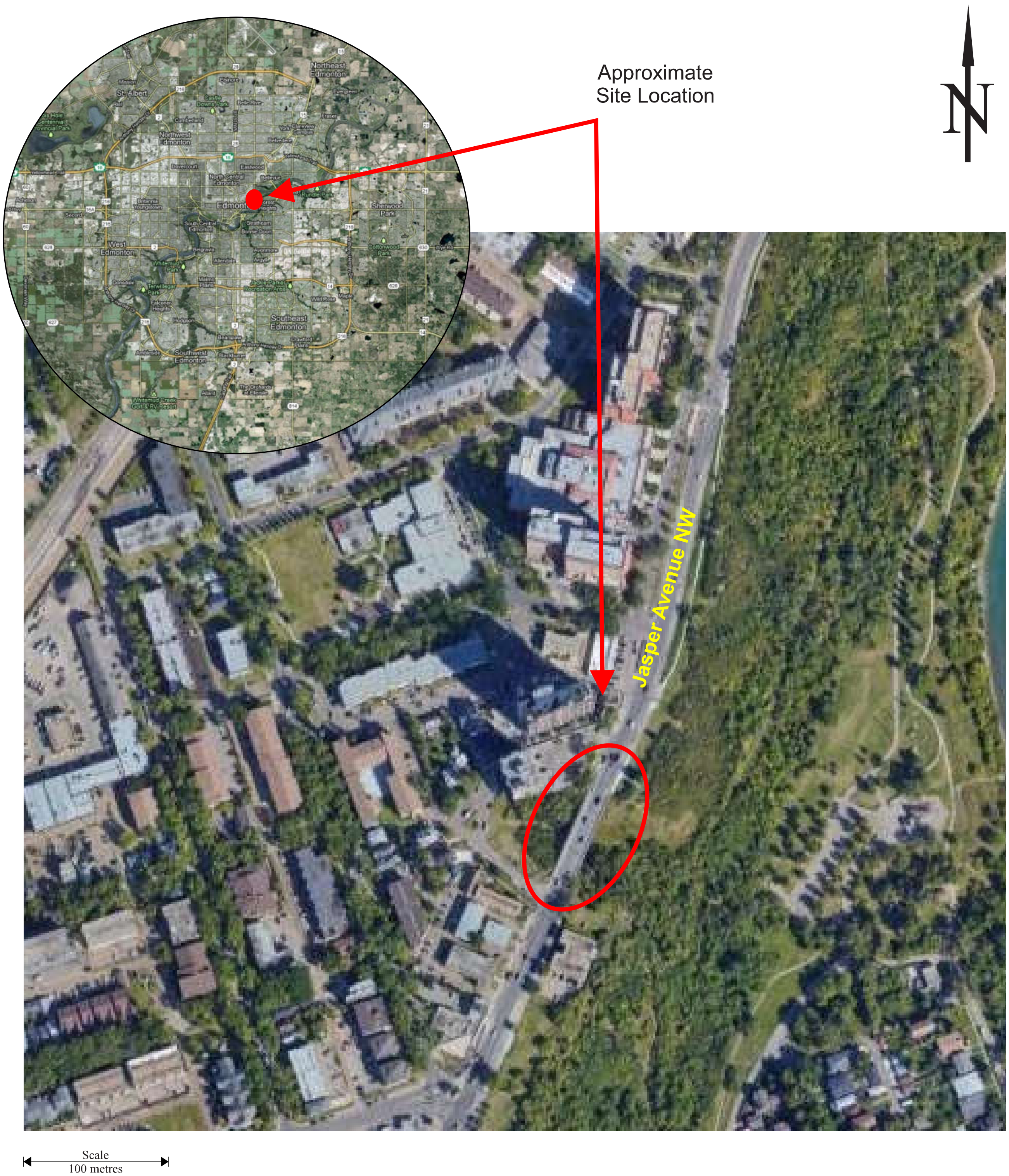
PROFESSIONAL ENGINEER ALBERTA
DOUGLAS PANKEWICH
ID 59254
September 27, 2021

PERMIT TO PRACTICE
CRIMSON ENVIRONMENTAL LIMITED
RM SIGNATURE:
RM APEGA ID #: 59254
DATE: September 27, 2021
PERMIT NUMBER: P008305
The Association of Professional Engineers and Geoscientists of Alberta (APEGA)

Douglas Pankewich, M.Sc., P.Geol., P.Eng.
Geological Engineer

Appendix A

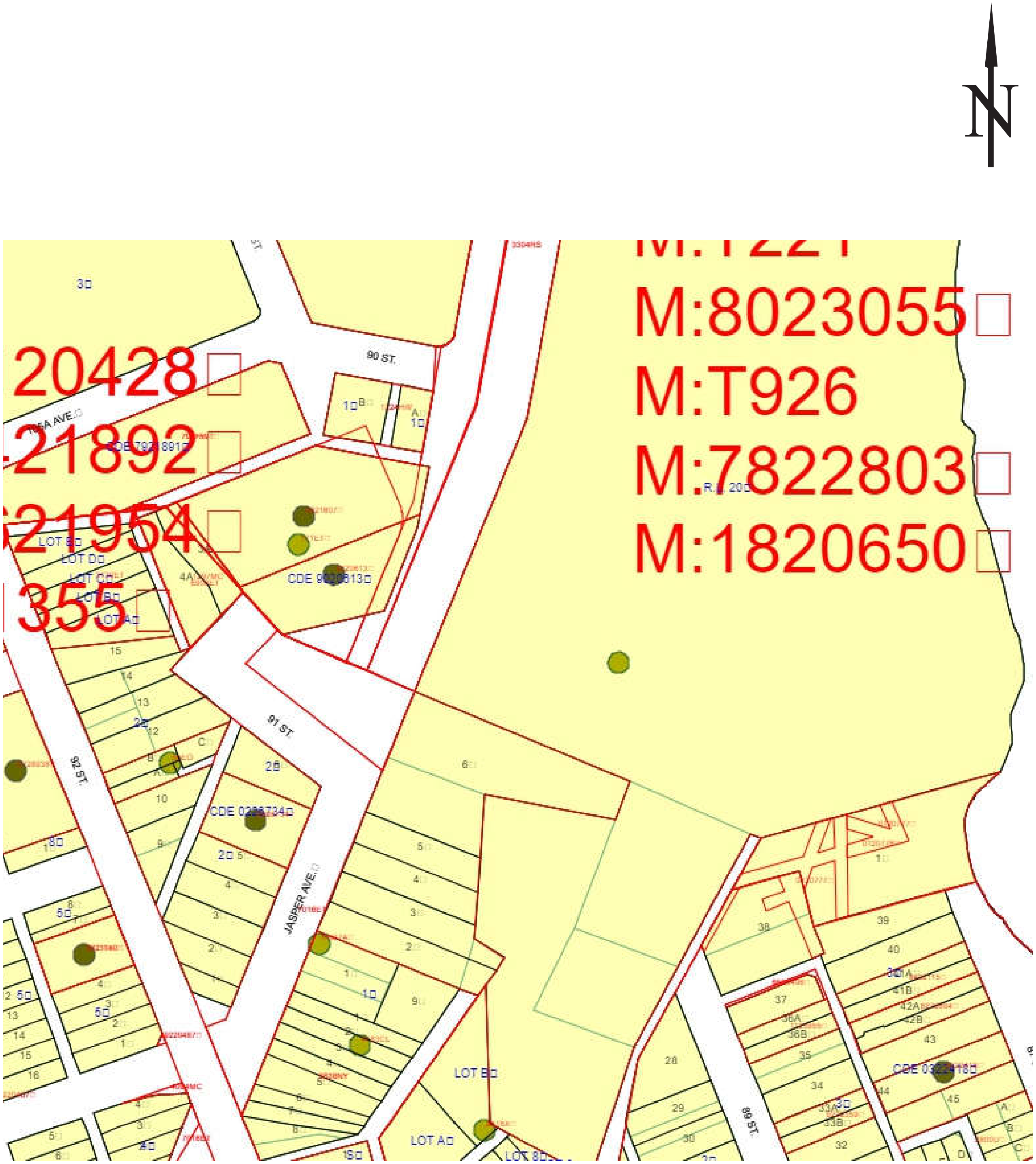
Figures



Reference: Goggle, 2021.

*Scale provided is approximate.
**This figure is not intended for design or construction purposes. Property lines are approximate.

CRIMSON ENVIRONMENTAL LIMITED	Site Location Plan	Figure 1
		Scale: As Shown
	Latta Bridge Edmonton, Alberta	August, 2021
		CEL-37557

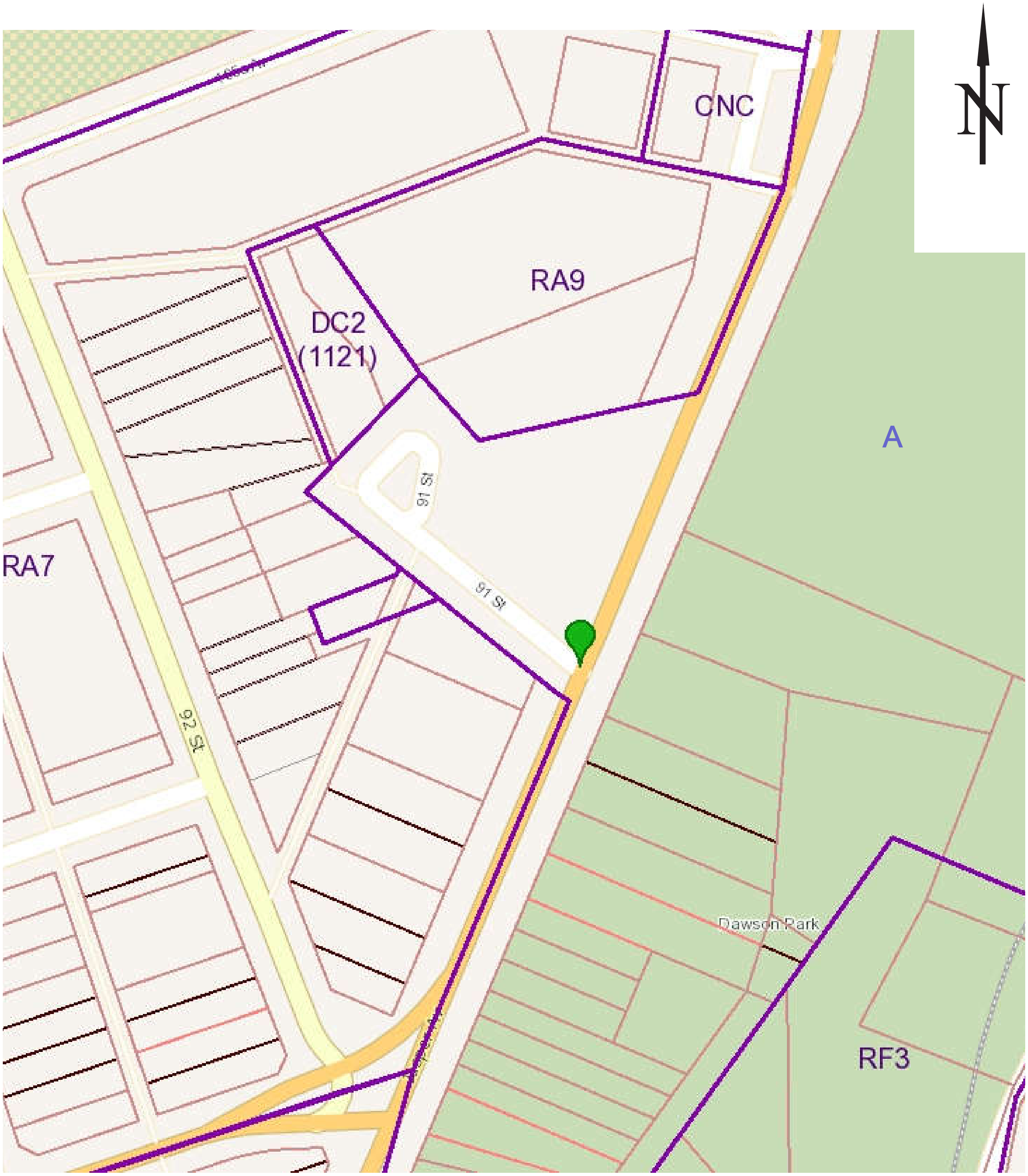


Scale
100 metres

Reference: Government of Alberta, 2021.

*Scale provided is approximate.
**This figure is not intended for design or construction purposes. Property lines are approximate.

CRIMSON ENVIRONMENTAL LIMITED	Site Survey Plan	Figure 2
		Scale: As Shown
	Latta Bridge Edmonton, Alberta	August, 2021
		CEL-37557

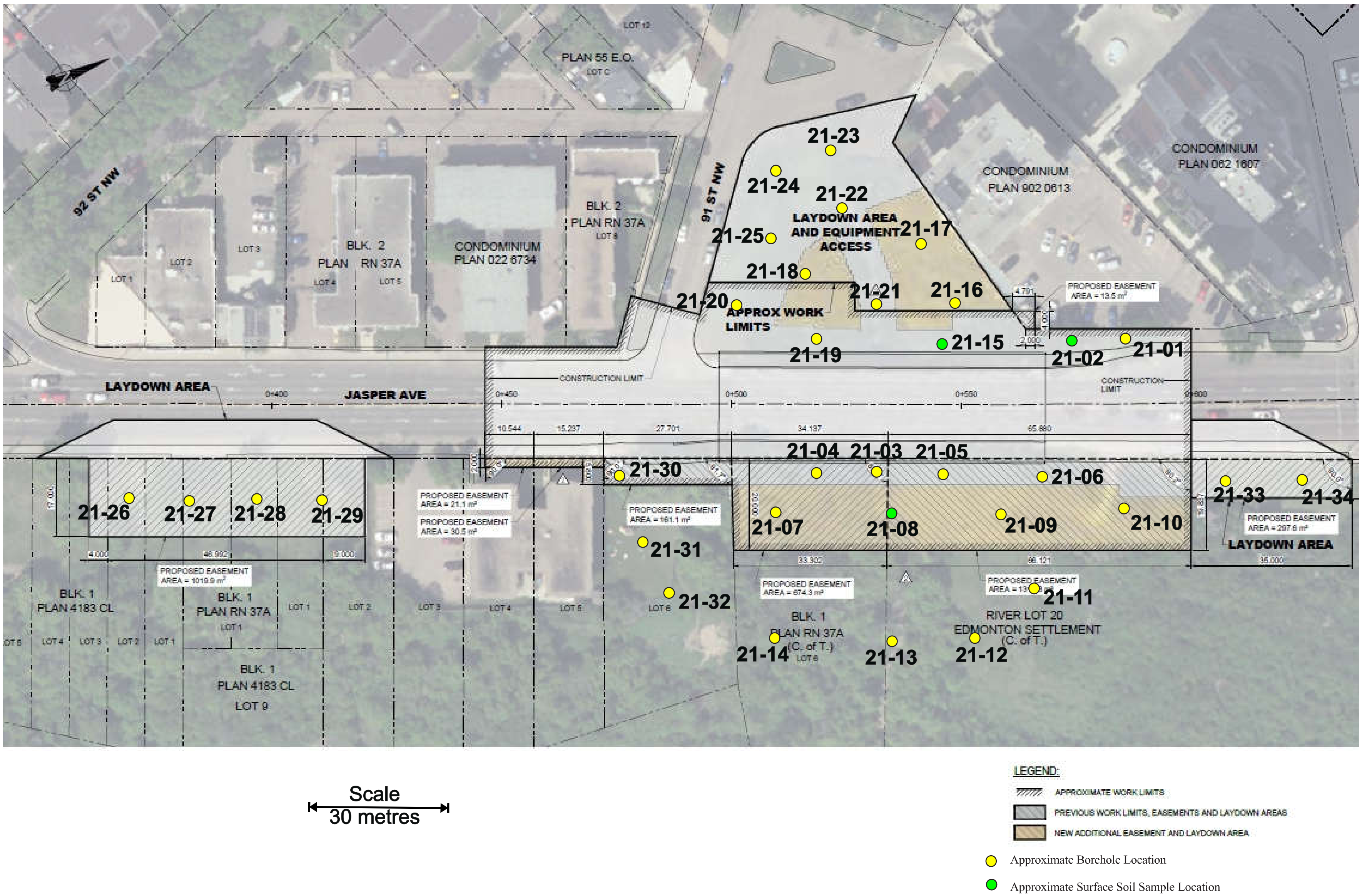


Scale
40 metres

Reference: City of Edmonton, 2021.

*Scale provided is approximate.
**This figure is not intended for design or construction purposes. Property lines are approximate.

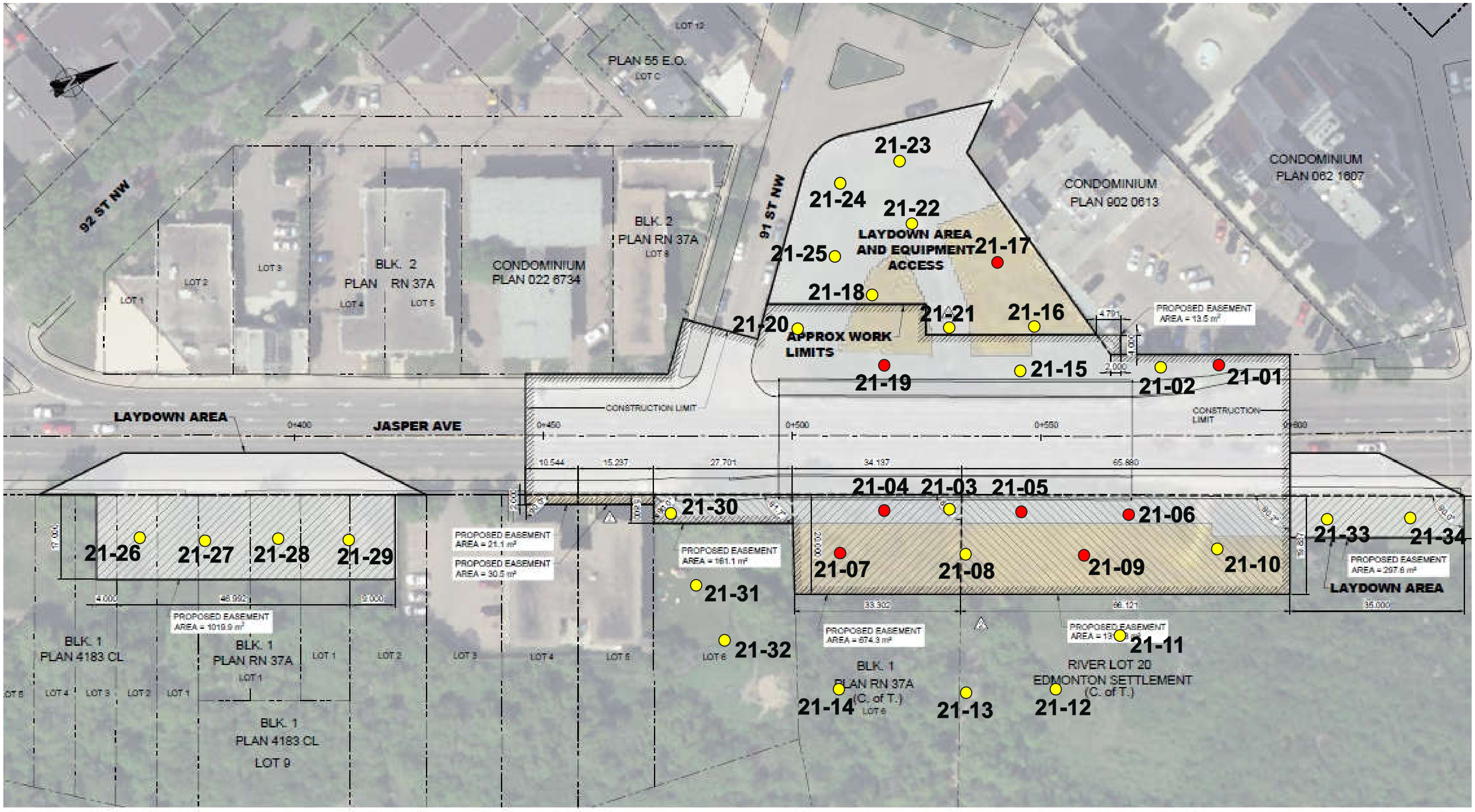
CRIMSON ENVIRONMENTAL LIMITED	Site Zoning Plan	Figure 3
		Scale: As Shown
	Latta Bridge Edmonton, Alberta	August, 2021
		CEL-37557



CRIMSON ENVIRONMENTAL LIMITED

Notes:
1. Scale provided is nominal and all details are approximate;
2. Scale provided is that of the original photograph;
3. This figure is not intended for design or construction purposes;
4. Reference: City of Edmonton, 2021.

Borehole & Surface Soil Sample Location Plan	Figure 4
	Scale: As Shown
Latta Bridge Edmonton, Alberta	August, 2021
	CEL-37557



Scale
30 metres

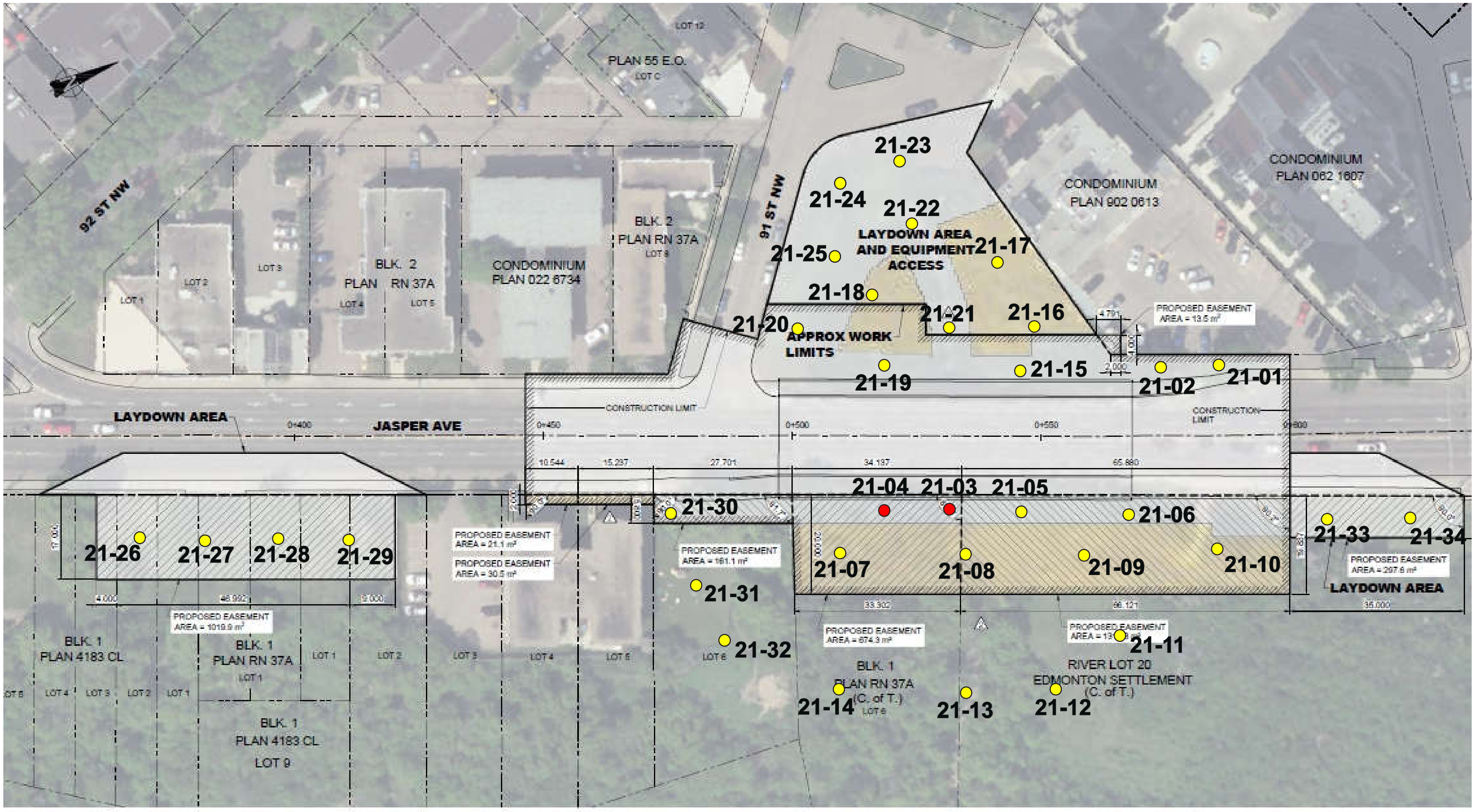
LEGEND:

- APPROXIMATE WORK LIMITS
- PREVIOUS WORK LIMITS, EASEMENTS AND LAYDOWN AREAS
- NEW ADDITIONAL EASEMENT AND LAYDOWN AREA
- No Exceedence of the applicable Alberta Tier 1 Guidelines detected;
- At least one exceedence of the applicable Alberta Tier 1 Guidelines detected.

CRIMSON ENVIRONMENTAL LIMITED

Notes:
1. Scale provided is nominal and all details are approximate;
2. Scale provided is that of the original photograph;
3. This figure is not intended for design or construction purposes;
4. Reference: City of Edmonton, 2021.

Lead Excedence Plan	Figure 5
	Scale: As Shown
Latta Bridge Edmonton, Alberta	August, 2021
	CEL-37557



Scale
30 metres

LEGEND:

APPROXIMATE WORK LIMITS

PREVIOUS WORK LIMITS, EASEMENTS AND LAYDOWN AREAS

NEW ADDITIONAL EASEMENT AND LAYDOWN AREA

No Exceedence of the applicable Alberta Tier 1 Guidelines detected;

At least one exceedence of the applicable Alberta Tier 1 Guidelines detected.

CRIMSON ENVIRONMENTAL LIMITED

Notes:
1. Scale provided is nominal and all details are approximate;
2. Scale provided is that of the original photograph;
3. This figure is not intended for design or construction purposes;
4. Reference: City of Edmonton, 2021.

Zinc Exceedence Plan	Figure 6
	Scale: As Shown
Latta Bridge Edmonton, Alberta	August, 2021
	CEL-37557

Appendix B

Tables

Table 1. Soil Analytical Chemistry - Lead

Borehole	Sample Depth	Analytical Result (ppm)	Regulatory Guideline[2] Residential/Parkland Land Uses: Human Direct Soil Contact	Regulatory Guideline[2] Residential/Parkland Land Uses: Ecological Direct Soil Contact
21-01	0.0-0.1 m	20.2	**140**	**300**
	0.5 m	**183**		
21-02	0.0-0.1 m	13.7		
21-03	0.0-0.1 m	63.5		
	0.5 m	84.1		
21-04	0.0-0.1 m	**294**		
	0.5 m	104		
	1.0 m	**205**		
21-05	0.0-0.1 m	**426**		
	0.5 m	**235**		
21-06	0.0-0.15 m	**367**		
	0.5 m	**179**		
21-07	0.0-0.15 m	101		
	0.5 m	**428**		
21-08	0.0-0.1 m	107		
21-09	0.0-0.15 m	**206**		
	0.5 m	40.2		
21-10	0.0-0.1 m	16		
	0.5 m	35.5		
21-11	0.0-0.15 m	90.3		
	0.5 m	42.5		
21-12	0.0-0.1 m	134		
	0.5 m	64		
21-13	0.0-0.15 m	97.3		
	0.5 m	70.4		
21-14	0.0-0.15 m	108		
	0.5 m	33.1		
21-15	0.0-0.15 m	64.1		
21-16	0.0-0.15 m	24.2		
	0.5 m	55.8		
21-17	0.0-0.15 m	128		
	0.5 m	**1,530**		
21-18	0.0-0.15 m	99.2		
	0.5 m	42.3		

Borehole	Sample Depth	Analytical Result (ppm)	Regulatory Guideline[2] Residential/Parkland Land Uses: Human Direct Soil Contact	Regulatory Guideline[2] Residential/Parkland Land Uses: Ecological Direct Soil Contact
21-19	0.0-0.15 m	**168**	**140**	**300**
	0.5 m	15		
21-20	0.0-0.15 m	30.9		
	0.5 m	20.2		
21-21	0.0-0.15 m	88.2		
	0.5 m	99.8		
	1.3 m	69.8		
21-22	0.0-0.15 m	79.1		
	0.5 m	51.4		
21-23	0.0-0.15 m	50.2		
	0.5 m	16.1		
21-24	0.0-0.15 m	23.3		
	0.5 m	99.7		
21-25	0.0-0.15 m	27		
	0.5 m	14.2		
21-26	0.0-0.15 m	33		
	0.5 m	7.5		
21-27	0.0-0.15 m	18.3		
	0.5 m	12.1		
21-28	0.0-0.15 m	15.6		
	0.5 m	77.8		
21-29	0.0-0.15 m	15.3		
	0.5 m	62		
21-30	0.0-0.15 m	20.5		
	0.5 m	15.3		
21-31	0.0-0.15 m	11.1		
	0.5 m	43.5		
21-32	0.0-0.15 m	9.7		
	0.5 m	122		
21-33	0.0-0.15 m	89.3		
	0.5 m	18.6		
21-34	0.0-0.15 m	90.1		
	0.5 m	19.9		

Notes:

1. All values expressed as parts-per-million (ppm);
2. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines, 2019.* Lowest guidelines for course or fine grained soil provided; and
3. Values (if any) which exceed the applicable Alberta Tier 1 Guideline are highlighted.

Table 2. Soil Analytical Chemistry - Zinc

Borehole	Sample Depth	Analytical Result (ppm)	Regulatory Guideline[2] Residential/Parkland Land Uses	
			Human Direct Soil Contact	Ecological Direct Soil Contact
21-01	0.0-0.1 m	124	**10,000**	**260**
	0.5 m	146		
21-02	0.0-0.1 m	99		
21-03	0.0-0.1 m	132		
	0.5 m	**444**		
21-04	0.0-0.1 m	**273**		
	0.5 m	127		
	1.0 m	173		
21-05	0.0-0.1 m	222		
	0.5 m	129		
21-06	0.0-0.15 m	182		
	0.5 m	125		
21-07	0.0-0.15 m	144		
	0.5 m	213		
21-08	0.0-0.15 m	124		
21-09	0.0-0.15 m	167		
	0.5 m	95		
21-10	0.0-0.15 m	104		
	0.5 m	82		
21-11	0.0-0.15 m	106		
	0.5 m	100		
21-12	0.0-0.1 m	112		
	0.5 m	96		
21-13	0.0-0.15 m	156		
	0.5 m	111		
21-14	0.0-0.15 m	189		
	0.5 m	100		
21-15	0.0-0.15 m	180		
21-16	0.0-0.15 m	111		
	0.5 m	96		
21-17	0.0-0.15 m	160		
	0.5 m	121		
21-18	0.0-0.15 m	111		
	0.5 m	60		

Borehole	Sample Depth	Analytical Result (ppm)	Regulatory Guideline[2] Residential/Parkland Land Uses	
			Human Direct Soil Contact	Ecological Direct Soil Contact
21-19	0.0-0.15 m	220	**10,000**	**260**
	0.5 m	87		
21-20	0.0-0.15 m	83		
	0.5 m	80		
21-21	0.0-0.15 m	123		
	0.5 m	87		
	1.3 m	70		
21-22	0.0-0.15 m	100		
	0.5 m	101		
21-23	0.0-0.15 m	107		
	0.5 m	94		
21-24	0.0-0.15 m	79		
	0.5 m	84		
21-25	0.0-0.15 m	58		
	0.5 m	88		
21-26	0.0-0.15 m	93		
	0.5 m	51		
21-27	0.0-0.15 m	81		
	0.5 m	77		
21-28	0.0-0.15 m	94		
	0.5 m	125		
21-29	0.0-0.15 m	82		
	0.5 m	149		
21-30	0.0-0.15 m	47		
	0.5 m	93		
21-31	0.0-0.15 m	66		
	0.5 m	102		
21-32	0.0-0.15 m	62		
	0.5 m	159		
21-33	0.0-0.15 m	133		
	0.5 m	112		
21-34	0.0-0.15 m	124		
	0.5 m	96		

Notes:
1. All values expressed as parts-per-million (ppm);
2. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines, 2019.* Lowest guidelines for course or fine grained soil provided; and
3. Values (if any) which exceed the applicable Alberta Tier 1 Guideline are highlighted.

Table 3. Surface Soil Analytical Chemistry - Polycyclic Aromatic Hydrocarbons

Parameter	Samples - Analytical Results	Regulatory Guideline[2] Residential/Parkland Land Uses	
	21-21 @ 1.3 m	Human Direct Soil Contact	Ecological Protection of Freshwater Aquatic Life
Acenaphthene	**0.49**	5,300	0.33
Acenaphthylene	0.13	NG	NG
Anthracene	**1.12**	24,000	0.0056
Benz(a)anthracene	2.09	NG	NG
Benzo(a)pyrene	1.37	20	72
Benzo(b&j)fluoranthene	2.19	NG	NG
Benzo(g,h,i)perylene	0.75	NG	NG
Benzo(k)fluoranthene	0.88	NG	NG
Chrysene	1.88	NG	NG
Dibenz(a,h)anthracene	0.23	NG	NG
Fluoranthene	**3.84**	3,500	0.055
Fluorene	**0.64**	2,700	0.34
Indeno(1,2,3-c,d)pyrene	0.72	NG	NG
Naphthalene	**0.248**	1,800	0.014
Phenanthrene	**4.06**	NG	0.061
Pyrene	**2.84**	2,100	0.150
B(A)P Total Potency Equivalent	2.21	≤5.3	≤8.0
IACR (Coarse)	**1.3**	<1.0	<1.0
IACR (Fine)	**2.47**	<1.0	<1.0

Notes:
1. All values expressed as parts-per-million (ppm);
2. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines, 2019* Lowest values provided for either coarse or fine grained soil;
3. IACR = Index of Additive Cancer Risk;
4. NG = No guideline provided by AEP; and
5. Values (if any) which exceed the applicable Alberta Tier 1 Guideline are highlighted.

Appendix C

Borehole Logs

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-01**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			TOPSOIL with vegetation and sand near surface.		1			
			SAND, with minor silt, clay and organics, fine to medium grained, loose, brown, dry.					
			CLAY, very silty, fine sand, low plastic, hard, brown, dry.		2			
			End of borehole at 0.5 metre below ground level (Auger Refusal). Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
1								1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 0.50 m
REVIEWED BY: DP	COMPLETION DATE: 8/8/21
PROJECT MANAGER: Pankewich	

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PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-03**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0	Cuttings		CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry, grey, trace debris (brick and wood).	Grab	1			
				Grab	2			
1			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.	Grab	3			1
2								2
3								3
4								

	LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
	REVIEWED BY: DP	COMPLETION DATE: 7/21/21
	PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-04**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry, grey, trace debris (brick and wood).	GRAB	1			
				GRAB	2			
				GRAB	3			
1			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-05**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry, grey, trace debris (brick and wood).		1			
					2			
			End of borehole at 0.5 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
1								1
2								2
3								3
4								

	LOGGED BY: DP	COMPLETION DEPTH: 0.50 m
	REVIEWED BY: DP	COMPLETION DATE: 7/21/21
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PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-06**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry, grey, trace debris (brick and wood).		1			
					2			
					3			
			End of borehole at 0.75 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
1								1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 0.75 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-07**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0	Cuttings		CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry, grey, trace debris (brick and wood).	Grab	1			
				Grab	2			
			End of borehole at 0.5 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
1								1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 0.50 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-09**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0	Cuttings		CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry, grey.	Grab	1			
				Grab	2			
			End of borehole at 0.5 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
1								1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 0.50 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-10**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry.		1			
					2			
			End of borehole at 0.5 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
1								1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 0.50 m
REVIEWED BY: DP	COMPLETION DATE: 8/8/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-11**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry, grey.		1			
					2			
			End of borehole at 0.5 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
1								1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 0.50 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-12**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0	Cuttings		CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry, grey.	GRAB	1			
				GRAB	2			
1			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.	GRAB	3			1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-13**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry, grey.	GRAB	1			
				GRAB	2			
			End of borehole at 0.5 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
1								1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 0.50 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-14**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry, grey.		1			
					2			
					3			
			End of borehole at 0.75 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
1								1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 0.75 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-16**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry, grey.		1			
					2			
			End of borehole at 0.5 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
1								1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 0.50 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	

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PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-17**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry, grey.		1			
					2			
			End of borehole at 0.5 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
1								1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 0.50 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-18**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry, grey.		1			
					2			
1			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.		3			1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

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PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-19**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, moist, grey, trace debris (brick, plastic and wood).		1			
					2			
			End of borehole at 0.5 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
1								1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 0.50 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

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PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-20**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0	Cuttings		CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, dry, grey.	Grab	1			
				Grab	2			
				Grab	3			
1			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-21**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, moist, grey, trace debris (brick and wood).		1			
					2			
1					3			1
					4			
			End of borehole at 1.3 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 1.30 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

ENVIRONMENTAL BOREHOLE LOGS CEL-37557 AUGUST 4 2021 - COPY.GPJ UMA.GDT PRINT: 8/24/21 By:pankewich@shaw.ca

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-22**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics near surface, trace fine and medium gravel, moist, brown.	GRAB	1			
				GRAB	2			
1			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.	GRAB	3			1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-23**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics near surface, trace fine and medium gravel, moist, brown.	GRAB	1			
				GRAB	2			
1				GRAB	3			1
			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-24**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics near surface, trace fine and medium gravel, moist, brown.		1			
					2			
1			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.		3			1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-25**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics near surface, trace fine and medium gravel, moist, brown.		1			
					2			
1			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.		3			1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-26**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0–1	Cuttings		CLAY FILL, silty, with fine sand and organics near surface, trace fine and medium gravel, moist, brown.	Grab	1			
				Grab	2			
1			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.	Grab	3			1
2								2
3								3
4								

	LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
	REVIEWED BY: DP	COMPLETION DATE: 7/21/21
	PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-27**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics near surface, trace fine and medium gravel, moist, brown.	GRAB	1			
				GRAB	2			
1			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.	GRAB	3			1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

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PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-28**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0	Cuttings	Fill	CLAY FILL, silty, with fine sand and organics near surface, trace fine and medium gravel, moist, brown.	Grab	1			
				Grab	2			
1				Grab	3			1
			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-29**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			CLAY FILL, silty, with fine sand and organics near surface, trace fine and medium gravel, moist, brown.		1			
					2			
					3			
1			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-30**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			Topsoil with vegetation at surface.		1			
			CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, moist, grey, trace debris (brick and wood).		2			
					3			
1			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-31**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			Topsoil with vegetation at surface.		1			
			CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, moist, grey, trace debris (brick and wood).		2			
1					3			1
			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
2								2
3								3
4								

	LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
	REVIEWED BY: DP	COMPLETION DATE: 7/21/21
	PROJECT MANAGER: Pankewich	

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-32**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0	Cuttings	Topsoil	Topsoil with vegetation at surface.	Grab	1			
	Cuttings	Fill	CLAY FILL, silty, with fine sand and organics, trace fine and medium gravel, moist, grey, trace debris (brick and wood).	Grab	2			
1				Grab	3			1
			End of borehole at 1.0 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 1.00 m
REVIEWED BY: DP	COMPLETION DATE: 7/21/21
PROJECT MANAGER: Pankewich	

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PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-33**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

BACKFILL TYPE: BENTONITE | GRAVEL | SLOUGH | GROUT | CUTTINGS | SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			TOPSOIL with vegetation at surface.	GRAB	1			
			CLAY FILL, silty, with fine sand and organics near surface, trace fine and medium gravel, moist, brown.	GRAB	2			
				GRAB	3			
			End of borehole at 0.75 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
1								1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 0.75 m
REVIEWED BY: DP	COMPLETION DATE: 8/8/21
PROJECT MANAGER: Pankewich	Page 1 of 1

PROJECT: Soil Quality Assessment	CLIENT: City of Edmonton	TESTHOLE NO: **21-34**
LOCATION: Latta Bridge, Edmonton, AB		PROJECT NO.: CEL-37557
CONTRACTOR: CRIMSON Environmental Limited	METHOD: Dutch Auger	ELEVATION (m):

SAMPLE TYPE: GRAB, SHELBY TUBE, SPLIT SPOON, BULK, NO RECOVERY, CORE

BACKFILL TYPE: BENTONITE, GRAVEL, SLOUGH, GROUT, CUTTINGS, SAND

DEPTH (m)	BACKFILL DETAILS	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	⊗ Vapour Concentration ⊗ (ppm) 100 1000 10000	COMMENTS	DEPTH (m)
0			TOPSOIL with vegetation at surface.		1			
			CLAY FILL, silty, with fine sand and organics near surface, trace fine and medium gravel, moist, brown.		2			
			End of borehole at 0.5 metre below ground level. Borehole backfilled with drill cuttings to surface. All details provided on this borehole log are approximate.					
1								1
2								2
3								3
4								

LOGGED BY: DP	COMPLETION DEPTH: 0.50 m
REVIEWED BY: DP	COMPLETION DATE: 8/8/21
PROJECT MANAGER: Pankewich	Page 1 of 1

ENVIRONMENTAL BOREHOLE LOGS CEL-37557 AUGUST 4 2021 - COPY.GPJ UMA.GDT PRINT: 8/24/21 By:pankewich@shaw.ca

Appendix D

Laboratory Reports

Element
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W: www.element.com

Report Transmission Cover Page

Bill To:	Crimson Environmental Ltd.	Project ID:	CEL-37557	Lot ID:	**1509170**
	#24 -314 - 222 Baseline Road	Project Name:	LATTA	Control Number:	
	Sherwood Park, AB, Canada	Project Location:		Date Received:	Jul 28, 2021
	T8H 1S8	LSD:		Date Reported:	Jul 30, 2021
Attn:	Doug Pankewich	P.O.:		Report Number:	2646080
Sampled By:	DP	Proj. Acct. code:			
Company:	Crimson	Alternate Client	CA01033		

Contact	Company	Address
Danielle Hutson	**Crimson Environmental Ltd.**	
		Edmotnon, AB null
		Phone: (555) 555-5555 Fax:
		Email: danielle.hutson@element.com

Delivery	Format	Deliverables
Email - Single Report	PDF	COA
Email - Single Report	PDF	Invoice

Contact	Company	Address
Doug Pankewich	**Crimson Environmental Ltd.**	#24 -314 - 222 Baseline Road
		Sherwood Park, AB T8H 1S8
		Phone: (780) 719-4959 Fax:
		Email: pankewich@shaw.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / COA
Email - Merge Reports	PDF	Invoice
Email - Multiple Reports By Agreement	PDF	COC / Test Report
Email - Single Report	Legacy Crosstab in CSV	Test Report

Notes To Clients:

Element
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Analytical Report

Bill To:	Crimson Environmental Ltd.	Project ID:	CEL-37557	Lot ID:	**1509170**
	#24 -314 - 222 Baseline Road	Project Name:	LATTA	Control Number:	
	Sherwood Park, AB, Canada	Project Location:		Date Received:	Jul 28, 2021
	T8H 1S8	LSD:		Date Reported:	Jul 30, 2021
Attn:	Doug Pankewich	P.O.:		Report Number:	2646080
Sampled By:	DP	Proj. Acct. code:			
Company:	Crimson	Alternate Client	CA01033		

		Reference Number	1509170-1	1509170-2		
		Sample Date	Jul 28, 2021	Jul 28, 2021		
		Sample Time	NA	NA		
		Sample Location				
		Sample Description	21-10 / 0.0-0.1	21-08 / 0.0-0.1		
		Matrix	Soil	Soil		
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Lead	Strong Acid Extractable	mg/kg	16.0	107		0.1
Zinc	Strong Acid Extractable	mg/kg	104	124		1

Approved by: Anthony Neumann

Anthony Neumann, MSc
General Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Element
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W: www.element.com

Quality Control

Bill To:	Crimson Environmental Ltd. #24 -314 - 222 Baseline Road Sherwood Park, AB, Canada T8H 1S8	Project ID:	CEL-37557	Lot ID:	**1509170**
		Project Name:	LATTA	Control Number:	
		Project Location:		Date Received:	Jul 28, 2021
		LSD:		Date Reported:	Jul 30, 2021
Attn:	Doug Pankewich	P.O.:		Report Number:	2646080
Sampled By:	DP	Proj. Acct. code:			
Company:	Crimson	Alternate Client	CA01033		

Metals Strong Acid Digestion

Blanks	**Units**	**Measured**	**Lower Limit**	**Upper Limit**		**Passed QC**
Lead	µg/L	0.00873954	-5.0	5.0		yes
Zinc	µg/L	0.157765	-1	1		yes
Date Acquired:	July 29, 2021					
Client Sample Replicates	**Units**	**Replicate 1**	**Replicate 2**	**% RSD Criteria**	**Absolute Criteria**	**Passed QC**
Lead	mg/kg	2.6	2.6	20	0.2	yes
Zinc	mg/kg	28	28	20	2	yes
Date Acquired:	July 29, 2021					
Control Sample	**Units**	**Measured**	**Lower Limit**	**Upper Limit**		**Passed QC**
Lead	mg/kg	19.8	18.3	21.3		yes
Zinc	mg/kg	203	186	210		yes
Date Acquired:	July 29, 2021					
Lead	mg/kg	274	200.6	318.8		yes
Zinc	mg/kg	345	283	390		yes
Date Acquired:	July 29, 2021					

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Methodology and Notes

Bill To:	Crimson Environmental Ltd. #24 -314 - 222 Baseline Road Sherwood Park, AB, Canada T8H 1S8	Project ID:	CEL-37557	Lot ID:	**1509170**
		Project Name:	LATTA	Control Number:	
		Project Location:		Date Received:	Jul 28, 2021
		LSD:		Date Reported:	Jul 30, 2021
Attn:	Doug Pankewich	P.O.:		Report Number:	2646080
Sampled By:	DP	Proj. Acct. code:			
Company:	Crimson	Alternate Client	CA01033		

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Metals ICP (Hot Block) in soil	EPA	*	Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Elements, October 1999, 200.2	Jul 29, 2021	Element Edmonton - Roper Road
Metals ICP (Hot Block) in soil	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Jul 29, 2021	Element Edmonton - Roper Road

** Reference Method Modified*

References

EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted.
The test report shall not be reproduced except in full, without the written approval of the laboratory.

element

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Report Transmission Cover Page

Bill To:	Crimson Environmental Ltd. #24-314 - 222 Baseline Road Sherwood Park, AB, Canada T8H 1S8	Project ID:	CEL 37557	Lot ID:	**1512326**
		Project Name:	Latta Bridge	Control Number:	
		Project Location:		Date Received:	Aug 9, 2021
		LSD:		Date Reported:	Aug 13, 2021
Attn:	Accounts Payable	P.O.:		Report Number:	2650692
Sampled By:	DP	Proj. Acct. code:			
Company:	Crimson				

Contact	**Company**	**Address**
Danielle Hutson	**Crimson Environmental Ltd.**	
		Edmotnon, AB null Phone: (555) 555-5555 Fax: Email: danielle.hutson@element.com

Delivery	Format	Deliverables
Email - Single Report	PDF	COA
Email - Single Report	PDF	Invoice

Contact	**Company**	**Address**
Doug Pankewich	**Crimson Environmental Ltd.**	#24 -314 - 222 Baseline Road Sherwood Park, AB T8H 1S8 Phone: (780) 719-4959 Fax: Email: pankewich@shaw.ca

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / COA
Email - Merge Reports	PDF	Invoice
Email - Multiple Reports By Agreement	PDF	COC / Test Report
Email - Single Report	Legacy Crosstab in CSV	Test Report

Notes To Clients:

- Aug 13, 2021 - Report was reissued to remove the Cr results as they were not requested on the COC. Previous report 2649080.

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W: www.element.com

Analytical Report

Bill To:	Crimson Environmental Ltd. #24-314 - 222 Baseline Road Sherwood Park, AB, Canada T8H 1S8	Project ID:	CEL 37557	Lot ID:	**1512326**
		Project Name:	Latta Bridge	Control Number:	
		Project Location:		Date Received:	Aug 9, 2021
		LSD:		Date Reported:	Aug 13, 2021
Attn:	Accounts Payable	P.O.:		Report Number:	2650692
Sampled By:	DP	Proj. Acct. code:			
Company:	Crimson				

		Reference Number	1512326-1	1512326-2	1512326-3
		Sample Date	Aug 08, 2021	Aug 08, 2021	Aug 08, 2021
		Sample Time	NA	NA	NA
		Sample Location			
		Sample Description	21-01 / 0.5 / m	21-10 / 0.5 / m	21-33 / 0.00-0.01 / m
		Matrix	Soil	Soil	Soil

Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Lead	Strong Acid Extractable	mg/kg	183	35.5	89.3	0.1
Zinc	Strong Acid Extractable	mg/kg	146	82	133	1

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Analytical Report

Bill To:	Crimson Environmental Ltd. #24-314 - 222 Baseline Road Sherwood Park, AB, Canada T8H 1S8	Project ID:	CEL 37557
		Project Name:	Latta Bridge
		Project Location:	
		LSD:	
Attn:	Accounts Payable	P.O.:	
Sampled By:	DP	Proj. Acct. code:	
Company:	Crimson		

Lot ID:	**1512326**
Control Number:	
Date Received:	Aug 9, 2021
Date Reported:	Aug 13, 2021
Report Number:	2650692

		Reference Number	1512326-4	1512326-5	1512326-6	
		Sample Date	Aug 08, 2021	Aug 08, 2021	Aug 08, 2021	
		Sample Time	NA	NA	NA	
		Sample Location				
		Sample Description	21-33 / 0.05 / m	21-34 / 0.0-0.01 / m	21-34 / 0.5 / m	
		Matrix	Soil	Soil	Soil	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Metals Strong Acid Digestion						
Lead	Strong Acid Extractable	mg/kg	18.6	90.1	19.9	0.1
Zinc	Strong Acid Extractable	mg/kg	112	124	96	1

Approved by:

Benjamin Morris, B.Sc
Operations Manager

Data have been validated by Analytical Quality Control and Element's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

element

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Quality Control

Bill To:	Crimson Environmental Ltd.	Project ID:	CEL 37557	Lot ID:	**1512326**
	#24-314 - 222 Baseline Road	Project Name:	Latta Bridge	Control Number:	
	Sherwood Park, AB, Canada	Project Location:		Date Received:	Aug 9, 2021
	T8H 1S8	LSD:		Date Reported:	Aug 13, 2021
Attn:	Accounts Payable	P.O.:		Report Number:	2650692
Sampled By:	DP	Proj. Acct. code:			
Company:	Crimson				

Metals Strong Acid Digestion

Blanks	Units	Measured	Lower Limit	Upper Limit		Passed QC
Chromium	µg/L	0.0827761	-0.5	0.5		yes
Lead	µg/L	0.0366231	-5.0	5.0		yes
Zinc	µg/L	0.584749	-1	1		yes
Date Acquired:	August 10, 2021					
Client Sample Replicates	**Units**	**Replicate 1**	**Replicate 2**	**% RSD Criteria**	**Absolute Criteria**	**Passed QC**
Chromium	mg/kg	16.8	17.2	20	1.1	yes
Lead	mg/kg	12.2	13.5	20	0.2	yes
Zinc	mg/kg	74	75	20	2	yes
Date Acquired:	August 10, 2021					
Control Sample	**Units**	**Measured**	**Lower Limit**	**Upper Limit**		**Passed QC**
Chromium	mg/kg	101	93.2	107.0		yes
Lead	mg/kg	19.8	18.3	21.3		yes
Zinc	mg/kg	201	186	210		yes
Date Acquired:	August 10, 2021					
Chromium	mg/kg	86.7	70.9	98.5		yes
Lead	mg/kg	289	200.6	318.8		yes
Zinc	mg/kg	354	283	390		yes
Date Acquired:	August 10, 2021					

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Methodology and Notes

Bill To:	Crimson Environmental Ltd. #24-314 - 222 Baseline Road Sherwood Park, AB, Canada T8H 1S8	Project ID:	CEL 37557	Lot ID:	**1512326**
Attn:	Accounts Payable	Project Name:	Latta Bridge	Control Number:	
Sampled By:	DP	Project Location:		Date Received:	Aug 9, 2021
Company:	Crimson	LSD:		Date Reported:	Aug 13, 2021
		P.O.:		Report Number:	2650692
		Proj. Acct. code:			

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Metals ICP (Hot Block) in soil	EPA	* Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Elements, October 1999, 200.2	Aug 10, 2021	Element Edmonton - Roper Road
Metals ICP (Hot Block) in soil	US EPA	* Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Aug 10, 2021	Element Edmonton - Roper Road

** Reference Method Modified*

References

EPA	Environmental Protection Agency Test Methods - US
US EPA	US Environmental Protection Agency Test Methods

Comments:

- Aug 13, 2021 - Report was reissued to remove the Cr results as they were not requested on the COC. Previous report 2649080.

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted.
The test report shall not be reproduced except in full, without the written approval of the laboratory.

Record of Site Condition

1 REPORT AND FORM INFORMATION			
Title of report	Soil Quality Assessment Latta Bridge Site Edmonton, Alberta		
Report date (*dd-mon-yyyy*)	24-08-2021	Record of Site Condition (RSC) ID No.[Ψ]	

2 SITE IDENTIFICATION AND PHYSICAL LOCATION			
2.1 Site name	Latta Bridge Site		
2.2 Address of site			
	Municipality	Edmonton	**Alberta**

2.3 Legal land description of site *(if multiple, list all.)*

Plan, Block, Lot (PBL)			**Alberta Township System (ATS)**					
Plan	Block	Lot	LSD	Quarter	Section	Township	Range	Meridian

3 STAKEHOLDERS

3.1 Operator

Company	The City of Edmonton	Contact person	Zsolt Margitai, M.Sc., P.Eng., P.Geol.
Mailing address	The City of Edmonton Engineering Services Section Integrated Infrastructure Services Infrastructure Planning and Design 11004 - 190 Street NW Edmonton, Alberta T5S 0G9	Position held	Environmental Engineer
		Business phone No.	780-916-0749
		Business fax No.	
		Business e-mail	zsolt.margitai@edmonton.ca

3.2 Consultant ☐ Not applicable

Company	CRIMSSON Environmental Limited	Contact person	Douglas Pankewich, M.Sc., P.Geol., P.Eng.
Mailing address	**314-222 Baseline Road PO Box 24 Sherwood Park, Alberta T8H 1S8**	Position held	Geological Engineer
		Business phone No.	780.719.4959
		Business fax No.	
		Business e-mail	pankewich@shaw.ca

3.3 Landowner(s)

Land type	☐ Private	☐ Special Areas	☐ Parks and protected area	☒ Public

Record of Site Condition

	(*if not private, provide Disposition No.:* _____)
Landowner(s)	☒ Same as operator ☐ Other

Ψ: Do not fill in. Reserved for internal administrative purposes only.

3.4 Occupant(s)			
Are there occupants at the site?	☐ Yes	☒ No	☐ To be determined (TBD)
Occupant(s)	☐ Same as operator	☐ Same as landowner	☐ Other
What is the type of occupancy?	☐ Apartment building	☐ Town house	☐ Single detached house
	☐ Agricultural	☐ Industrial	☐ Commercial
	☒ Other (*specify*) Bridge / Park Site		

4 OPERATING STATUS

☐ Operating ☐ Suspended ☐ Abandoned ☐ Decommissioning in progress ☐ Closed
☐ Reclaimed (*provide Reclamation Certificate No.(s):* _____) ☒ Not applicable

5 TYPE OF ACTIVITY AND SITE

5.1 Petroleum Storage Tank Site ☐ Yes

5.1.1 ESRD file No.(s)		PTMAA site No.	

5.1.2 Types of activity

☐	Retail gas station	☐	Aviation fuelling station	☐	Bulk fuel	☐	Other (*specify*): Municipal Services Only

5.2 Upstream Oil and Gas Facility ☐ Yes

5.2.1 ESRD file No.(s)		**AER approval No.(s)**	

5.2.2 AER authorization type ☐ Approval ☐ License ☐ Permit ☐ Order ☐ Other (*specify*)_____

5.2.3 Types of activity

☐	Wellsite and associated facility	☐	Satellite	☐	Battery	☐	Pipeline
☐	Compressor and pumping station	☐	Other (*specify*): _____				

5.3 Approved Facility Under Environmental Protection and Enhancement Act (EPEA) ☐ Yes

5.3.1 ESRD approval No.(s)		**AER approval No.(s)**	

5.3.2 Types of approved activity

☐	Chemical manufacturing plant	☐	Enhanced recovery in-situ oil sands or heavy oil processing plant	☐	Fertilizer manufacturing plant	☐	Landfill
☐	Metal manufacturing plant	☐	Oil refinery	☐	Oilsands processing plant	☐	Oil production site
☐	Pesticide manufacturing plant	☐	Petrochemical manufacturing plant	☐	Pipeline	☐	Power plant
☐	Pulp and paper processing plant	☐	Sour gas processing plant	☐	Sulphur manufacturing or processing plant	☐	Waste management facility

☐	Wood treatment plant	☐	Other *(specify)*: _____

5.4 Facility Under EPEA Code of Practice				☐ Yes			
5.4.1 ESRD registration No.(s)				**AER registration No.(s)**			
5.4.2 Type of Code of Practice							
☐	Asphalt paving plant	☐	Compressor and pumping station	☐	Concrete producing plant	☐	Landfill
☐	Pesticides	☐	Pipeline	☐	Land treatment of soils containing hydrocarbons	☐	Sand and gravel pit
☐	Small incinerator	☐	Sweet gas processing plant	☐	Other *(specify)*: _____		

5.5 Other Activity		☐ Yes			
5.5.1 ESRD file No.(s)		Other site ID No.(s)		Authorized by	
5.5.2 Types of activity					
☐	Dry cleaning operation	☐	Highway maintenance yard	☐	Transportation
☐	Other *(specify)*: _____				

6 SITE CHARACTERIZATION

6.1 What Environmental Site Assessments (ESA) Have Been Conducted and Completed to Date?

☐ Phase I ESA

☒ Phase II ESA (*check all that apply.*)

☒ Initial intrusive sampling ☐ delineation completed ☐ post-remediation monitoring ☐ final confirmatory sampling

6.2 Contaminants of Potential Concern (COPC)

6.2.1 Does the site have any of the conditions that require the mandatory use of *Alberta Tier 2 Soil and Groundwater Remediation Guidelines* (ESRD, 2007 and updates)? *(check all that apply in Section 6.2.1.1.)*

☐ Yes ☒ No (*➔proceed to Section 6.2.2.)*

6.2.1.1 Identify any conditions that require the approaches of the Alberta Tier 2 guidelines. *(see Alberta Tier I Soil and Groundwater Remediation Guidelines (ESRD, 2007 and updates), for details.)*

☐	Contamination within 30 cm of building foundation	☐	Unusual building feature (*eg. earthen floor*)	☐	Contamination within 10 m distance of surface water body
☐	Fractured bedrock	☐	Potentially high hydraulic conductivity (*> 10^{-5} m/sec.*)	☐	Other (*see Alberta Tier 1 guidelines and specify)*: _____

6.2.1.2 Did the Alberta Tier 2 approach lead to a soil or groundwater guideline that was lower than the corresponding Tier 1 guideline for the same contaminant(s)?

☐ Yes ☐ TBD ☐ No (*➔proceed to Section 6.2.2.)*

6.2.1.3 If you answered 'yes' or 'TBD' to Section 6.2.1.2, identify the group of contaminants for each COPC with a mandatory Tier 2 guideline that is lower than the corresponding Tier 1 guideline (*check all that apply*, *see Alberta Tier 1 guidelines, Tables 1-4 for detailed listing).*

☐	General and inorganic parameters	☐	Metals
☐	Hydrocarbons	☐	Halogenated aliphatics
☐	Chlorinated aromatics	☐	Pesticides

☐	Other organics	☐	Radionuclides
☐	Salt	☐	Other (*specify*): _____

6.2.1.4 Did any past or current ESA relevant to this investigation identify an exceedance of the mandatory Tier 2 guidelines referred to in Section 6.2.1.3 (e.g. Tier 2 guidelines that are lower than the corresponding Tier 1 guidelines)? ☐ Yes ☐ No ☐ TBD

6.2.1.5 If you answered 'yes' in Section 6.2.1.4, have all relevant COPC been remediated to meet the mandatory Tier 2 guidelines? ☐ Yes ☐ No

6.2.2. Did any past or current ESA relevant to this investigation identify a drilling waste disposal area?
☐ Yes ☒ No (*➔proceed to Section 6.2.3.)*

6.2.2.1 If a drilling waste disposal area was identified, did any past or current ESA identify non-compliance with the compliance options outlined in *Assessing Drilling Waste Disposal Areas: Compliance Options for Reclamation Certification* (AER, 2014), as amended?
☐ Yes ☐ No

6.2.2.2 If you answered 'yes' in Section 6.2.2.1, have all COPC been remediated to meet the compliance options outlined in *Assessing Drilling Waste Disposal Areas: Compliance Options for Reclamation Certification* (AER, 2014), as amended?
☐ Yes ☐ No

6.2.2.3 For any COPC that did not meet the compliance options in Assessing Drilling Waste Disposal Areas, identify the group of contaminants (*check of all that apply*, *see the Alberta Tier 1 guidelines, Tables 1-4 for detailed listing).*

☐	General and inorganic parameters	☐	Metals
☐	Hydrocarbons	☐	Halogenated aliphatics
☐	Chlorinated aromatics	☐	Pesticides
☐	Other organics	☐	Radionuclides
☐	Salt	☐	Other (*specify*): _____

6.2.3 For all areas and COPCs not assessed under Sections 6.2.1 or 6.2.2, did any ESA relevant to this investigation identify an exceedance over the Alberta Tier 1 guidelines?
☒ Yes ☐ No (*➔proceed to Section 6.3.)*

6.2.3.1 If you answered 'yes' in Section 6.2.3, have all COPC been remediated to meet the Alberta Tier 1 guidelines?
☐ Yes ☒ No ☐ TBD

6.2.3.2 For any COPC that exceeded Alberta Tier 1 guidelines in Section 6.2.3.1, identify the group of contaminants. (*check all that apply*, *see the Alberta Tier 1 guidelines, Tables 1-4 for detailed listing.)*

☐	General and inorganic parameters	☒	Metals
☐	Hydrocarbons	☐	Halogenated aliphatics
☐	Chlorinated aromatics	☐	Pesticides
☐	Other organics	☐	Radionuclides
☐	Salt	☐	Other (*specify*): _____

6.3 Status of Investigation

6.3.1 Identify soil and groundwater guidelines used to assess the COPCs that are the subject of this investigation *(check all that apply).*

☒ *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* – 2007 and updates,
☐ Coarse grained ☐ Fine grained

☐ *Alberta Tier 2 Soil and Groundwater Remediation Guidelines* – 2007 and updates,
☐ Pathway exclusion ☐ Guideline adjustment ☐ Site specific remediation objectives

☐ *Assessing Drilling Waste Disposal Areas: Compliance Options for Reclamation Certification* (AER, 2014), as amended

☐ Other (*specify*): _____

6.3.2 What land use classification(s) is used?
☐ Natural ☐ Agricultural ☐ Residential ☐ Commercial ☐ Industrial ☒ Other (*specify*: Parkland)

6.3.3 What is the outcome of the investigation? *(check one only.)*
☐ For all COPCs on-site and off-site, no exceedance has been found above any applicable soil and groundwater guidelines in any prior and current assessments.
☐ All contamination on-site and off-site has been completely remediated and meets the applicable soil and groundwater guidelines.
☒ One or more COPC still exceeds the applicable soil or groundwater guidelines.

6.3.4 How many contaminated areas are there currently at the site?
1 ☐ None ☐ TBD

6.3.5 Are all contaminated areas and potential contaminated areas assessed during this investigation?
☒ Yes ☐ No

6.3.6 For all areas of potential environmental concern, list the dates when the contamination was discovered *(specify dd-mon-yyyy)*: **2021**; _____

6.3.7 For all areas that have been identified in Section 6.3.4, have all substance releases been reported to ESRD?
☐ Yes ☐ No ☐ Not applicable

6.3.8 If the answer to Section 6.3.7 is 'yes', list all Incident No.(s) (*attach separate sheet if necessary*):
_____; _____ ☐ Not assigned

6.3.9 What is the approximate, cumulative amount of land area remaining exceeding applicable remediation guidelines? 3000 (m^2) ☐ None ☐ TBD

6.3.10 Is there non-aqueous phase liquid (NAPL) product remaining on site? ☐ Yes ☒ No ☐ TBD

6.3.11 Is there non-aqueous phase liquid (NAPL) product remaining off site? ☐ Yes ☒ No ☐ TBD

6.3.12 What is the remediation status of the contaminated areas at site?

☐	No remediation required	☒	Site has exceedance but no remediation plan
☐	Remediation plan developed	☐	Active remediation
☐	Remediation completed	☐	Post remediation assessment completed
☐	Ongoing risk management plan – on-site	☐	Ongoing risk management plan – off-site
☐	Remediation Certificate issued for some area(s) *(provide Remediation Certificate No.(s):_____)*		
☐	Remediation Certificate cancelled for some area(s) *(provide Remediation Certificate No.(s):_____)*		

Record of Site Condition

Alberta Energy Regulator | Alberta Government

Direction for Completing the Remainder of the Form

Attach the analytical summary tables of the COPCs that are the subject of this investigation and still present at this site. A detailed listing of COPCs can be found with Tables 1-4 in *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (ESRD, 2007 and updates), as amended. Refer to the *RSC User's Guide* for detailed information on format and other requirements regarding the summary table.

For the remainder of the form, follow the directions below:

- If the COPCs on-site and off-site have never exceeded any applicable soil and groundwater guidelines in any prior and current assessments, ➔proceed to Section 8, or
- If the COPCs on-site and off-site have been completely remediated and meet the applicable soil and groundwater guidelines, ➔proceed to Section 8, or
- For all other circumstances, continue with Section 6.4.

6.4 Key Transport Factors for Existing COPCs

6.4.1 What is the horizontal distance to the nearest water well from the edge of the nearest contaminated area?

☐ 0-50 m ☐ 50-100 m ☐ 100-300 m ☐ 300-1000 m ☐ > 1000 m

6.4.2 What is the horizontal distance to the nearest surface water body from the edge of the contaminated area?

☐ ≤10 m ☐ 10-50 m ☐ 50-100 m ☒ 100-300 m ☐ 300-1000 m ☐ > 1000 m

6.4.3 Does delineation achieve closure above the groundwater water table that is nearest to the ground surface?

☐ Yes (➔ *go to Section 6.5.)* ☐ No ☒ TBD

6.4.4 Is the groundwater that is nearest the ground surface a domestic use aquifer (DUA) as defined in Alberta Tier 2 guidelines?

☐ Yes ☐ No ☐ TBD ☒ Not required (NR)

6.4.5 Is there a hydraulic barrier, as defined in Alberta Tier 2 guidelines, between the base of the contaminated area and the DUA?

☐ Yes ☐ No ☐ TBD ☒ NR

6.4.6 If you answered 'yes' to Section 6.4.5, provide the measured largest value of the hydraulic conductivity (as value ×10^{-7} m/sec.) for the 5.0 m vertical layer from the bottom of the contaminated zone.

______(×10^{-7} m/sec.) ☐ TBD ☒ NR

6.5 On-site Characterization

6.5.1 What is the dominant soil texture that governs substance transport at the site?

☐ Coarse grained ☐ Fine grained ☒ TBD ☐ Not applicable (*must identify reason in Section 6.2.1.1.)*

6.5.2 What are the shallowest and deepest measured depths (meters below ground surface) of the water table at site?

Shallowest: _____ (m) Deepest: _____(m) ☐ TBD ☒ NR (*specify max. depth assessed*: ______(m))

6.5.3 What is the dominant horizontal direction of groundwater flow for the near surface water table?

(*N, NW, etc.*: _____) ☐ TBD ☒ NR

6.5.4 What is the existing land use classification?

☐ Natural ☐ Agricultural ☐ Residential ☐ Commercial ☐ Industrial ☒ Other (*specify*) Parkland

6.5.5 What is the end land use classification?

☐ Natural ☐ Agricultural ☐ Residential ☐ Commercial ☐ Industrial ☒ Other (*specify*) Parkland

6.5.6 Identify exposure pathways for which the applicable guidelines are exceeded on-site *(check all that apply).*			
☐	Vapour inhalation	☐	Soil ingestion
☐	Ingestion of potable water	☒	Soil dermal (skin) contact
☐	Fresh water aquatic life	☒	Soil contact for plants and invertebrates
☐	TBD	☐	Other *(specify)*: _____

6.6 Off-site Characterization

6.6.1 Are there COPCs off-site exceeding applicable soil or groundwater guidelines?

☒ No (➔*if on-site contamination was reported, proceed to Section 7, otherwise, proceed to Section 8.)*
☐ Yes ☐ TBD

6.6.2 What is the current land use classification for any off-site area(s) identified in Section 6.6.1?

☐ Natural ☐ Agricultural ☐ Residential ☐ Commercial ☐ Industrial ☐ Other (*specify*) parkland

6.6.3 What is the end land use classification for any off-site area(s) identified in Section 6.6.1?

☐ Natural ☐ Agricultural ☐ Residential ☐ Commercial ☐ Industrial ☐ Other (*specify*) _____

6.6.4 Is there any substance concentration under a road allowance exceeding the applicable soil or groundwater guidelines?

☐ Yes ☐ No (➔*proceed to Section 6.6.6.)* ☐ TBD

6.6.5 What is the most sensitive land use classification adjacent to the road allowance?

☐ Natural ☐ Agricultural ☐ Residential ☐ Commercial ☐ Industrial ☐ Other (*specify*) _____

6.6.6 Identify exposure pathways for which the applicable guidelines are exceeded off-site *(check all that apply).*			
☐	Vapour inhalation	☐	Soil ingestion
☐	Ingestion of potable water	☐	Soil dermal (skin) contact
☐	Fresh water aquatic life	☐	Soil contact for plants and invertebrates
☐	TBD	☐	Other *(specify)*: _____

7	RISK MANAGEMENT PLAN (RMP)

7.1 What is the Plan for Contaminated Areas Still Remaining on and off the Site? *(check one only.)*

- ☐ Complete remediation (➔*proceed to Section 8).*
- ☐ Partial remediation with risk management for some residual contamination.
- ☐ Risk management for all remaining contamination.

7.2 Key Progress of RMP

7.2.1 If the site needs an on-going RMP, answer all the following questions that apply to the RMP.

☐ Yes	☐ No	Are contaminated areas completely delineated horizontally and vertically in soil?
☐ Yes	☐ No	Are contaminated areas completely delineated horizontally and vertically in groundwater?
☐ Yes	☐ No	Is source identified and completely delineated?
☐ Yes	☐ No	Is source migrating or has migrated off-site?
☐ Yes	☐ No	Is source left as is?
☐ Yes	☐ No	Is source partially removed and residual source being managed?
☐ Yes	☐ No	Is source controlled with physical or administrative methods?
☐ Yes	☐ No	Are all pathways of concern identified?
☐ Yes	☐ No	Have all relevant receptors been identified and protected?
☐ Yes	☐ No	Is there a monitoring program in place to verify RMP success?
☐ Yes	☐ No	Are there third parties related to this RMP? (*if the answer is 'no', skip the next question.*)
☐ Yes	☐ No	If there are third parties, have all of them accepted the RMP?
☐ Yes	☐ No	Is there a commitment from person(s) responsible to implement and monitor the RMP until final remediation guidelines are achieved?
☐ Yes	☐ No	Is there a contingency plan in place should the RMP fail?
☐ Yes	☐ No	Is the RMP implemented for the site?

Public Disclosure and Privacy Notification

The *Record of Site Condition* form is a public record that is disclosed in accordance with section 35 of the *Environmental Protection and Enhancement Act, Disclosure of Information Regulation*, and *Ministerial Order 23/2004*. Reasonable efforts have been made to minimize collection of personal information where possible. Personal information on the form is collected under the authority of section 12(c) and other provisions of the *Environmental Protection and Enhancement Act* and is in compliance with section 33(a) and 33(c) of the *Freedom of Information and Protection of Privacy Act* (FOIP). Personal information collected on this form will be used by Alberta Environment and Sustainable Resource Development (ESRD) or the Alberta Energy Regulator (AER), as the case may be, for the purposes of administering its programs.

Accuracy of Information

The information in this document has been submitted by persons other than ESRD or the AER. The Department, the Government of Alberta, and the AER cannot and do not warrant that the information in this document is current, accurate, complete, or free of errors. Persons accessing the information provided should not rely on it, and any reliance on the information provided is taken at the sole risk of the user. Users of this information are advised to conduct their own due diligence to satisfy themselves of the environmental condition of the property of interest.

8 DECLARATION

This *Record of Site Condition* form was prepared for the purpose of reporting on the state of environmental site conditions and, where applicable, for the purpose of remediation or reclamation, for:

Latta Bridge Site (site name) (the "Site").

I, as the licensed operator or authorized representative, have reviewed all information that was used in preparation of this form and I am satisfied that it was prepared in a manner consistent with the Applicable Standard⫫ together with any relevant additional guidance that is available from Alberta Environment and Sustainable Resource Development as of this date for conducting environmental site assessments.

Having conducted reasonable inquiries to obtain all relevant information, to my knowledge, the statements made in this form are true as of this date. I have disclosed all pertinent information of which I am aware concerning the historical and current environmental condition of the Site to the Director.

Any use which a third party, other than the Crown in right of Alberta or the AER, makes of this form, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. The undersigned accepts no responsibility for damages, if any, suffered by any third party, other than the Crown in right of Alberta and the AER, as a result of decisions made or actions based on this form. Any exclusions or disclaimers to the contrary contained in any attachment to this form are of no force or effect as against the Crown in right of Alberta and the AER.

Footnote ⫫:

"Applicable Standard" means

a) for the purposes of upstream oil and gas sites,

i) *2010 Reclamation Criteria for Wellsites and Associated Facilities Application Guidelines* (ESRD 2011),

ii) CSA Standard Z769, *Phase II Environmental Site Assessment,* as amended, for any Phase II site assessment information used in preparation of this form on all upstream oil and gas sites not included in a) i);

b) for the purposes of all other sites, CSA Standard Z768, *Phase I Environmental Site Assessment,* as amended, for any Phase I site assessment information and with CSA Standard Z769, *Phase II Environmental Site Assessment,* as amended, for any Phase II site assessment information used in preparation of this form.

By signing below, I as the licensed operator or authorized representative, confirm the information provided herein is correct and complete, to the best of my knowledge and belief.

City of Edmonton	Douglas Pankewich CRIMSON Environmental Limited	Consultant - Engineer	PROFESSIONAL ENGINEER DOUGLAS PANKEWICH ALBERTA ID 59254	September 27 2021
Name of operator	Name of authorized representative	Title of authorized representative (*e.g. officer, director*)	Signature	Date (*dd-mon-yyyy*)

Appendix I: Plant Inventory (July 2021)

Latta Bridge Replacement Plant Species Inventory (13 July 2021)

Species*				Plant Community**			
Scientific Name	Common Name	Origin	ACIMS Rank	Balsam Poplar Mixed Shrubs (PB.1)	Non-Forest Caragana - Steep Slopes (NF.1)	Non-Forest Smooth Brome - Steep Slopes (NF.6)	Manicured
Acer negundo	Manitoba maple	Native	SU	O	O	O	O
Agropyron cristatum	crested wheatgrass	Exotic	SNA		O		O
Amaranthus retroflexus	red-root pigweed	Exotic	SNA		R		O
Aralia nudicaulis	wild sarsaparilla	Native	S5	R			
Arctium tomentosum	woolly burdock	Noxious	SNA	O	O	O	O
Artemisia absinthium	absinthe wormwood	Exotic	SNA			R	
Asparagus officinalis	wild asparagus	Exotic	SNA			R	
Atriplex prostrata	prostrate saltbush	Exotic	SNA	O	F	F	
Bromus inermis	smooth brome	Exotic	SNA	A	F	D	F
Campanula rapunculoides	creeping bellflower	Noxious	SNA	R			
Capsella bursa-pastoris	shepherd's-purse	Exotic	SNA				R
Caragana arborescens	common caragana	Exotic	SNA		D	O	
Chenopodium album	lamb's-quarters	Exotic	SNA	O			R
Cirsium arvense	creeping thistle	Noxious	SNA	O		O	O
Corylus cornuta	beaked hazelnut	Native	S5				R
Crepis tectorum	annual hawk's-beard	Exotic	SNA				R
Elymus repens	quackgrass	Exotic	SNA	O	O	O	F
Equisetum sylvaticum	woodland horsetail	Native	S5	R			
Euthamia graminifolia	flat-topped goldenrod	Native	S4	R			R
Galeopsis tetrahit	hemp-nettle	Exotic	SNA		R		
Glycyrrhiza lepidota	wild licorice	Native	S4			F	
Hordeum jubatum	foxtail barely	Native	S5				O

Species*				Plant Community**			
Scientific Name	**Common Name**	**Origin**	**ACIMS Rank**	**Balsam Poplar Mixed Shrubs (PB.1)**	**Non-Forest Caragana - Steep Slopes (NF.1)**	**Non-Forest Smooth Brome - Steep Slopes (NF.6)**	**Manicured**
Kochia scoparia	summer-cypress	Exotic	SNA	O	R	R	R
Lappula squarrosa	bluebur	Exotic	SNA				R
Lathyrus ochroleucus	cream-colored vetchling	Native	S5		R		
Lonicera tatarica	Tatarian honeysuckle	Exotic	SNA	R	O	O	
Lotus corniculatus	bird's-foot trefoil	Exotic	SNA				R
Matricaria discoidea	pineappleweed	Exotic	SNA				R
Medicago sativa	alfalfa	Exotic	SNA		O	F	O
Melilotus officinalis	yellow sweet-clover	Exotic	SNA		O		
Plantago major	common plantain	Exotic	SNA				O
Poa pratensis	Kentucky blue grass	Native	S5				D
Polygonum aviculare	prostrate knotweed	Exotic	SNA				R
Populus balsamifera	balsam poplar	Native	S5	A			
Ribes sp.	planted hedge species	Exotic	SNA				R
Salix alba	white willow	Exotic	SNA		O		
Sambucus racemosa	red elderberry	Native	S4	R			
Senecio vulgaris	common groundsel	Exotic	SNA				R
Silene latifolia	white cockle, bladder campion	Noxious	SNA		R		
Sonchus oleraceus	annual sow-thistle	Exotic	SNA				R
Symphoricarpos occidentalis	buckbrush	Native	S5			O	
Syringa sp.	lilac	Exotic	SNA		O	O	
Tanacetum vulgare	common tansy	Noxious	SNA		R		
Taraxacum officinale	common dandelion	Exotic	SNA	O			F
Thlaspi arvense	stinkweed	Exotic	SNA				R

Species*				Plant Community**			
Scientific Name	**Common Name**	**Origin**	**ACIMS Rank**	**Balsam Poplar Mixed Shrubs (PB.1)**	**Non-Forest Caragana - Steep Slopes (NF.1)**	**Non-Forest Smooth Brome - Steep Slopes (NF.6)**	**Manicured**
Tragopogon dubius	common goat's-beard	Exotic	SNA				R
Trifolium hybridum	alsike clover	Exotic	SNA				O
Tripleurospermum inodorum	scentless chamomile	Noxious	SNA				R
Vicia americana	wild vetch	Native	S5		R	R	
Viola canadensis	western Canada violet	Native	S5		R		

*Scientific nomenclature, common names and rank follow ACIMS (2018)

**Species abundance abbreviations per location are as follows: D=dominant, A=abundant, F=frequent, O=occasional, R=rare

Appendix J: Wildlife List

List of Species with Potential to Occur in the Latta Bridge Local Study Area

Common Name	Scientific Name*	Provincial Status (General Status of AB Wild Species 2015)	Wildlife Act Designation and New Species Assessed by ESCC	COSEWIC Designation	SARA Designation	Observed/ Previous Record	Likelihood of Occurrence	Potential Habitat Use
Common Garter Snake	*Thamnophis sirtalis*	Sensitive	LP Candidate	LP Candidate (SSC)			Low	Foraging/ dispersal
Gray Partridge	*Perdix perdix*	Exotic/Alien						
Sharp-shinned Hawk	*Accipiter striatus*	Secure		Not at Risk				
Cooper's Hawk	*Accipiter cooperii*	Secure		Not at Risk				
Merlin	*Falco columbarius*	Secure		Not at Risk				
Great Horned Owl	*Bubo virginianus*	Secure						
Barred Owl	*Strix varia*	Sensitive	Special Concern			FWMIS (2021)		
Short-eared Owl	*Asio flammeus*	May Be At Risk		Threatened	Special Concern (Schedule 1)	FWMIS (2021)		
Northern Saw-whet Owl	*Aegolius acadicus*	Secure						
Rock Pigeon	*Columba livia*	Exotic/Alien						
Ruby-throated Hummingbird	*Archilochus colubris*	Secure						
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Secure						
Downy Woodpecker	*Dryobates pubescens*	Secure						
Hairy Woodpecker	*Dryobates villosus*	Secure						
Northern Flicker	*Colaptes auratus*	Secure						
Pileated Woodpecker	*Dryocopus pileatus*	Sensitive					Low	Foraging
Least Flycatcher	*Empidonax minimus*	Sensitive		LP Candidate (SSC)			Low	Foraging
Eastern Phoebe	*Sayornis phoebe*	Sensitive					Low	Foraging
Red-eyed Vireo	*Vireo olivaceus*	Secure						
Blue Jay	*Cyanocitta cristata*	Secure						
Black-billed Magpie	*Pica hudsonia*	Secure						
American Crow	*Corvus brachyrhynchos*	Secure						
Common Raven	*Corvus corax*	Secure						
Tree Swallow	*Tachycineta bicolor*	Secure						
Black-capped Chickadee	*Poecile atricapillus*	Secure						
White-breasted Nuthatch	*Sitta carolinensis*	Secure						
House Wren	*Troglodytes aedon*	Secure						
American Robin	*Turdus migratorius*	Secure						
Gray Catbird	*Dumetella carolinensis*	Secure						
European Starling	*Sturnus vulgaris*	Exotic/Alien						

List of Species with Potential to Occur in the Latta Bridge Local Study Area

Common Name	**Scientific Name***	**Provincial Status (General Status of AB Wild Species 2015)**	**Wildlife Act Designation and New Species Assessed by ESCC**	**COSEWIC Designation**	**SARA Designation**	**Observed/ Previous Record**	**Likelihood of Occurrence**	**Potential Habitat Use**
Bohemian Waxwing	*Bombycilla garrulus*	Secure						
Cedar Waxwing	*Bombycilla cedrorum*	Secure						
Yellow Warbler	*Setophaga petechia*	Secure						
Yellow-rumped Warbler	*Setophaga coronata*	Secure						
Chipping Sparrow	*Spizella passerina*	Secure						
Clay-colored Sparrow	*Spizella pallida*	Secure						
Song Sparrow	*Melospiza melodia*	Secure						
White-throated Sparrow	*Zonotrichia albicollis*	Secure						
Dark-eyed Junco	*Junco hyemalis*	Secure						
Purple Finch	*Haemorhous purpureus*	Secure						
House Finch	*Haemorhous mexicanus*	Secure						
Common Redpoll	*Acanthis flammea*	Secure						
Hoary Redpoll	*Acanthis hornemanni*	Secure						
American Goldfinch	*Spinus tristis*	Secure						
House Sparrow	*Passer domesticus*	Exotic/Alien						
Masked Shrew	*Sorex cinereus*	Secure						
Pygmy Shrew	*Sorex hoyi*	Secure						
Red Fox	*Vulpes vulpes*	Secure						
Little Brown Bat	*Myotis lucifugus*	May Be At Risk	None Given	Endangered	Endangered (Schedule 1)	FWMIS (2021)	High	Roosting/ Foraging
Northern Bat	*Myotis septentrionalis*	May Be At Risk	Data Deficient	Endangered	Endangered (Schedule 1)	FWMIS (2021)	Low	Roosting/ Foraging
Big Brown Bat	*Eptesicus fuscus*	Secure				Potential based on bat survey (2021)	High	Roosting/ Foraging
Silver-haired Bat	*Lasionycteris noctivagans*	Sensitive		HP Candidate (SSC)		Potential based on bat survey (2021)	High	Roosting/ Foraging
Hoary Bat	*Lasiurus cinereus*	Secure						
Snowshoe Hare	*Lepus americanus*	Secure						
White-tailed Jack Rabbit	*Lepus townsendii*	Secure						
Least Chipmunk	*Tamias minimus*	Secure						
Richardson's Ground Squirrel	*Spermophilus richardsonii*	Secure						

Common Name	Scientific Name*	Provincial Status (General Status of AB Wild Species 2015)	Wildlife Act Designation and New Species Assessed by ESCC	COSEWIC Designation	SARA Designation	Observed/ Previous Record	Likelihood of Occurrence	Potential Habitat Use
Red Squirrel	*Tamiasciurus hudsonicus*	Secure						
Northern Flying Squirrel	*Glaucomys sabrinus*	Secure						
Deer Mouse	*Peromyscus maniculatus*	Secure						
Southern Red-backed Vole	*Clethrionomys gapperi*	Secure						
Meadow Vole	*Microtus pennsylvanicus*	Secure						
House Mouse	*Mus musculus*	Exotic/Alien						
Common Porcupine	*Erethizon dorsatum*	Secure						
Coyote	*Canis latrans*	Secure						
Striped Skunk	*Mephitis mephitis*	Secure						
Moose	*Alces alces*	Secure						
Mule Deer	*Odocoileus hemionus*	Secure						
White-tailed Deer	*Odocoileus virginianus*	Secure						
* Scientific names are based on the American Ornithological Society's Checklist (2020) (birds) and the Government of Alberta's 2015 Wild Species Status List (mammals, amphibians, reptiles)								

Appendix K: Historical Resources Act Approval

Alberta	HRA Number: 4715-20-0068-002 December 08, 2020

Historical Resources Act Approval

Proponent: City of Edmonton
12th Floor Edmonton Tower, 10111 - 104 Avenue N, Edmonton, AB T5J 0J4
Contact: Mr. Mitchell Schutta

Agent: Stantec Consulting Limited
Contact: Joshua Read

Project Name: City of Edmonton Latta Bridge Replacement

Project Components: Bridge
Slope Stabilization
Geotechnical / Geophysical Testing

Application Purpose: Requesting HRA Approval / Requirements

Historical Resources Act approval is granted for the activities described in this application and its attached plan(s)/sketch(es) subject to Section 31, "a person who discovers an historic resource in the course of making an excavation for a purpose other than for the purpose of seeking historic resources shall forthwith notify the Minister of the discovery." The chance discovery of historical resources is to be reported to the contacts identified within Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources.

David Link
Assistant Deputy Minister
Heritage Division
Alberta Culture, Multiculturalism
and Status of Women

HISTORIC STRUCTURES

There are no *Historical Resources Act* requirements associated with historic structures; however, the proponent must comply with Standard Requirements under the *Historical Resources Act*: Reporting the Discovery of Historic Resources, which are applicable to all land surface disturbance activities in the Province.

SITE	HRV	SITE DESCRIPTION	CONDITIONS/APPROVAL
HS 107526	N/A	Latta Bridge	The documentation completed for this site is considered to be acceptable, and there are no further requirements for this site.

(continued)

Lands Affected: All New Lands

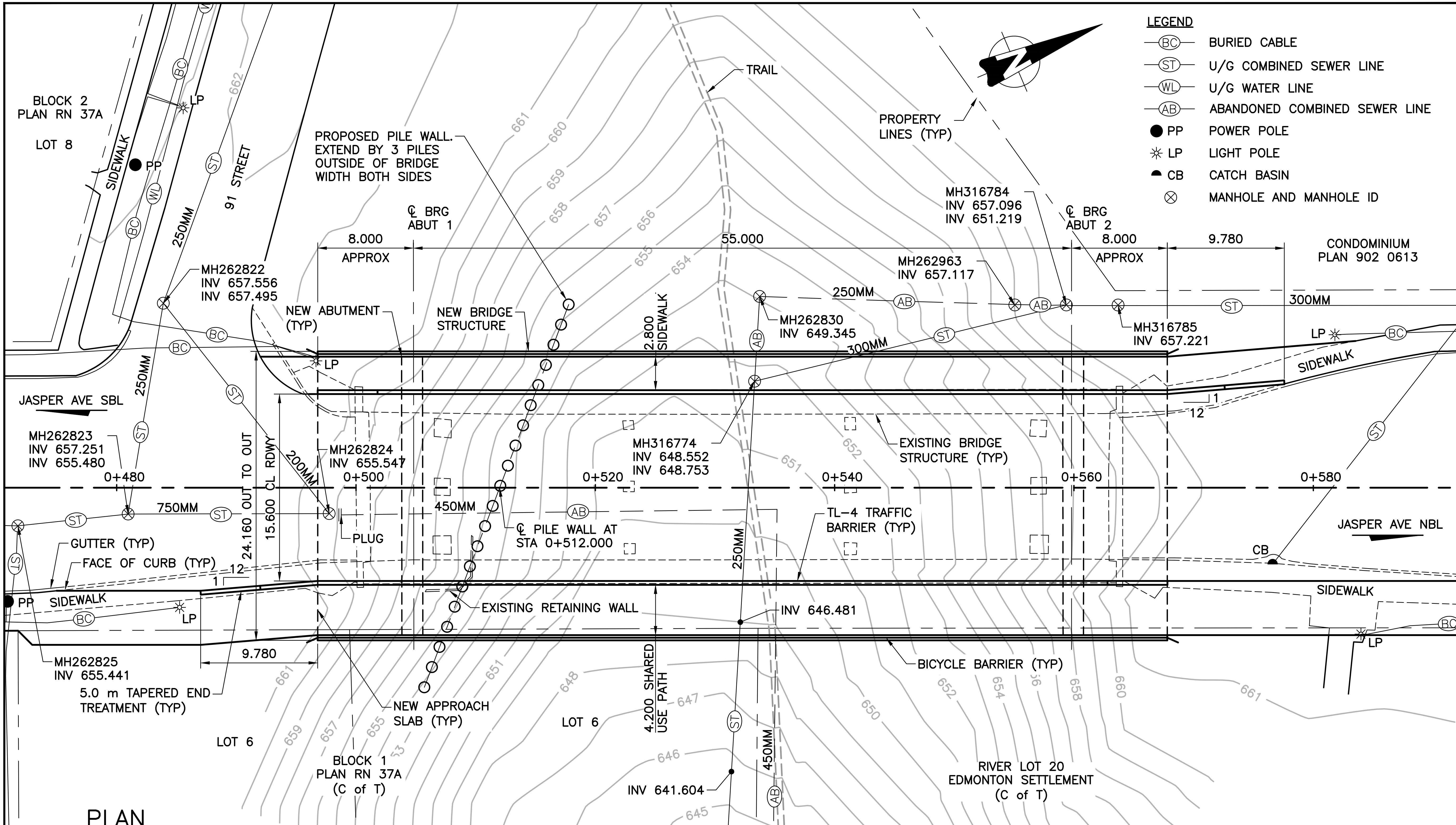
Proposed Development Area:

MER	RGE	TWP	SEC	LSD List
4	24	53	4	7,9-10

Documents Attached:

Document Name	Document Type
Project plans	Illustrative Material

Appendix L: Preliminary Design Drawings (BPTEC and Stantec 2021)



PLAN

1:300

NOTES:

- DIMENSIONS IN METERS UNLESS NOTED OTHERWISE
- SINGLE-SPAN OPTION SHOWN. MULTI-SPAN OPTION SIMILAR
- UTILITY LOCATIONS ARE APPROXIMATE, FROM CITY OF EDMONTON DIGITAL DATA. INVERTS FROM CITY OF EDMONTON AS-BUILT DRAWINGS

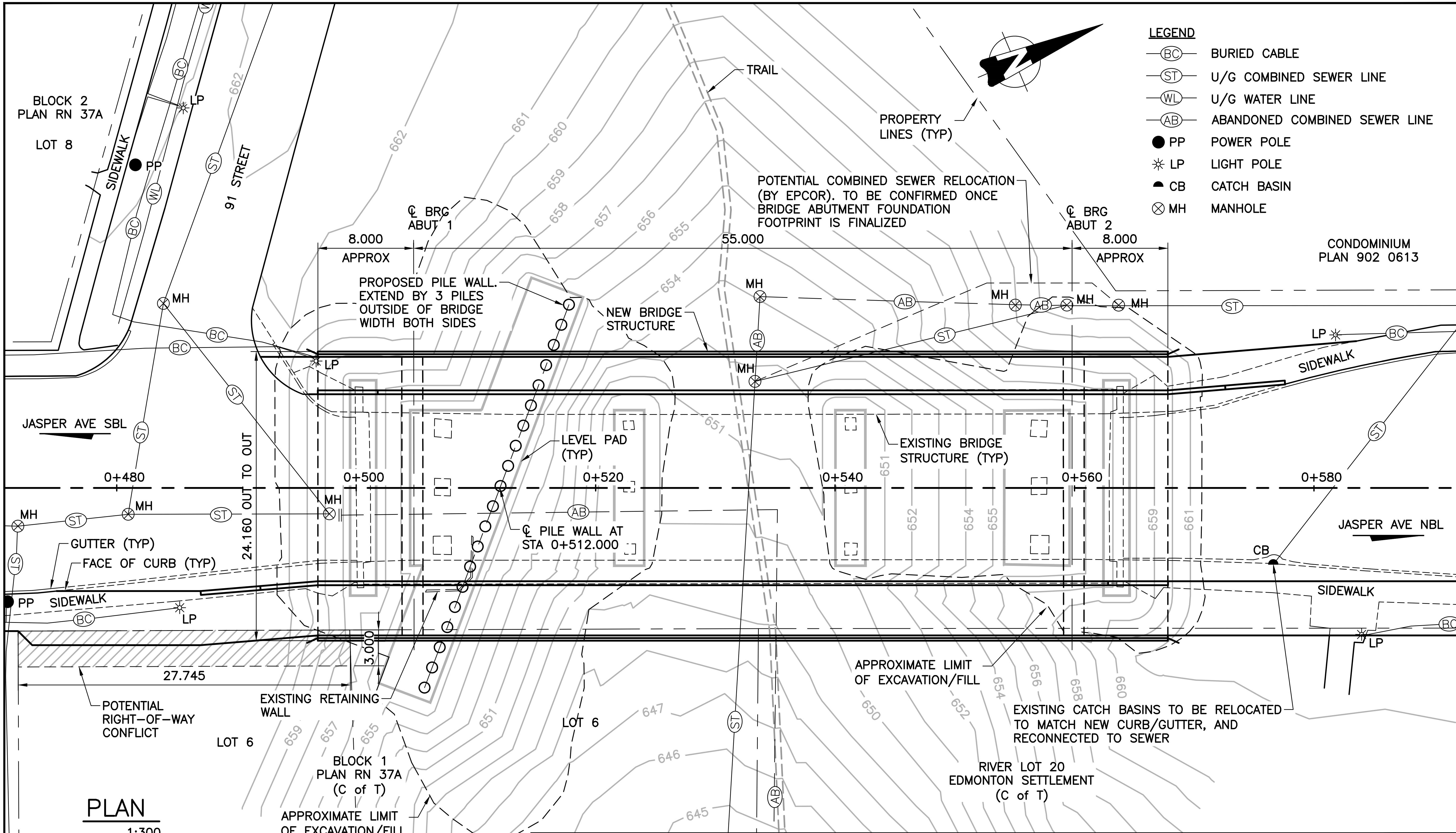
BPTEC ENGINEERING
Stantec

NO.	DATE	REVISIONS	BY

PROJECT: CITY OF EDMONTON
LATTA BRIDGE REPLACEMENT

TITLE: GENERAL LAYOUT AND EXISTING UTILITIES

DRAWN	DATE	FILE NO.	DRAWING
AD	MAY 3, 2021	521-036	SK-01



NOTES:
- DIMENSIONS IN METERS UNLESS NOTED OTHERWISE
- SINGLE-SPAN OPTION SHOWN. MULTI-SPAN OPTION SIMILAR
- APPROXIMATE EXCAVATION AND FILL LIMITS SHOWN FOR REMOVAL OF EXISTING BRIDGE AND CONSTRUCTION OF NEW SUBSTRUCTURE ELEMENTS
- UTILITY LOCATIONS ARE APPROXIMATE, FROM CITY OF EDMONTON DIGITAL DATA

BPTEC ENGINEERING

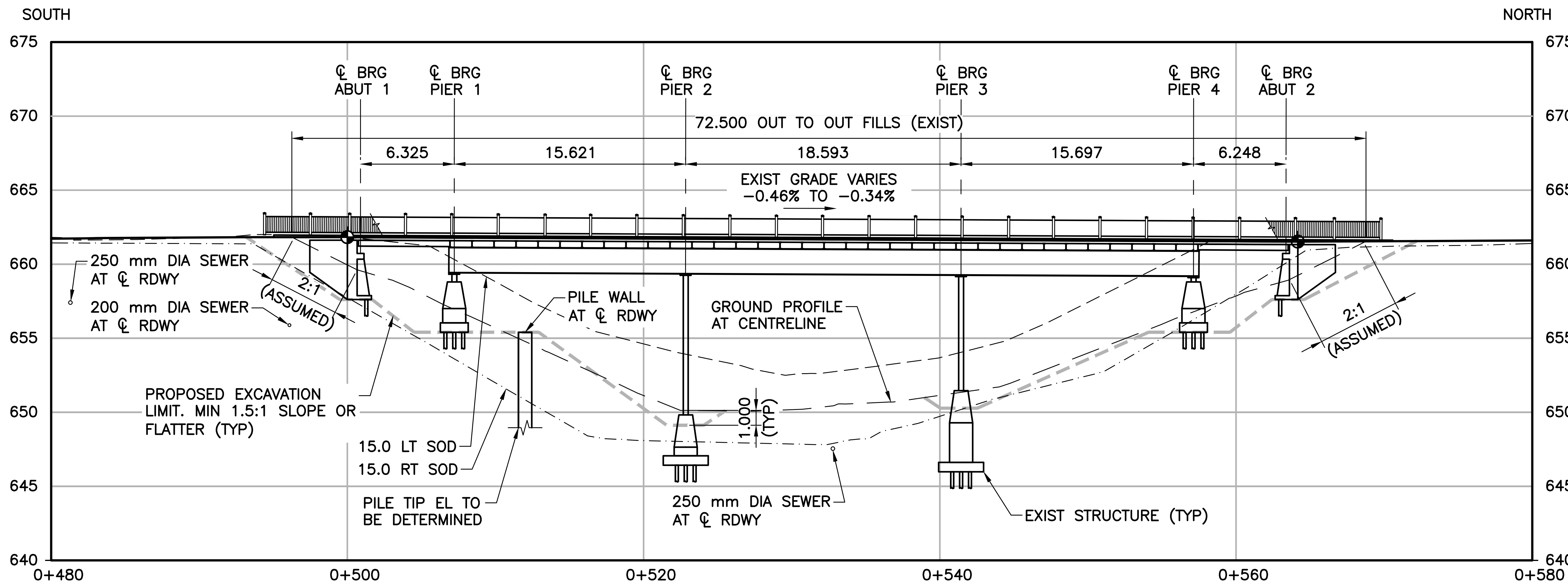
Stantec

NO.	DATE	REVISIONS	BY

PROJECT: CITY OF EDMONTON
LATTA BRIDGE REPLACEMENT

TITLE: POTENTIAL UTILITY & RIGHT-OF-WAY IMPACTS

DRAWN	DATE	FILE NO.	DRAWING
AD	MAY 3, 2021	521-036	SK-02



ELEVATION

LOOKING WEST 1:300

GENERAL NOTES:

- STATION NUMBERING IS ARBITRARY (STA 0+500 = BACK OF ABUT 1)
- EXISTING BRIDGE IS SHOWN FOR ILLUSTRATIVE PURPOSES AND MAY NOT BE EXACTLY AS SHOWN
- DIMENSIONS IN METERS UNLESS NOTED OTHERWISE

SURVEY:

- SURVEY BY STANTEC
- COORDINATES ARE GRID
- PROJECTION: 3TM 114
- COMBINED SCALE FACTOR: 0.999815

EXISTING BRIDGE COORDINATES				
WORK POINT	STATION	NORTHING	EASTING	ELEVATION
WP−1	0+500.000	5935378.747	34847.894	661.825
WP−2	0+564.070	5935437.681	34873.037	661.527

NOTE:
COORDINATES LOCATED AT TOP OF ACP ON ROADWAY CENTRELINE

BPTEC ENGINEERING

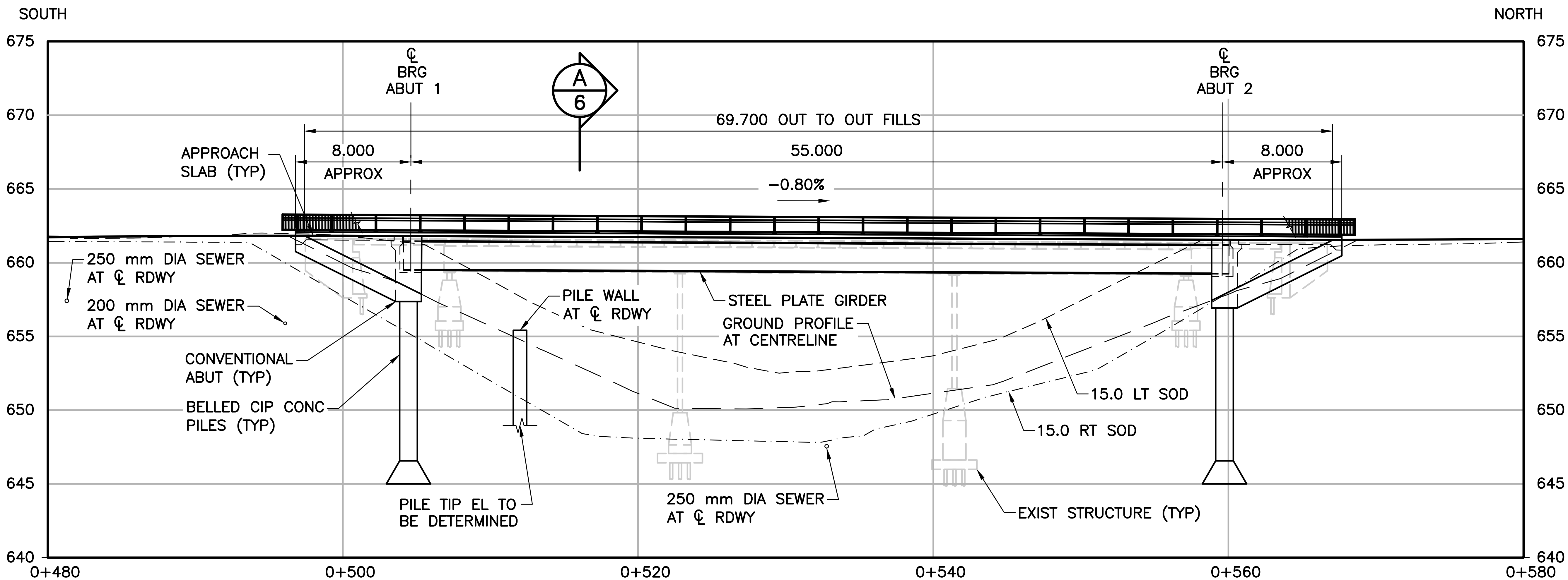
Stantec

NO.	DATE	REVISIONS	BY

PROJECT: CITY OF EDMONTON LATTA BRIDGE REPLACEMENT

TITLE: EXISTING BRIDGE ELEVATION

DRAWN	DATE	FILE NO.	DRAWING
AD	MAY 3, 2021	521-036	SK-04



ELEVATION

LOOKING WEST 1:300

NOTE:
DIMENSIONS IN METERS UNLESS NOTED OTHERWISE

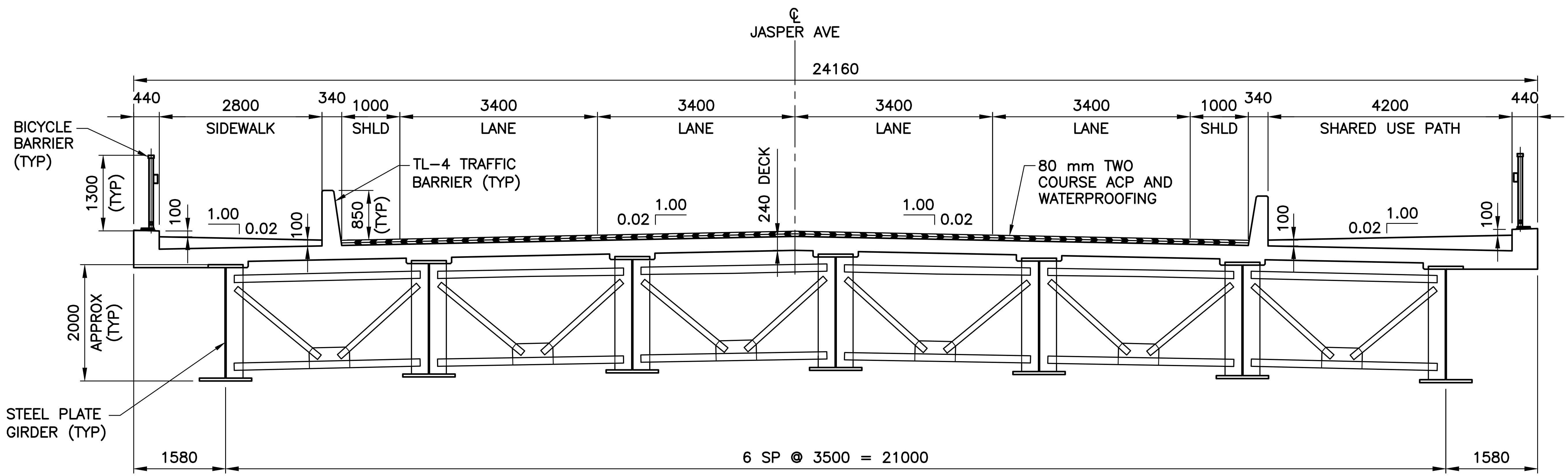
BPTEC ENGINEERING
Stantec

NO.	DATE	REVISIONS	BY

PROJECT: CITY OF EDMONTON
LATTA BRIDGE REPLACEMENT

TITLE: OPTION 1 - SINGLE SPAN STEEL GIRDER
ELEVATION

DRAWN	DATE	FILE NO.	DRAWING
AD	MAY 3, 2021	521-036	SK-05



A
5
SECTION
LOOKING NORTH 1:75

NOTE:
DIMENSIONS IN MILLIMETERS UNLESS NOTED OTHERWISE

BPTEC ENGINEERING

Stantec

NO.	DATE	REVISIONS	BY

PROJECT: CITY OF EDMONTON
LATTA BRIDGE REPLACEMENT

TITLE: OPTION 1 - SINGLE SPAN STEEL GIRDER SECTION

DRAWN	DATE	FILE NO.	DRAWING
AD	MAY 3, 2021	521-036	SK-06

Appendix M: Completed Appendix D (Wildlife Passage Design Guidelines

Appendix D – User Checklists

The checklist presented in this section is designed as an additional tool to highlight the important questions that must be answered when designing a wildlife passage and to provide a place to organize the information obtained during the process. Use of this checklist is not a requirement and it may or may not be helpful to certain individuals.

The checklist follows the general flow of both the document and Decision Tree 1 and Decision Tree 2. If additional information is required for a specific question section references have been provided. If "unknown" is checked for any of the questions additional study may be required.

Transportation engineers may have difficulty answering some questions with certainty. As a result, it is strongly advised that the process of designing a wildlife passage be a joint effort between both ecologists and engineers.

1.1 PLANNING CHECKLIST

Project: Latta Bridge Replacement

Date: Aug 22, 2021

Location: Jasper Avenue and 91 St, Edmonton, AB

1. IMPORTANT CONSIDERATIONS

Will the activity have a substantial adverse effect by habitat modifications on any species sensitive species or sensitive natural areas identified in local or regional policies or regulations?	☐ Yes	☒ No	☐ Unknown
Will the activity have an adverse effect on locally or provincially significant wetlands through removal, filling, hydrological interruption, or others activities?	☐ Yes	☒ No	☐ Unknown
Will the activity interfere with the movement of any resident or migratory fish or wildlife species or previously existing wildlife corridors?	☐ Yes	☒ No	☐ Unknown

*Please note: Checking 'Yes' or 'Unknown' to one or more of the questions stated above, may result in the requirement for further biological studies and/or correspondence with various governing agents to determine regulatory requirements

APPENDIX D – USER CHECKLIST

2. IDENTIFY PROPOSED LAND USE

Check any of the land uses that will apply to both the project area and adjacent area. Assess both current and future land uses. Please refer to Section 3.2.1 for additional information

Residential	☒	Industrial	☐
Commercial	☐	Institutional	☐
Agricultural	☐	Conserved	☒

2. IDENTIFY ECOLOGICAL COMPONENTS OF PROJECT AREA

Indicate whether any of the following ecological components are located on the project area and will be affected by the proposed activity. Refer to Section 3.2.2 for assistance

North Saskatchewan River (NSR)	☐ Yes	☒ No
Water courses (excluding the NSR)	☐ Yes	☒ No
Natural Areas (Geowest 1993, Spencer 2006)	☐ Yes	☒ No
Wildlife corridors (refer to question 4)	☐ Yes	☐ No
Wetlands	☐ Yes	☒ No
Lakes	☐ Yes	☒ No
Woodland	☐ Yes	☒ No

3. IDENTIFY ECOLOGICAL COMPONENTS OF ADJACENT AREA

Indicate whether any of the following ecological components are located on the adjacent land will be affected by the proposed activity. Refer to Section 3.2.2 for assistance

North Saskatchewan River (NSR)	☐ Yes	☒ No
Water courses (excluding the NSR)	☐ Yes	☒ No
Natural Areas (Geowest 1993, Spencer 2006)	☐ Yes	☒ No
Wildlife corridors (refer to question 4)	☒ Yes	☐ No
Wetlands	☐ Yes	☒ No
Lakes	☐ Yes	☒ No
Woodland	☐ Yes	☒ No

4. IDENTIFY WILDLIFE CORRIDORS

If you are unsure whether a wildlife corridor is located on the project area, please review the *checklist below. A corridor may be present if your project area contains one of the following:*		
Linear landscape features (Ridges, valleys, rivers, sharp breaks in vegetative cover)	☒ Yes	☐ No
Identified Natural Areas (within 1 km of the project)	☒ Yes	☐ No
Water bodies (wetlands, lakes, rivers, streams)	☐ Yes	☒ No
Known migratory pathways	☐ Yes	☒ No
Hedgerows, shelterbelts, windbreaks	☐ Yes	☒ No
Greenways	☐ Yes	☒ No

Please note that some corridors are more important ecologically than others and will have greater wildlife use. for example, a natural riparian corridor will likely have a greater diversity and frequency of wildlife use than a greenway. Please refer to Section 3.2.2 for additional resources that may be used to identify wildlife corridors.

5. IDENTIFY HABITAT IN THE PROJECT AREA

Please indicate the types of habitat located on the project area			
Riparian	☐ Yes	☒ No	☐ Unknown
Permanent Water Body (Stream/Lake)	☐ Yes	☒ No	☐ Unknown
Wetland/Slough/Marsh	☐ Yes	☒ No	☐ Unknown
Trees or Forested Land	☒ Yes	☐ No	☐ Unknown
Grassland/Pasture Land/ Hay Field	☐ Yes	☒ No	☐ Unknown

Please note: Each habitat type identified above has a corresponding species list found in Appendix B.
If "unknown" is checked future studies will be required

6. IDENTIFY POTENTIAL LOCATIONS FOR HABITAT RESTORATION

Please identify any possibilities for restoration of habitat and connectivity. This could include restoring portions of a cattle-damaged creek or re-planting trees. Refer to Section 3.2.3.

Vegetation clearing on the steep slopes of Latta Ravine is required to accommodate bridge replacement construction activities. These areas will be relandscaped post-construction + trees/shrubs replaced pursuant to the Corporate Tree Management Policy.

7. IDENTIFY CONFLICTS WITH CURRENT/FUTURE LAND USE

Please identify any foreseen conflicts between the land use and wildlife movement (Use Questions 1 through 5). This may mean that no action is required. Please refer to Section 3.3.1. An example of a land use conflict could be an area slated for industrial development that is located adjacent to a natural feature. In this situation, you may not want to promote wildlife movement into the industrial park.

The existing bridge ~~will be~~ currently passes ~~all wild~~ wildlife ~~along~~ in an east-west direction to + from the NSRV to the end of the short Latta Ravine. The Latta Ravine terminus is at 91 St and is surrounded by roadways + residential. The new bridge will maintain this same wildlife passage condition.

Is there reason to believe that providing mobility through this area will be beneficial and sustainable?	☐ Yes	☒ No

Wildlife mitigation will likely be required if yes is checked

8. IDENTIFY CONFLICTS WITH HABITAT

Wildlife-vehicle conflicts may occur if the project area involves the items listed below			
Natural Area within 1 km	☐ Yes	☒ No	☐ Unknown
Upland-Wetland Habitat is Bisected	☐ Yes	☒ No	☐ Unknown
Wetland-Wetland Habitat is Bisected	☐ Yes	☒ No	☐ Unknown
North Saskatchewan River Valley and any of its Tributaries	☐ Yes	☒ No	☐ Unknown
The project has high traffic or speed	☒ Yes	☐ No	☐ Unknown
The project area contains species with status (Section 3.2.4.1)	☐ Yes	☒ No	☐ Unknown

Wildlife mitigation will likely be required if yes is checked; additional studies may be required if unknown is checked

9. IDENTIFY PHYSICAL BARRIERS

Please identify the presence of any potential barriers to wildlife movement		
High traffic volume and/or speed (see Section 3.3) (i.e. arterial roads for fast moving wildlife, local roads for slow moving wildlife)	☒ Yes	☐ No
Perched culverts (see Section 3.3.4)	☐ Yes	☒ No
Insufficient water depth for aquatic passage (i.e. water is not deep enough for organism to physically pass)	☐ Yes	☒ No
Water velocity in excess of upstream and downstream velocity	☐ Yes	☒ No
Culverts without dry passage area	☐ Yes	☒ No

1.2 DESIGN CHECKLIST

Project: Latta Bridge Replacement.

Date: Aug 22/2021

Location: Jasper Avenue + 91 Street, Edmonton, AB.

1. ECOLOGICAL DESIGN GROUP

Please identify the Ecological Design Group(s) located in the project area (Refer to Section 4.3.1)

Large Terrestrial	☒ Yes	☐ No	☐ Unknown
Medium Terrestrial	☒ Yes	☐ No	☐ Unknown
Small Terrestrial	☒ Yes	☐ No	☐ Unknown
Amphibian	☐ Yes	☒ No	☐ Unknown
Aquatic	☐ Yes	☒ No	☐ Unknown
Aerial Mammal	☒ Yes	☐ No	☐ Unknown
Scavenger Birds	☒ Yes	☐ No	☐ Unknown
Birds of Prey	☒ Yes	☐ No	☐ Unknown
Water Birds	☐ Yes	☒ No	☐ Unknown
Ground Dwelling Birds	☒ Yes	☐ No	☐ Unknown
Other Birds	☒ Yes	☐ No	☐ Unknown
Unknown	☐ Yes	☐ No	☐ Unknown

If unknown is checked, please refer to Appendix B for additional studies. Consult an ecologist for assistance.

2. RARE AND PROTECTED SPECIES

Please identify any rare or protected species (Red and Blue Listed or COWSEWIC Listed) (please see Section 3.2.3.1 for further information on identifying species with status.)

Little brown myotis - please see EIA Section 3.6.2.3 - Special Status Species for further discussion.

If any rare or protected species have been identified additional studies will be required to determine specific crossing requirements. Regulatory agencies must be contacted if rare or protected species are identified.

Undersized Culverts (not physically large enough to accommodate EDG or becomes blocked with debris like branches)	☐ Yes	☒ No
Retaining walls	☐ Yes	☒ No
Traditional jersey barriers and/or noise barriers	☐ Yes	☒ No
Other		

Please note: These barriers will affect different EDGs in different ways. Some barriers may not be applicable to your project (e.g. Jersey barriers may not be a barrier if only Large Terrestrial species are present)

10. WILDLIFE AND TRANSPORTATION CONFLICTS

a) Please indicate whether a conflict will exist between the project and wildlife in the area? (Refer to Section 3.3.5)

	☐ Yes	☒ No

b) Can this conflict be avoided? (Refer to Section 3.4) N/A

	☐ Yes	☐ No

Wildlife mitigation will be required if "no" is checked for 9.b)

11. PROPOSED SOLUTIONS

Please indicate what types of solutions will be used to mitigate for the disturbance to wildlife in the project area (before, after, and during).

Retention of existing habitat – clearing kept to a minimum	☑ Yes	☐ No
Restoration or enhancement of existing habitat (Section 3.2.3)	☑ Yes	☐ No
Habitat protection during construction	☑ Yes	☐ No
Wildlife corridors – maintain existing corridor	☑ Yes	☐ No
Wildlife Crossings **(Please proceed to Section 4.0 and Checklist 12.2)**	☐ Yes	☒ No
Management Plan	☐ Yes	☒ No
Monitoring	☐ Yes	☒ No

Wildlife mitigation will likely be required if yes is checked

3. WILDLIFE PREFERENCES

Please identify any specific needs that are required by the Ecological Design Group(s). (Refer to *Section 4.3.2 and Appendix B*)

None identified. New bridge will provide same, unimpeded passage under the bridge as the existing bridge.

If any rare or protected species have been identified additional studies will be required to determine specific crossing requirements. Regulatory agencies must be contacted if rare or protected species are identified.

Please indicate which mitigation possibilities meet the ecological, transportation, and regulatory requirements for your project (refer to Section 4.4 and 4.5)

4. IDENTIFY APPROPRIATE MITIGATION Not applicable.

a) Please indicate which mitigation possibilities meet the ecological, transportation, and regulatory requirements for your project (refer to Section 4.4 and 4.5). This table corresponds to Table 4.4 and is designed to help determine what mitigation options meet the three requirements. If an option does not meet all three then it should not be considered. More than one mitigation option may meet all three requirements. In this case, the best option should be chosen or a combination of several should be considered.

	Requirements		
	Ecological	**Transportation**	**Regulatory**
Signage and/or Reflectors	☐	☐	☐
Fencing	☐	☐	☐
Altered Lighting	☐	☐	☐
Altered Sight Lines	☐	☐	☐
Public Education	☐	☐	☐
Traffic Calmed Areas	☐	☐	☐
Reduced Speed Limits	☐	☐	☐
Wildlife "Crosswalk"	☐	☐	☐
Diversionary Methods	☐	☐	☐
Reduce/Remove Roadkill	☐	☐	☐
Vegetation Management	☐	☐	☐
Noise Barriers	☐	☐	☐
Curb Improvements	☐	☐	☐
Closed Bottom Culvert	☐	☐	☐
Amphibian Tunnel	☐	☐	☐

Open Bottom Culvert	☐	☐	☐
Box Culvert	☐	☐	☐
Bridges**	☐	☐	☐
Tunnel/Overpass	☐	☐	☐

b) Please identify the crossing mitigation(s) that will BEST meet all the requirements

N/A

5. MITIGATION SIZE N/A

If culvert or bridge-like structures are selected, please calculate the size of mitigation required. This will vary depending on the Ecological Design Group and the size of the road. Use the openness calculation to help assess mitigation size (Refer to Section 4.3.3)

Openness = $\frac{\text{Height x Width}}{\text{Length}}$	Openness Ratio (m)				
	Large Terrestrial	*Medium* Terrestrial	*Small* Terrestrial	Amphibian	Aquatic
	1.5	0.4	≤0.4	0.16	Encompasses entire channel width

EDG Preferred Openness

Structure Length

Structure Width

Structure Height

6. MITIGATION FREQUENCY

If the project area encompasses a large portion of the EDGs home range, several structures may be required to reduce vehicle-wildlife collisions and provide habitat connectivity. Please refer to Section 4.3.5 for assistance in determining if multiple structures are required and how close they must be placed.

N/A

00 00

7. COST-BENEFIT ANALYSIS

A cost-benefit analysis may be completed to determine the relative need for a structure. Please note that a cost-benefit analysis may not adequately reflect the value of important habitat and rare species. Please refer to Section 4.3.6 for additional information

N/A

1.3 REGULATORY CHECKLIST

This checklist provides a summary of common legislation that may be applicable to the project. Additional legislation may apply depending on the area. Please refer to Appendix C for additional information on regulatory requirements.

See EIA, Section ~~4.0~~ 4.6.

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Appendix N: Stakeholder Engagement and Communication Report (Stantec 2021)

1.0 STAKEHOLDER ENGAGEMENT AND COMMUNICATION

For any project, it is important to allow those who are affected by the project to contribute their voice to the outcomes. The City of Edmonton has established this philosophy in the Council Initiative on Public Engagement and Policy C593. It was communicated to the project team through the City of Edmonton Public Engagement Summary that most decisions during the preliminary design phase of the project life cycle will be based on technical factors and, as such, public engagement is not expected; however, key stakeholder engagement and public communication and information sharing is required.

1.1 WHAT WE DID

In the fall of 2020, the City of Edmonton identified directly and potentially affected stakeholders to exchange preliminary project information with. Stakeholders included those who were adjacent property and business owners, City agencies and boards who advise infrastructure projects, environmental organizations, and river valley user groups. In total 18 stakeholders were identified for engagement during the Preliminary Design Phase. Subsequently a Stakeholder Engagement, Communications and Media Plan was developed, along with invitations and a presentation.

Letters of invitation to meet with the project team were sent to these stakeholders via Canada Post on January 19, 2021. Additional outreach to follow up on invitations was conducted by email and phone, as well as letters that were hand delivered. Of the 18 stakeholders invited, 9 accepted the offer to meet with the project team, while others appreciated receiving information they could communicate with their members or organization.

In total 9 stakeholder meetings were conducted with 22 participants between February 16 and March 24, 2021. One-on-one stakeholder meetings were conducted with the following organizations:

- Paths for People (February 16, 2021)
- Royal Canadian Legion (February 18, 2021)
- River Valley Conservation Coalition (March 5, 2021)
- Edmonton Arts Council (March 18, 2021)
- Boyle Street Outreach Team (March 19, 2021)
- River Valley Alliance (March 23, 2021)
- Edmonton Historical Board (March 24, 2021)

Businesses, residences, and community leagues adjacent to the bridge locations were invited to participate in two group meetings. These occurred:

- Community Leagues (February 18, 2021)
- Residences and Businesses (February 25, 2021)

Due to COVID – 19 in-person gatherings and face to face stakeholder meetings were prohibited therefor meeting occurred virtually through Google Meet, Microsoft Teams or by conference call. At each meeting, the project team presented information on each of the Latta and Kinnaird bridge projects, including a project overview, the potential impacts, timelines, and next steps. The presentation was formatted to encourage discussion and allowed multiple opportunities to collect stakeholder feedback and answer questions. The project team posed discussion questions to foster open dialogue and learn information that can be considered as design progresses.

The presentation and meeting minutes are attached in Appendix A.

1.2 WHAT WE HEARD

As a result of these stakeholder meetings, the project team was provided with local and contextual knowledge that will be considered when completing the detailed design work of the two bridge projects. Six themes were generated from these conversations and are discussed below.

1.2.1 Access During Construction

Stakeholders requested to have signage and detour information well in advance of construction to notify residents, businesses, commuters and trail users in the area. Many stakeholders offered to share construction notification through their social media and membership communication channels.

These conversations informed the project team that the unofficial trail beneath Latta Bridge is popular and provides well used access to Dawson Park. Stakeholders expressed interest in detour signage specifically for park access.

The Royal Canadian Legion explained that construction projects impact their business and make it difficult for patrons to access. They requested that the City provide their staff and customers with information and safe traffic maneuvers to access the parking lot during construction to minimize business disruptions.

1.2.2 Multi-modal Connectivity

All Stakeholders indicated strong support for the inclusion of a shared-use path on the Latta Bridge. Paths for People indicated they would support a shared use path on both sides of each bridge. Several stakeholders indicated the desire for a shared-use path on the Kinnaird Bridge. This was documented and will be taken into consideration for the Kinnaird Bridge's replacement in the future.

1.2.3 Traffic Calming and Pedestrian Safety

Pedestrian safety and accessibility is important to all stakeholders.

The Community Leagues spoke about the desire for traffic calming their neighborhoods. They discussed how lane width, speed, pedestrian safety and accessibility could improve neighborhood safety. Some stakeholders asked whether it was necessary to maintain 4 lanes of traffic, and proposed to reduce the number of lanes.

1.2.4 Displacement and Safety of Vulnerable Populations

Construction impacts affecting vulnerable people living in the river valley, and clients of the Catholic Social Services women's shelter adjacent to Latta Bridge were discussed in detail with Boyle Street Community Services Street Outreach Team (Street Outreach Team) and Catholic Social Services.

The Street Outreach Team indicated that Latta Bridge is a popular gathering place where clients can take shelter from the elements. It was requested that an alternate safe gathering space be allocated for vulnerable people who are displaced as a result of the project. The Street Outreach Team will suggest an appropriate alternate site, and share communications for construction notification and detours with their clients.

To provide safety to these vulnerable people during construction the Street Outreach Team proposed daily site sweeps to make sure that no one entered or is sleeping in the construction site and providing education and awareness training for construction workers. The latter is intended to help construction workers interact respectfully and appropriately with vulnerable people found in the construction site or laydown areas. The City committed to continuing this conversation to develop a mitigation plan for vulnerable populations.

Catholic Social Services operates a women's shelter to the southeast of Latta Bridge, and they shared a number of concerns with the project team. The property encroachment means the fence and the only tree in their playground will be removed. The tree and the fence provide shade and privacy for clients. There is concern that the raised roadway height and removal of the fence and tree will leave their clients potentially exposed to abusive partners they have left. Discussion with the project team included temporary fencing during construction, as well as fence and tree (6 foot high) replacement. If possible, the existing tree will be preserved.

Catholic Social Services identified that noise due to construction activities would impact their clients quiet and calm environment at the shelter. CSS mentioned that they currently lease the building from the City of Edmonton and they questioned whether the building would be impacted due to vibrations caused by construction.

1.2.5 Tree and Vegetation Removal

Stakeholders shared that they value the trees and vegetation in the ravines and the North Saskatchewan River Valley. They requested the City only remove trees needed for construction, and replace trees that are removed following construction.

1.2.6 History and Art

Discussions with Edmonton Arts Council and the Historical Society generated ideas about preserving historical elements of the existing bridge including the Latta plaque and date stones. It was suggested that the Latta bridge be replaced with steel rather than concrete, as a 'historical nod' to the Latta family who were blacksmiths.

Public art, will be based on the city based percentage of the growth amount of the project budget. Locations for art may include the open grassed areas along Jasper Avenue where pedestrians can approach and interact with the artwork.

1.2.7 Commitments

From these meetings, the project team has committed to the following:

- Provide information regarding detours and construction access to the Royal Canadian Legion.
- Confirm the allocation amount for public art with the Arts Council.
- Work with Boyle Street Outreach team to develop mitigation plan for vulnerable peoples.
- Follow up with Boyle Street Outreach team regarding training for construction workers
- Project websites will be updated as design progresses.

1.3 NEXT STEPS

Stakeholders were informed that the next steps regarding Stakeholder Engagement included:

- Stakeholders will be invited to participate in a second round of engagement prior to construction in the Spring of 2022.
- A Public Information Session will occur prior to construction in the Spring of 2022, as will communications providing construction notification.

APPENDIX A

Stakeholder Engagement Meeting Minutes and Presentation

Stantec

Meeting Notes

Paths for People Stakeholder Meeting

Latta Bridge Replacement and Kinnaird Bridge Rehabilitation

Date/Time:	February 16, 2021 / 10:00 AM
Place:	Google Meet
Next Meeting:	TBD
Attendees:	Stephen Raitz, Mitchell Schutta, Cyril Balitbit, David MacLaggan, Chuck Wiltzen, Zoe Rezac
Absentees:	Absentees
Distribution:	All

Safety Moment: As we spend time in cold weather and try to stay warm be aware of potential burn hazards. There are 4 burn risks: contact (space heaters), electrical (powerlines), flames (campfires), and scald (hot beverages/boiling water).

Item:

1. **Welcome & Territory Acknowledgement**

2. **Introductions**

   - Paths for People (PFP): Stephen Raitz
   - City of Edmonton (City): Mitchell Schutta, Cyril Balitbit
   - BPTEC: Chuck Wiltzen
   - Stantec: David MacLaggan, Zoe Rezac

3. **Agenda Overview**

4. **Project Overview**

   - Two bridge projects: Kinnaird Bridge Rehabilitation on 82 Street between 111 Ave and 112 Ave, and Latta Bridge Replacement on Jasper Avenue between 90 Street and 91 Street.
   - Kinnaird Bridge will be rehabilitated to extend the service life of structure through regularly scheduled assessments and maintenance.
   - Latta Bridge will be replaced, meaning the existing bridge will be demolished and a new bridge will be reconstructed.
   - The City of Edmonton does regular condition assessments as part of our life cycle processes. Condition assessments evaluate the service life and determine whether the infrastructure is financially viable to maintain.
   - Impacts of the projects: Kinnaird is likely to have a partial closure and reduced vehicle and pedestrian access. Latta bridge is likely to involve a full closure and will have detour routes.

5. **Latta Bridge Replacement**

- Existing steel span and concrete bridge constructed in 1936 and is at end of its service life. The Condition Assessment in 2019 recommended replacement as the most cost effective option.
- We are in preliminary design phase and are looking at structural options.
- New bridge will be wider. The lanes will be widened. There will be a 4.2 meter shared use path on the east side of the facility (currently have a 1.5 sidewalk). 2.8 meter sidewalk on the west side of the roadway. There will be barriers between the roadway and sidewalks.
- It is looking like the full bridge closure is the most cost effective construction option.
- The trail below the structure is a maintenance trail. We expect this will be closed during construction.
- Vegetation clearing will be done for construction laydown and safety. We will be meeting with the City Forester to determine replacement or compensation values.

Questions and comments:

- PFP: What is the status of the roadway, where is this portion of the road in the lifecycle?
    - City: Design will integrate the shared use path appropriately into either end of the bridge.
- PFP: Regarding the road surface itself, is the portion of Jasper Ave on either end of the bridge not being rehabilitated anytime soon?
    - City: That is correct. We assess roadway conditions regularly. We don't have any rehabilitation work planned for this part of the roadway anytime soon, but we may address any issues that arise year over year.

6. Kinnaird Bridge Rehabilitation

- The Kinnaird Bridge was originally constructed in 1932 along 82 Street, between 112 Avenue and 111 Avenue. The Condition Assessment in August 2019 recommended minor rehabilitation work to maintain the service life of the bridge.
- This work will require staged lane and sidewalk closures, access will be maintained with reduced volumes.
- Vegetation will need to be cleared to accommodate construction activities.

Questions and comments:

- PFP: Through this rehab there is no lane reapportionment? Will sidewalks or lane widths stay the same?
    - Stantec: Yes. The sidewalks and lanes will remain the same.
- PFP: Was there any analysis on what type of lane reduction could happen to ensure that a sidewalk or shared use path could be implemented?
    - City: Assessment was based on bridge condition. If we were in a replacement scenario, then we could look at standards and improvements. Because Kinnaird is rehabilitation changes to lanes and sidewalks were not included.
- PFP: Did you investigate proportionating the lanes differently, for example did you investigate using 3 lanes for vehicles and expanding the sidewalk width?

    - City: Bridges in the renewal program for rehabilitation are not looked at for changes to number of vehicle lanes. That would be considered as a level of service change and is out of scope for the rehabilitation project.
- PFP: I think that the rehabilitation process is an opportunity to rethink the uses. By not doing so, we are putting off and not fulfilling the bike path plan for quite a long time. I think we need to discuss the implementation of not doing that at this time. We can discuss this more during the discussion.

7. Timelines

- Preliminary Engineering, Fall 2020
- Stakeholder Meeting #1 (today) and Public Communications, Winter 2020/2021
- Detailed Design, Winter 2021/2022
- Stakeholder Meeting #2 and Public Information Session, Winter 2021/2022
- Construction, Spring 2022
- Bridges Operational, Winter 2023

Questions and comments:

- PFP: Will there be an opportunity to provide feedback on the detailed design?
    - City: No. Our next touchpoint will be prior to construction.
- PFP: I would recommend doing a check in following your detailed design – I would like to check to see whether feedback received was included in the design, that is a better practice for engagement.
    - City: Once the detailed design is done there is not much opportunity to influence the design. We are looking for that feedback now.
- PFP: When reviewing designs, we focus on the connections, placement of light standards, and nuanced design elements such as viewpoints or places to dwell. We like to have the ability to course correct if needed.

8. Discussion

Tell us about your vision and current work regarding the bike plan.

- PFP: It is a draft plan and the implementation strategy continues to be worked on. We are going to Urban Planning Committee in Spring of 2021 and will hopefully have the plan adopted. That would provide guidance for future projects. We have been working with Dan Vriend and Dallas Karhut from the City of Edmonton to develop the plan.
- PFP: This corridor is identified as a potential and future bike route. The south east edge of Jasper on Latta will be improved. Kinnaird may be an opportunity that we are not exploring fully enough, and we may not be able to provide that connection on 82nd Street from Jasper to 112 Ave. The question becomes: where can that all ages and abilities connection take place? It needs to be a feasible option that enhances the connectivity. It needs to be all seasons, all reasons, biking and rolling plan. It needs to be safe and accessible. We are interested in alternate options such as going through the stadium lands.
    - City: Kinnaird rehabilitation is very minor, almost superficial rehabilitation. We will definitely have a chat with our business partners and flag this for them for future planning. It cannot be done on this project.

- PFP: We may not need to make the bridge wider, we may be able to reallocate the lanes. We did that recently with a bridge – it isn't permanent because this summer was not business as usual. When this project is done we can't do that rethinking. We have not discussed this project with Dallas.

Is there information Paths for People would like to share with the project team regarding potential access/detours that could affect the pathway trail system during the construction activities of these projects?

- PFP: It is temporary, but you can put up bollards and barriers and to ensure detours are all ages, all abilities, that can support people biking and rolling. It should be a coherent detour that is not a maze.

Do you have any recommendations regarding dismount signs?

- PFP: Dismount signs are good if you need to dismount in a certain area. Signage needs to be placed farther away to allow for advance decision making. A good example is 61 Ave and 109 Street. I saw a sign for that at south campus. That is great advance warning. That example was for vehicles. You need to scale the signage appropriately and place the signage at the decision making points.

Would you like to provide feedback on the standards used for the Latta bridge sidewalk and shared use path?

- PFP: We are happy with what is being presented in terms of the Latta bridge.
- PFP: I am wondering why you are doing these improvements to Latta now? Is the bridge unsafe?
    - City: We are doing this to meet current standards.

Does Paths for People have communication avenues to membership and trail users that could potentially be used prior to construction?

- PFP: We have a monthly newsletter and social media feeds. We can share trail closure information widely. For this project, this is not a major active node artery at this time. We wouldn't want to share this information. We would consider sharing information prior to construction.

Do you have any questions for the project team?

- PFP: With the approach to lighting, what is the focus of that? We think it is important to effectively light the active mode space and the right of way?
    - Stantec: For Latta the existing lights are overhead and halogen. Those will be upgraded to City standards. They will be LED lighting.
    - Stantec: For Kinnaird, since there is no major roadway rehab, we will be upgrading the light post heads to LED but the pole and overhead power will most likely remain the same.
- PFP: This is the opportunity to open up some work and make it a safe space. Lighting can be improved on the sidewalks.

Have you seen recent upgrades in an SUP area, has the lighting been adequate in your opinion?

- PFP: Don't have specific examples to offer at this time.
- PFP: Our members tell us the illumination focuses on vehicles at the expense of active modes.

9. Next Steps

- Project information is available on the City websites:
    - edmonton.ca/lattabridge
    - edmonton.ca/kinnairdbridge

The meeting adjourned at 11:05 AM

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Ltd.

Zoë Rezac
Communications & Indigenous Engagement Specialist

Phone: 780 917 8188
Zoe.Rezac@stantec.com

Meeting Notes

Community Leagues Stakeholder Meeting

Latta Bridge Replacement and Kinnaird Bridge Rehabilitation

Date/Time:	February 18, 2021 / 10:00 AM
Place:	Google Meet
Next Meeting:	TBD
Attendees:	Kevin Jones, Daria Nordell, Jonathan Lawrence, Mitchell Schutta, Cyril Balitbit, David MacLaggan, Chuck Wiltzen, Zoe Rezac
Absentees:	Absentees
Distribution:	All

Safety Moment: As the weather warms our will get icy on the sidewalks again. Please remember to walk/cycle cautiously, clear snow from your sidewalk, and use salt when appropriate.

Item:

1. **Welcome & Territory Acknowledgement**

2. **Introductions**

   - McCauley Community League: Kevin Jones
   - Riverdale Community League: Daria Nordell
   - Boyle Street Community League: Jonathan Lawrence
   - City of Edmonton (City): Mitchell Schutta, Cyril Balitbit
   - BPTEC: Chuck Wiltzen
   - Stantec: David MacLaggan, Zoe Rezac

3. **Agenda Overview**

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5. Latta Bridge Replacement

- The existing steel span and concrete bridge was constructed in 1936 and is at the end of its service life. The Condition Assessment in 2019 recommended replacement as the most cost effective option.
- We are in the preliminary design phase and are looking at structural options.
- To meet current Design standards, the new bridge will be wider. The lanes will be widened. There will be a 4.2 meter shared use path on the east side of the facility (currently have a 1.5 sidewalk). 2.8 meter sidewalk on the west side of the roadway. There will be barriers between the roadway and sidewalks.
- It is looking like the full bridge closure is the most cost effective construction option.
- The trail below the structure is a maintenance trail. We expect this will be closed during construction.
- Vegetation clearing will be done for construction laydown and safety. We will be meeting with the City Forester to determine replacement or compensation values.

Questions and comments:

- Boyle Street Community League: With regard to the lane size changes, I appreciate the sidewalk increase and shared use path. With the increased lane width, traffic speed will not be reduced. I wonder where there can be opportunities to acknowledge the need for traffic calming?
    - City: Traffic calming measures are an important discussion. We have used the City standards for these bridges. Internally we can have more in depth discussion on traffic calming.
    - Stantec: What has Boyle Street Community League observed that brings traffic calming to the front of your mind?
    - Boyle Street Community League: Defocusing the City from vehicle traffic. I believe there should be conversations in general on focusing less on vehicle traffic and increasing focus on other modes of transportation. There are a lot of standards to choose from, and we don't have to choose standards that focus on vehicles.
    - Stantec: Thank you, we have that feedback documented.

- Boyle Street Community League: Another item is the foundations and trail beneath the bridge. You note that it is a maintenance trail. However, Latta Bridge access will be slated for a change over from maintenance trail to a formal trail. This is being coordinated with the Dawson Park Renewal. There should be an allowance for public art, and improved safety. Currently the trail has slippery slopes, litter, and is in need of improving the experience.
    - City: We are aware of the Dawson Park Renewal plans.

- Riverdale Community League: I am interested in the data about northbound/southbound traffic using the bridge, does it have to be four full lanes?

  - o BPTEC: The bridge is consistent with the City Plan.
  - o City: I do not have data for current traffic flow through the bridge at the moment. We did not identify this project for monitoring traffic. However, traffic modelling is being used to plan the detour routes.
  - o City: 112 Ave and Jasper Ave are your two main conduits to Rowland road. That is a significant amount of traffic that will be rerouted to 112 Ave. It is very unlikely that we can reduce the traffic to two lanes.
  - o McCauley Community League: Concerning the impact to slowing down vehicle traffic. It is four lane now, I am happy that it is continuing to be four lanes. Slower traffic creates driver frustration and leads to shortcutting down 107th and Stadium Road. Shortcutting leads to a safety hazard for our community. Shortcutting down 97 Street and 95 Street would be bad for our residents.

- Riverdale Community League: The crosswalk points can be tricky on that wide of a bridge, across 4 lanes of traffic. Will the crosswalks be adapted accordingly to improve crossing experience?
  - o City: This project is limited to the bridge abutments. There are two signalized crosswalks farther West and East of the bridge, outside of the project site. There are crosswalks within 100 meters.

- Riverdale Community League: Where is the closest trail to access to Dawson park if the maintenance path is closed?
  - o City: The closest access would be the stairwell along Rowland Road which will be used as a pedestrian detour route. Accommodating the unofficial trail users would require us to clear more trees and install stairs, at this time we have chosen not to increase the impacts of the project to remove additional trees.

- Stantec: It sounds like you and your community members are maintenance trail users. Is there information your Community Leagues would like the project team to be aware of regarding the maintenance trail?
  - o McCauley Community League: The maintenance trail is treacherous and unsafe. There is homelessness and drug use and garbage. Will they put lights underneath the new bridge? In the future can we look at making official trails down to Dawson Park. If we are making the site safer for the workers, perhaps we can utilize that after the project is done?
  - o City: This project team is coordinated with the Dawson Park Master plan. The bridge design will accommodate that new trail in the future. The options we have will allow for a trail underneath. Thank you for bringing up that idea of worker safety. We can discuss maintaining the slope and not making it steep again. We will be reinstating the trees that are removed to restore the natural area. We are not considering lighting underneath the bridge because it is considered a Naturalized Area.

- McCauley Community League: Regarding slowing the traffic, I am sure the City could install traffic cameras as a speed deterrent. There are a lot of ideas to slow it down.
- Boyle Street Community League: I want to point firmly that Boyle Street will only support a plan that not only supports pedestrians through wider sidewalks, but also must calm traffic. Research shows that we are over building roads. We would like roads to be

designed to the 50 km per hour standard rather than 70 km. Boyle Street understands we are adjacent to a thoroughfare, but our residents do not have to tolerate unsafe driving. We want to make sure that we are respecting the residents that live in the community. We can't have something that is overbuilt or unsafe.

6. Kinnaird Bridge Rehabilitation

- The Kinnaird Bridge was originally constructed in 1932 along 82 Street, between 112 Avenue and 111 Avenue. The Condition Assessment in August 2019 recommended minor rehabilitation work to maintain the service life of the bridge.
- This work will require staged lane and sidewalk closures, access will be maintained with reduced volumes.
- Vegetation will need to be cleared to accommodate construction activities.

Questions and comments:

- McCauley Community League: It doesn't sound like the walkways are getting wider. This bridge seems pretty tight. Nothing will be done on that?
  - Stantec: Currently the structure is slated for rehabilitation and does not include improvements such as wider sidewalks.
  - City: We are maintaining the current level of service. We are following the processes and moving forward with the recommendations of the Condition Assessment. The level of service is being maintained through the rehabilitation work.

- Riverdale Community League: You mentioned there would be tree clearing. Are there plans to replace the trees after?
  - Stantec: We will need to do some trimming and replacement. We will be meeting with the City Forester to assess the compensation value of the trees.
  - Riverdale Community League: Will they be planted back in the same spot?
  - Stantec: We don't have a confirmed answer on that. The City Forester will determine exactly where replacement and compensation trees are planted.
  - City: If there are excess trees that would encroach back on the bridge we will work with the Forestry team to compensate those trees in other areas.

- Boyle Street Community League: Given it is a rehabilitation, I ask the project team, have you had opportunities connected to possible improvements?
  - City: This bridge is funded under the Bridge Renewal Program. The funds need to go to rehab and repairs. There is no funding towards any upgrade work.

- Boyle Street Community League: Have you reached out to the Cromdale neighbourhood?
  - Stantec: Yes, we have invited Bellevue, Parkdale/Cromdale Community Leagues to meet with the project team as well as yourselves. We have followed up and have not received a response to date from them. If you have a contact there we would reach out to them.
  - Boyle Street Community League: I do not have a contact there to share.

7. Timelines

- Preliminary Engineering, Fall 2020
- Stakeholder Meeting #1 (today) and Public Communications, Winter 2020/2021
- Detailed Design, Winter 2021/2022
- Stakeholder Meeting #2 and Public Information Session, Winter 2021/2022
- Construction, Spring 2022
- Bridges Operational, Winter 2023

Questions and comments:

- Riverdale Community League: Question about the public information session. We have had members of the Friends of Kinnaird Ravine approach us about the public information session. They were not sure where or when the session would be happening. Members have reached out to the project email, and I heard they were unsatisfied with the response they received. Will there be an engagement opportunity, or will it only be an information session?
    - City: Friends of Kinnaird Ravine was invited to engage with the project team at a meeting like this. We are taking ideas and feedback from stakeholders. At the information session we will provide project information for construction activities and detour routes. There will be an opportunity for input on a few items such as detour signage placement.
    - City: Kinnaird Bridge Rehabilitation is technical in nature, it is a straightforward rehabilitation. For the Latta Bridge Replacement, decisions are really following standards. There are not a lot of engageable items for the general public. We are doing stakeholder engagement to provide advance information to you, hear your thoughts on the project, and take them back to our team for consideration.

- Riverdale Community League: What information can we share with our community? Are the slides available? Is there a more detailed feedback form?
    - City: The primary vehicle for project information is on the website. There is an email address where people can submit their inquiries. The next website update will be in July following preliminary design.

8. Discussion

Do you have any questions for the project team?

- Riverdale Community League: Will there be a self serve public engagement option? Riverdalians are passionate about Latta Bridge and involved citizens. What information can we share? Will you be sharing your presentation?
    - City: At this time we have not planned on posting these slides to the website. We have information to share but we want to be present to provide context to that information as well. We will go through our Communications Team and make that request. The website will be updated in July following preliminary design. Regarding your self serve form, do you have an example that you would like to share?

  - Riverdale Community League: We recently received a self serve form for the Waste project.
  - City: Thank you, we will speak with our Public Engagement team to consider a form.

- McCauley Community League: Was there any talk to the LRT folks? Has pedestrian traffic been addressed? I know there were issues around the Stadium.
  - City: We don't have any LRT infrastructure within the project limit. We have not identified anything that requires input from LRT at this time.
  - City: We did speak with LRT and ETS regarding detours and service accommodations in the area.

- Boyle Street Community League: I appreciate the opportunity to have a key stakeholder group here and learn about the projects, principles, and standards. Have you engaged with the Quarters CRL implementation team regarding design or financial resources?
  - City: As far as the Quarters team and funding goes, it is a conversation that I will start with the Quarters. Do you have someone your Community League has been working with?
  - Boyle Street Community League: Mary Ann Debrinski, she is the lead of the CRL team. Clair St. Aubin, Planner. David Holdsworth, does City wide implementation.
  - City: The concept provided by Design (which dictates the new bridge cross section and tie-in to the east and west) has considered the Jasper Avenue New Vision plan. We are limited by what is covered under the bridge renewal funding. For Latta we are working with Edmonton Arts Council. They want us to have our preliminary plans done before we meet with them.
  - Boyle Street Community League: I want to push back on that a bit. It is the City responsibility to take a one city approach to project implementation. I mean to look past public art, and look at great infrastructure and innovative design. I want you to look at the project holistically with the ARPs.
  - City: We share information with Urban Form and Corporate Strategic Development. We circulate design at 90% to that group and sit down with them to coordinate.

- Boyle Street Community League: As you move forward into detailed design. Boyle Street Community League is happy to stand with you regarding variance to standards, if there is opportunity to impact change to improve walkability and calm traffic, we are happy to provide you with support.

9. Next Steps

- Project information is available on the City websites:
  - edmonton.ca/lattabridge
  - edmonton.ca/kinnairdbridge

The meeting adjourned at 11:15 AM

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Ltd.

Zoë Rezac
Communications & Indigenous Engagement Specialist

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Meeting Notes

Royal Canadian Legion Stakeholder Meeting

Latta Bridge Replacement and Kinnaird Bridge Rehabilitation

Date/Time:	February 18, 2021 / 1:00 PM
Place:	Conference Call
Next Meeting:	TBD
Attendees:	Lise Leclair, George Dewindt, Mitchell Schutta, Cyril Balitbit, David MacLaggan, Chuck Wiltzen, Zoe Rezac
Absentees:	Absentees
Distribution:	All

Safety Moment: As the weather warms our will get icy on the sidewalks again. Please remember to walk/cycle cautiously, clear snow from your sidewalk, and use salt when appropriate.

Item:

1. **Welcome & Territory Acknowledgement**

2. **Introductions**

   - Royal Canadian Legion: George Dewindt and Lise Leclair
   - City of Edmonton (City): Mitchell Schutta, Cyril Balitbit
   - BPTEC: Chuck Wiltzen
   - Stantec: David MacLaggan, Zoe Rezac

3. **Project Overview**

   - Two bridge projects: Kinnaird Bridge Rehabilitation on 82 Street between 111 Ave and 112 Ave, and Latta Bridge Replacement on Jasper Avenue between 90 Street and 91 Street.
   - Kinnaird Bridge will be rehabilitated to extend the service life of structure through regularly scheduled assessments and maintenance.
   - Latta Bridge will be replaced, meaning the existing bridge will be demolished and a new bridge will be reconstructed.
   - The City of Edmonton does regular condition assessments as part of our life cycle processes. Condition assessments evaluate the service life and determine whether the infrastructure is financially viable to maintain.
   - Impacts of the projects: Kinnaird is likely to have a partial closure and reduced vehicle and pedestrian access. Latta bridge is likely to involve a full closure and will have detour routes.

4. **Latta Bridge Replacement**

- The existing steel span and concrete bridge was constructed in 1936 and is at the end of its service life. The Condition Assessment in 2019 recommended replacement as the most cost effective option.
- We are in preliminary design phase and are looking at structural options.
- To meet current Design standards, the new bridge will be wider. The lanes will be widened. There will be a 4.2 meter shared use path on the east side of the facility (currently have a 1.5 sidewalk). 2.8 meter sidewalk on the west side of the roadway. There will be barriers between the roadway and sidewalks.
- It is looking like the full bridge closure is the most cost effective construction option.
- The trail below the structure is a maintenance trail. We expect this will be closed during construction.
- Vegetation clearing will be done for construction laydown and safety. We will be meeting with the City Forester to determine replacement or compensation values.

Questions and comments:

- Royal Canadian Legion: I am not too concerned about that one, we aren't impacted by it.

5. Kinnaird Bridge Rehabilitation

- The Kinnaird Bridge was originally constructed in 1932 along 82 Street, between 112 Avenue and 111 Avenue. The Condition Assessment in August 2019 recommended minor rehabilitation work to maintain the service life of the bridge.
- This work will require staged lane and sidewalk closures, access will be maintained with reduced volumes.
- Vegetation will need to be cleared to accommodate construction activities.

Questions and comments:

- Royal Canadian Legion: We don't get much foot traffic here. My problem is that we have old guys coming here to play cards. When things are not normal it throws them off and they have trouble arriving. When the access changes it is hard on them. Last summer there was construction and many people had a difficult time getting into our parking lot.

- Royal Canadian Legion: They put in those bike paths but they are not used.

- Royal Canadian Legion: Normally we have quite a few people in here. If they are frustrated, they won't come. Half the customers walk with canes and walkers. Last year people couldn't make a turn they cut through our property. There is a left turn from 82 Street, and a right hand turn from 112 Ave. We are on the corner. The safe thing to do is go to 82 Street and make a right turn. If you reduce the lanes people get confused and do unsafe things.
    - Stantec: There are two accesses to the Legion. One from 82 Street in the SE corner of your property and one on 112th Street. During the rehabilitation of the bridge back in 2004, the contractor used the 82nd Street access to access the ravine. There is an unofficial trail near the memorial. The City sometimes uses that route. I spoke to a gentleman in a truck when I was on site in the fall. Regarding that access off 82 Street, that is nearly the only reasonable route to

get down into the ravine. As it pertains to closures on 82 Street. There will need to be some closures, but it will be staged. One side would be closed, then the other. We are still looking at options.

- Royal Canadian Legion: When you close one lane you are in fact putting 4 lanes of traffic into two. That is going to be bumper to bumper. Are you going to come into my yard with gravel trucks and rip up my parking lot?
    - Stantec: Any damage to existing infrastructure would have to be repaired.
    - City: We would definitely reinstate the surface or boulevard. There is a possibility to use 82 Street to access the site and isolate our construction activities from the general public.

- Royal Canadian Legion: I would have to retrain my customers. Is it illegal to make a left hand turn out of my yard?
    - City: No, but it is not a safe maneuver. With a closure on 82 Street, the detour will be 112 Ave. making a left hand turn will be tricky. Safest maneuver would be east on 112 Ave, and a right hand turn eastbound.
    - Royal Canadian Legion: Will you provide detour information to us?
    - City: Yes, the City can provide options to maneuver safely through one access point on 112 Ave.

- Royal Canadian Legion: Next year when we are back into football season that parking lot will be used for games. Those customers will be pissed off if our parking lot is closed.
    - City: Is just your members that use your parking lot?
    - Royal Canadian Legion: The general public comes in and they pay a donation to park here during games.
    - City: For that clientele you can provide them with the same figures to access the site as well.

- Royal Canadian Legion: Training would be good. Old people take a long time to retrain.
    - Stantec: How far in advance of construction would you like the detour and access information? When you say training, do you mean in person training with your customers, or is a poster and signage sufficient?
    - Royal Canadian Legion: Something we can post in the canteen would be great.
    - City: Yes we can do that.

- City: What hours do your clients come to the Legion?
    - Royal Canadian Legion: Usually from noon until 5pm. During the week they come in for supper sometimes. I have to retrain them all right now to come in due to COVID.

- Stantec: What communication methods to do you currently use with your customers?
    - Royal Canadian Legion: We are all old soldiers, we have gone through this lots before. We just let them know.
    - Royal Canadian Legion: We are busy if we have a wedding or funeral. Otherwise the draw is from 11am and is done at 2pm, so most people are gone by 5pm.

- Stantec: What access is used by delivery drivers?

- Royal Canadian Legion: Deliveries come in through the back of the building, delivery vans and taxis they all drive and deliver all the time so they are fine with changes. They know how to deal with that.
- City: Do deliveries use the 112 Avenue access? It is near a small railway track to the west.
- Royal Canadian Legion: Yes.

- Royal Canadian Legion: you are going to give me a phone number for a project manager right?
    - City: Do you use email?
    - Royal Canadian Legion: Not really, but there is an email address you can send stuff to.
    - Royal Canadian Legion: rclnorwood@shaw.ca
    - City: Alternatively you can call me (Mitchell at 780-442-1757). I will email my phone number to you.

- Stantec: Is there any other information you would like the project team to know about?
    - Royal Canadian Legion: I worry about my pavement. It is only a couple inches. Some of those trucks could rip it right up. Other than that, we have telephone poles being installed in the backyard right now. It seems to be going ok.
    - Royal Canadian Legion: The only issue is when you park your vehicles. There is a high frequency of vehicle break-in and theft. We don't want to be responsible for that.
    - BPTEC: Thank you, we will make sure the contractor knows that.

- Royal Canadian Legion: Do you know if you will be parking in our parking lot?
    - City: The contractor will identify parking locations. We have not hired a contractor yet. If the only access to the bridge site is through your property we would work with you more.
    - Royal Canadian Legion: We can work that in. That is not a problem.

6. Timelines

- Preliminary Engineering, Fall 2020
- Stakeholder Meeting #1 (today) and Public Communications, Winter 2020/2021
- Detailed Design, Winter 2021/2022
- Stakeholder Meeting #2 and Public Information Session, Winter 2021/2022
- Construction, Spring 2022
- Bridges Operational, Winter 2023

7. Next Steps

- Project information is available on the City websites:
    - edmonton.ca/lattabridge
    - edmonton.ca/kinnairdbridge

The meeting adjourned at 2:00 PM

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Ltd.

Zoë Rezac
Communications & Indigenous Engagement Specialist

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Stantec

Meeting Notes

Residents and Businesses Stakeholder Meeting

Latta Bridge Replacement and Kinnaird Bridge Rehabilitation

Date/Time:	February 25, 2021 / 10:00 AM
Place:	Google Meet
Next Meeting:	TBD
Attendees:	John Cook, Catherine Greig, Mitchell Schutta, Cyril Balitbit, David MacLaggan, Chuck Wiltzen, Zoe Rezac
Absentees:	Absentees
Distribution:	All

Safety Moment: Cyber Security. Remember to change the password on your wireless router to keep your home network safe.

Item:

1. **Welcome & Territory Acknowledgement**

2. **Introductions**

   - Catholic Social Services (CSS): John Cook, Catherine Greig
     - CSS runs a third stage shelter out of the 91 Street location. We have a lease until 2023. The property is owned by the City. We have been in the building for a very long time.
     - We do complete builds of projects. We lease many buildings in central Alberta. We are responsible for maintaining that portfolio and making sure the buildings don't fall down.
     - The 91 Street building has been recently upgraded.
   - City of Edmonton (City): Mitchell Schutta, Cyril Balitbit
   - BPTEC: Chuck Wiltzen
   - Stantec: David MacLaggan, Zoe Rezac

3. **Agenda Overview**

4. **Project Overview**

   - Two bridge projects: Kinnaird Bridge Rehabilitation on 82 Street between 111 Ave and 112 Ave, and Latta Bridge Replacement on Jasper Avenue between 90 Street and 91 Street.
   - Kinnaird Bridge will be rehabilitated to extend the service life of structure through regularly scheduled assessments and maintenance.
   - Latta Bridge will be replaced, meaning the existing bridge will be demolished and a new bridge will be reconstructed.

- The City of Edmonton does regular condition assessments as part of our life cycle processes. Condition assessments evaluate the service life and determine whether the infrastructure is financially viable to maintain.
- Impacts of the projects: Kinnaird is likely to have a partial closure and reduced vehicle and pedestrian access. Latta bridge is likely to involve a full closure and will have detour routes.

5. Latta Bridge Replacement

- Existing steel span and concrete bridge constructed in 1936 and is at end of its service life. The Condition Assessment in 2019 recommended replacement as the most cost effective option.
- We are in preliminary design phase and are looking at structural options.
- To meet current Design standards, the new bridge will be wider. The lanes will be widened. There will be a 4.2 meter shared use path on the east side of the facility (currently have a 1.5 sidewalk). 2.8 meter sidewalk on the west side of the roadway. There will be barriers between the roadway and sidewalks.
- It is looking like the full bridge closure is the most cost effective construction option.
- The trail below the structure is a maintenance trail. We expect this will be closed during construction.
- Vegetation clearing will be done for construction laydown and safety. The tree adjacent to your property may be impacted. We will be meeting with the City Forester to determine replacement or compensation values.

Questions and comments:

- CSS: The 4.2 meters will probably be right beside the building.
  - BPTEC: Yes it does look like the 4.2m shared use path will get closer to your building/property, however, we should be able to stay within City road right-of-way, and not go into your private property. When you look at the roadway approach to the bridge, you can see the roadway narrows quite a bit, so there may not be as much encroachment as initially thought. Certainly that is a consideration in our design right now. We want to minimize impacts to that property. We know that tree has heritage value and want to keep it if possible. We do envision the tree may be in conflict with the proposed shared use path.

- CSS: I have a question about access to the parking lot. The parking lot is primarily used by our staff. It is not used by clients, they generally don’t own vehicles. Hopefully you can ensure we have access to our parking lot when you are doing your traffic accommodation. Most of our staff are young women, it is not a safe neighbourhood, and I would hate to see our staff having to park across the street.
  - BPTEC: We would maintain a local access route. We are cognisant of where we would like to lay down equipment. There may be short term closure impacts. We will do our best to maintain access.
  - City: We have identified areas that the contractor can use. We have accommodated for access to your parking lot. When we get the contractor on board we will reiterate that we need to keep your access open.

- CSS: From a sound perspective, on other City projects like the 23rd Avenue overpass, I've found that the sound of vehicles going from bridge to the road is significant. There is a big bump sound as the vehicles go over the bridge. The 23rd Avenue overpass has an insanely loud transition. Our clients are sleeping at night, they have a lot of stress in their lives and often have young children with them. Sleep is really important for them. We don't want lots of noise from vehicles going across the bridge.
    - City: We have identified the construction limit to help with that vertical transition. We come back 50 meters to begin that transition.
    - BPTEC: Part of our preliminary design does look at the grade line. We are trying to provide a smooth transition onto the bridge. On 23rd Ave, those bridges are usually built on fill. The fill usually causes a bump when transitioning. We don't have a large amount of fill on this project, and are working on the grade line for a smooth transition.

6. Kinnaird Bridge Rehabilitation

- Stantec: Would you like to talk about the Kinnaird bridge?
    - CSS: No. Will be a traffic slow down instead of a direct impact. We are not worried about that project.

7. Discussion

Is there any information you would like the project team to know about?

- CSS: Where the tree sits is the playground for the building. We have a grassy area on the north east side. That is the only place the mothers and their children can go to play. That will be decreased somewhat and impacted by construction. I understand that it will get smaller in size, nothing we can do about that.
    - BPTEC: We could incorporate a provision for exclusion fencing. We would specify the contractor provide fencing to keep residents safe. We wouldn't have a crane or equipment in the playground. There will be physical work adjacent to the tree, and perhaps tree removal.
- CSS: If you took the tree out would you replace it with a larger caliber tree? That tree provides shade to the playground.
    - City: We have to prioritize the bridge over the tree.
    - BPTEC: When we look at the transition of barriers along the shared use path then we will know more about whether the tree will have to be removed. We will engage the City Forester prior to tree removal to determine replacement and compensation.

- CSS: There is a fence along the sidewalk too. Would you replace that?
    - BPTEC: We have not gotten into that level of detail yet.
    - City: Fence would be replaced like for like. Are you happy with the current fence?
    - CSS: The fence is currently 4 feet tall. It would be good to have a visual obstruction from the sidewalk to our clients using the playground.
    - City: We would have to consider the cost of like for like, versus an improvement.
    - CSS: If the new sidewalk is significantly higher, you could see over the fence because you are higher on the sidewalk. A 6 foot fence may be best. Right now

the fence is waist height. It is a privacy and safety concern for these women. They are leaving abusive situations and it would be uncomfortable if their partner would come and be able to see them.

How do deliveries and services access this building?

- CSS: No more than any other place. We have lawn maintenance, occasional furniture delivery, and janitorial services. It operates like an apartment building without all the moving. There is only one access through the parking lot.
- CSS: There are two doors to the building, one on the east and one on the west. They will need to maintain two building exits for fire.

Do you foresee any issues with accessibility?

- CSS: We have one accessible suite. Accessibility is generally not an issue.

How do your clients access the building when they arrive?

- CSS: Parking lot access to the back door is priority.

How can we best communicate construction information to CSS and your clients?

- CSS: We have a few service areas. This one is Children and Family Services. There is a VP in that area, Directors and Team Leads. We brief them on all the information. We would like your notes as a summary. We will provide that information.
- Stantec: We will send you a copy of the notes for your records. Current project information, including location maps and timelines are available on the City's website.

Do you have any questions for the project team?

- CSS: Will you assess the building foundation prior to construction? I know they did that with the LRT construction.
    - City: We have not included inspecting adjacent property foundations in the scope. I will look to see what is typically done and what can be done for this project.
    - CSS: If it won't be impacted then that is ok. I know LRT is different.
    - City: The building should be well out of the impact zone.
    - BPTEC: There is existing instability on the south side that we are aware of. As a result a cast in place concrete pile wall will be incorporated into the design to mitigate slope instability.

- CSS: You mentioned there would be utility impacts. Is there power or water going under that bridge? Will our utility service be impacted?
    - BPTEC: There are several water lines, sewer line facilities, fibre, and telecom. We are hopeful we can make adjustments during construction so as to not impact utility services.

8. Timelines

- Preliminary Engineering, Fall 2020

- Stakeholder Meeting #1 (today) and Public Communications, Winter 2020/2021
- Detailed Design, Winter 2021/2022
- Stakeholder Meeting #2 and Public Information Session, Winter 2021/2022
- Construction, Spring 2022
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9. Next Steps

- Project information is available on the City websites:
  - edmonton.ca/lattabridge
  - edmonton.ca/kinnairdbridge

The meeting adjourned at 11:00 AM

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Ltd.

Zoë Rezac
Communications & Indigenous Engagement Specialist

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Meeting Notes

Edmonton River Valley Conservation Coalition Stakeholder Meeting

Latta Bridge Replacement and Kinnaird Bridge Rehabilitation

Date/Time:	March 5, 2021 / 11:00 AM
Place:	Google Meet
Next Meeting:	TBD
Attendees:	Eric Gormley, Mitchell Schutta, Cyril Balitbit, David MacLaggan, Chuck Wiltzen, Zoe Rezac
Absentees:	Absentees
Distribution:	All

Safety Moment: Icy walks and paths that come with warmer weather. Tread cautiously, shovel your walk, and use sand/salt to protect those who traverse your sidewalk.

Item:

1. **Welcome & Territory Acknowledgement**

2. **Introductions**

    - Edmonton River Valley Conservation Coalition (RVCC): Eric Gormley
        - ERVCC is an advocacy group who reviews City development proposals to preserve and protect the river valley. ERVCC was formed about 3 years ago.
    - City of Edmonton (City): Mitchell Schutta, Cyril Balitbit
    - BPTEC: Chuck Wiltzen
    - Stantec: David MacLaggan, Zoe Rezac

3. **Agenda Overview**

4. **Project Overview**

    - Two bridge projects: Kinnaird Bridge Rehabilitation on 82 Street between 111 Ave and 112 Ave, and Latta Bridge Replacement on Jasper Avenue between 90 Street and 91 Street.
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    - The City of Edmonton does regular condition assessments as part of our life cycle processes. Condition assessments evaluate the service life and determine whether the infrastructure is financially viable to maintain.

- Impacts of the projects: Kinnaird is likely to have a partial closure and reduced vehicle and pedestrian access. Latta bridge is likely to involve a full closure and will have detour routes.

Questions and comments:

- ERVCC: There used to be a blacksmith shop there, believe it was the Latta family who were blacksmiths.

5. Latta Bridge Replacement

- Existing steel span and concrete bridge constructed in 1936 and is at end of its service life. The Condition Assessment in 2019 recommended replacement as the most cost effective option.
- We are in preliminary design phase and are looking at structural options.
- New bridge will be wider. The lanes will be widened. There will be a 4.2 meter shared use path on the east side of the facility (currently have a 1.5 sidewalk). 2.8 meter sidewalk on the west side of the roadway. There will be barriers between the roadway and sidewalks.
- It is looking like the full bridge closure is the most cost effective construction option.
- The trail below the structure is a maintenance trail. We expect this will be closed during construction.
- Vegetation clearing will be done for construction laydown and safety. We will be meeting with the City Forester to determine replacement or compensation values.

Questions and comments:

- ERVCC: The bridge will be about 7 meters wider than the old bridge?
- BPTEC: It will be about 8 meters wider. Existing lane widths do not meet current standards. Lanes will be widened, the shared use path, and wider sidewalk all contribute to the increased width.
- ERVCC: Have vehicles grown in size? Why do lanes need to be wider?
- City: Lane size is increasing due to current standards. The increase will better accommodate ETS buses. Old lane widths do not safely accommodate the mirrors on buses. Mirrors are often hit. Increased overall width is also due to the shared use path.
- ERVCC: Is there just one sidewalk right now?
- City: There are sidewalks on both sides. They are 1.5 meters in width. We should say that is substandard for today.
- ERVCC: What is the percentage increase in the width?
- BPTEC: We are adding 8 meters to a current 16-meter-wide bridge.
- ERVCC: OK that is quite a bit of impact to the Latta Ravine. Do you have any sense of how much tree clearing you are looking at to the left of the bridge? To the west of the bridge.
- City: We are calling that maintenance access path the construction access. We need to develop that trail so we can bring equipment and manpower down safely to the bridge site. We are hoping not to impact trees other than the access path.
- BPTEC: There will be clearing to accommodate the abutment and the pile wall. We want to minimize the tree removal.

- ERVCC: I know that path pretty well. I have walked that path quite a few times. Is most of the bridge building done from the top? Is most of the equipment kept at the surface level up top?
- BPTEC: For the substructure, that work is done in the valley underneath the bridge. It will be a bottom up construction.
- ERVCC: Are you talking about some big hoes?
- BPTEC: There will be drilling rigs, and grading equipment like small dozers, excavators and bobcats.
- ERVCC: There will be big impact then.
- BPTEC: We are using smaller equipment, which will take longer, but will help reduce the impact.
- ERVCC: Will the bridge go wider to the east or south?
- BPTEC: Most of the widening is to the east. We are matching the centrelines up. The main widening is to the east side.
- ERVCC: That helps me get a sense of what is being proposed. Is there a reforestation plan?
- City: There are policies in place for tree and tree impact. We are going to be restoring impacted surfaces such as laydown areas. We will be working with the city forester to compensate what is removed. We will have to plant new trees that are native to the area.
- ERVCC: Where will the laydown area be, and how much space will you need?
- City: We are of the mindset of preserving the river valley. We are going to make them as close to the work site as possible.
- BPTEC: The area adjacent to the bridge near that triangle has been identified as a potential laydown area. There is green space in the triangle that could be used. There are also two green space's north and south down Jasper Avenue that could be used for laydown. We don't anticipate needing any laydown areas beyond those.
- ERVCC: Are any of those in the valley?
- BPTEC: No, we don't want to have a laydown in Dawson Park due to impact. We don't want to touch those green spaces. Focused on Jasper Avenue use.
- ERVCC: The green spaces that you mentioned, where are those exactly?
- Stantec: [Indicating areas on slide] The grassed areas are adjacent to the sidewalk on Jasper Avenue.
- ERVCC: Up on the surface, on the table lands then?
- City: Yes. We are mandated to use existing hard surfaces as much as possible to minimize disturbance to the environment. The next thing we look at is just grassed areas. Our last option is natural areas. Natural areas are our last resort. The only reason we are disturbing the left side is for construction access.
- RVCC: OK, that triangle area will be used for access and laydown?
- City: Yes, it will be used for construction access and laydown.

6. Kinnaird Bridge Rehabilitation

- The Kinnaird Bridge was originally constructed in 1932 along 82 Street, between 112 Avenue and 111 Avenue. The Condition Assessment in August 2019 recommended minor rehabilitation work to maintain the service life of the bridge.
- This work will require staged lane and sidewalk closures, access will be maintained with reduced volumes.
- Vegetation will need to be cleared to accommodate construction activities.

Questions and comments:

- RVCC: How many trees are you thinking?
    - o Stantec: [Indicating the photo on the slides] They need to be trimmed and cleared to remove encroachment on the structure.
- RVCC: Are you talking about clearing a 5 meter strip?
- Stantec: A 5 meter strip is not the intent. We will have to remove the built-up sediment and restore it to its original condition.
- City: Majority of the works will be below the bridge in the valley. We are removing soil around the bridge footing. The work under the bridge is to reinstate the condition of when it was originally installed. We need to remove soil that has overtaken the footings. We will make every effort to keep the impact within the road right of way. At this time the majority of work will be within the road right of way.
- RVCC: What type of equipment will you need, and how will you bring it down there?
- Stantec: This bridge was rehabilitated in 2004. We will use the same access that was used then. There is a trail from the parking lot that we anticipate using. Intent would be to use small equipment due to the access constraints.
- RVCC: That is a steep hill down from the parking lot. How do you get small equipment like bobcats down there?
- Stantec: It would likely involve a skid steer and manual labour.
- RVCC: All that painting that will be done, how will that work? Do you need equipment to paint?
- Stantec: The painting will be done by local containment. A variety of methods can be used from hand tools to commercial blasters. It has to be contained. They will repaint the sidewalk braces. In previous work they did use equipment that hung off the sidewalk.
- RVCC: Do you know if they would use scaffolding?
- Stantec: Theoretically contractors can propose their methods.
- City: Using scaffolding may require more tree clearing which the City is not in favour of.
- RVCC: Will the sidewalk width be extended?
- Stantec: No, the width will stay the same.
- City: There will be no geometric improvements done on this bridge.
- RVCC: But 4.2 is the standard.
- City: The structure is not built for extensions.
- BPTEC: This is a rehabilitation on a structure that is deemed to have remaining service life. Right now, we are maintaining its current level of service.

7. Timelines

- Preliminary Engineering, Fall 2020
- Stakeholder Meeting #1 (today) and Public Communications, Winter 2020/2021
- Detailed Design, Winter 2021/2022
- Stakeholder Meeting #2 and Public Information Session, Winter 2021/2022
- Construction, Spring 2022
- Bridges Operational, Winter 2023

Questions and comments:
- RVCC: Are you meeting with the Community Leagues?

  - o Stantec: Yes we have met with Boyle Street, McCauley, and Riverdale. We have extended invitations to Parkdale/Cromdale and Bellevue Community Leagues as well.
- RVCC: What about Paths for People?
- Stantec: Yes, we have met with Paths for People.
- RVCC: I appreciate this. I will take the information back to the group. Our position is to be careful with the ravines and river valley. It is habitat for animals and birds. Our society is built so that we don't think about them as much as we should. We have a wildlife corridor running through the City. We have to keep that up for biodiversity and our own well-being as well. Anything you can do to minimize the impact to wildlife, natural flora and fauna would be good.

8. Next Steps

- Project information is available on the City websites:
  - o edmonton.ca/lattabridge
  - o edmonton.ca/kinnairdbridge

The meeting adjourned at 11:05 AM

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Ltd.

Zoë Rezac
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Meeting Notes

Edmonton Arts Council Stakeholder Meeting

Latta Bridge Replacement and Kinnaird Bridge Rehabilitation

Date/Time:	March 18, 2021 / 11:00 AM
Place:	Google Meet
Next Meeting:	TBD
Attendees:	David Turnbull, Evgeny Voutchkov, Mitchell Schutta, Joanna Young, David MacLaggan, Chuck Wiltzen, Zoe Rezac
Absentees:	n/a
Distribution:	All plus Cyril Balitbit

Safety Moment: Garden safety

Item:

1. **Welcome & Territory Acknowledgement**

2. **Introductions**

   - Edmonton Arts Council: David Turnbull, Evgeny Voutchkov
   - City of Edmonton (City): Mitchell Schutta, Joanna Young
   - BPTEC: Chuck Wiltzen
   - Stantec: David MacLaggan, Zoe Rezac

3. **Agenda Overview**

4. **Project Overview**

   - Two bridge projects: Kinnaird Bridge Rehabilitation on 82 Street between 111 Ave and 112 Ave, and Latta Bridge Replacement on Jasper Avenue between 90 Street and 91 Street.
   - Kinnaird Bridge will be rehabilitated to extend the service life of structure through regularly scheduled assessments and maintenance.
   - Latta Bridge will be replaced, meaning the existing bridge will be demolished and a new bridge will be reconstructed.
   - The City of Edmonton does regular condition assessments as part of our life cycle processes. Condition assessments evaluate the service life and determine whether the infrastructure is financially viable to maintain.
   - Impacts of the projects: Kinnaird is likely to have a partial closure and reduced vehicle and pedestrian access. Latta bridge is likely to involve a full closure and will have detour routes.

5. **Latta Bridge Replacement**

- The existing steel span and concrete bridge was constructed in 1936 and is at the end of its service life. The Condition Assessment in 2019 recommended replacement as the most cost effective option.
- We are in the preliminary design phase and are looking at structural options.
- To meet current Design standards, the new bridge will be wider. The lanes will be widened. There will be a 4.2 meter shared use path on the east side of the facility (currently have a 1.5 sidewalk). 2.8 meter sidewalk on the west side of the roadway. There will be barriers between the roadway and sidewalks.
- It is looking like the full bridge closure is the most cost effective construction option.
- The trail below the structure is a maintenance trail. We expect this will be closed during construction.
- Vegetation clearing will be done for construction laydown and safety. We will be meeting with the City Forester to determine replacement or compensation values.

Questions and comments:

- Edmonton Arts Council: Are there plans for the access pathway that goes under the bridge? How much is it used by people to access the ravine?
    - City: We have not done pedestrian monitoring. This is not currently a formal trail. There is another group within the City that is working on the Dawson Park and Kinnaird Ravine Redevelopment Master Plan. We will leave the trail in a reasonable condition following construction.
    - Edmonton Arts Council: Is that work through Open Spaces?
    - City: It is through Open Spaces Planning and Design. The master plan was done 2-3 years ago. Is your question whether there is a public access underneath the bridge?
    - Edmonton Arts Council: When we talk about public art we generally look at pedestrian traffic who can approach and view the artwork.
    - Edmonton Arts Council: I am trying to get a sense of the area and what is underneath. I know the gas station nearby is a high pedestrian traffic area. There are two green spaces which are high pedestrian areas as well. Thinking about the City of Edmonton off leash areas, I am wondering if we could look at the green spaces. I know it is outside the physical scope of the project. Would the project team have any concerns if we looked at those nearby green spaces?
    - Edmonton Arts Council: When we look at locations for public art, we look for places nearby where the art can be experienced. Sometimes there is opportunity for art to be integrated into the project. One example is the funicular. We put the art 20 meters away from the structure. One area that is of interest to me is the lookout point that is north of the bridge. I assume it is not included, but it is a great place to view the river valley. You can see nice views from the bridge itself, but there is moving traffic on the bridge so it is not as comfortable as perhaps the green space.
    - City: The green space you see to the southeast is associated with the nearby building and is fenced off. To the north east there is a small lookout space that is owned by the City and has potential for art.
    - City: This project is funded by the bridge renewal program. There is 1% for art and we are determining the calculation for the base price. We will have limitations

due to this project being a composite profile. We are looking at using the growth cost instead of the overall construction cost to determine the art amount.
- Edmonton Arts Council: The policy itself talks about publicly accessible structures. We are evaluating the accessibility and visibility of the bridges. It is a grey area in how you want to evaluate whether this project will qualify for the 1% overall budget or not. My advice is that it qualifies.
- Edmonton Arts Council: My stance is that we should look at the impact and I would like to know the dollar amount so that we know how much we are looking at. There could be a significant difference between growth and overall budgets. If there is a way that you can share the number that would help us.
- City: Growth represents 25% of the overall project, with the allotment for art being 1%. Overall expected construction cost is $15 million. We have a range of $37,000 to $150,000. We are working under the assumption that it will be only the growth amount of $37,000.
- City: Does the Art Council still use 25% as the administration fee?
- Edmonton Arts Council: Yes, the policy dictates that 20% of art funding goes towards our administration and conservation reserve. Roughly 5% goes to fees for the commissioning process. We are then looking at about $28,000 as a call out for artists. That includes their artist fees, fabrication, design, installation, and any accommodations for the work. This is where there is a big difference between what could be done.
- City: Based on preliminary discussion we anticipate the answer will be the growth dollar only. I would work under that assumption.
  - **Action item: City to communicate leadership's decision regarding the amount that will be used to calculate % for art.**

6. Kinnaird Bridge Rehabilitation

- The Kinnaird Bridge was originally constructed in 1932 along 82 Street, between 112 Avenue and 111 Avenue. The Condition Assessment in August 2019 recommended minor rehabilitation work to maintain the service life of the bridge.
- This work will require staged lane and sidewalk closures, access will be maintained with reduced volumes.
- Vegetation will need to be cleared to accommodate construction activities.

Questions and comments:

- Edmonton Arts Council: I am curious about the pathways below, and curious about the open space at the southeast end. I know the legion is at the northwest, and I am not sure about the north east corner.
  - City: There is green space on the southeast which is a bit of a playground. There is pedestrian access on the southeast corner.
  - Stantec: There is currently not an official trail underneath the bridge.
  - Edmonton Arts Council: Does the park/playground serve the citizens that live on the east side there? There is density on the southside, I wonder if those people cross the bridge to use the park.
  - City: We do not have data on the pedestrian use of the bridge.

- Edmonton Arts Council: There is the LRT station to the west. This is the Stadium LRT access. We can expect people to be crossing the bridge to access the LRT.
- Edmonton Arts Council: We have a percent for art going into the plaza side of the tracks. However, that does not address the community that is on the east side of the tracks.
- Edmonton Arts Council: What is the budget of the rehabilitation?
- Stantec: Is it about $500,000 to $700,000.
- Edmonton Arts Council: Ideally we could look at these two bridge projects as one. If we were able to convince the decision makers that we look at the full amount. I would like to think about this as procuring one artist that can link the two locations of the viewpoint and the playground. If we had $15.5 million as our total budget, I would be confident that we could come up with something that could address both sites. That is the argument I would make to the higher powers to maximize the impact to the citizens, use the full budget, procure one artist and link the context between the two project sites.

- Edmonton Arts Council: It would be useful if we could get a copy of the presentation that I could share with our team. We are happy to advocate for the full percentage and are willing to put together a presentation to showcase what could be done with the full amount. These communities are a mixed bag. I know there are a lot of young families that are settling into the neighbourhood. There are some very good opportunities for art.

7. Timelines

- Preliminary Engineering, Fall 2020
- Stakeholder Meeting #1 (today) and Public Communications, Winter 2020/2021
- Detailed Design, Winter 2021/2022
- Stakeholder Meeting #2 and Public Information Session, Winter 2021/2022
- Construction, Spring 2022
- Bridges Operational, Winter 2023

Questions and comments:

- Edmonton Arts Council: Has this been approved for construction funding?
  - City: Yes

- Edmonton Arts Council: What is the best way advocate for full percent? I really think that with the City Plan and the direction of the Cultural Plan for the City, we are considered to be partners to build the city. We would love to be able to come in and be part of the broader stakeholder engagement where we can talk about the bridgework and also give an opportunity for the community to engage with the artist.
  - BPTEC: The Dawson Park and Kinnaird Master Plan calls for connectivity. Perhaps, it would make sense to advocate for incorporation of an art feature or expansion of the lookoff area to the northeast of the bridge as this would also be an opportunity to benefit the COE vision for the Dawson Park and Kinnaird Master Plan as well as this project.

- Edmonton Arts Council: We would look to you to understand the best way to go about this.
- City: We will take this information back to our leadership team for consideration. I am trying to understand the percent for art policy. If there is going to be some more clarification in the policy that would be helpful for the management side. The current wording does not provide clear definition for what should be included in art funding.
- Edmonton Arts Council: The new City Plan does have references for public art. I will share that with you.

8. Next Steps

- Project information is available on the City websites:
  - edmonton.ca/lattabridge
  - edmonton.ca/kinnairdbridge

The meeting adjourned at 12:10 PM

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Ltd.

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Stantec

Meeting Notes

Boyle Street Outreach Team Stakeholder Meeting

Latta Bridge Replacement and Kinnaird Bridge Rehabilitation

Date/Time:	March 19, 2021 / 12:30 PM
Place:	Conference Call
Next Meeting:	TBD
Attendees:	Jenelle Slywka, Betty Rego, Brenna Stefure, Jane Anderton, Jared Tkachuk, Merissa Kirk, Miriam Dewar, Mitchell Schutta, Cyril Balitbit, David MacLaggan, Chuck Wiltzen, Zoe Rezac
Absentees:	Absentees
Distribution:	All

Safety Moment: Ladder Safety

Item:

1. **Welcome & Territory Acknowledgement**

2. **Introductions**

   - Boyle Street Outreach Team (BSOT): Jenelle Slywka, Betty Rego, Brenna Stefure, Jane Anderton, Jared Tkachuk, Merissa Kirk, Miriam Dewar
   - City of Edmonton (City): Mitchell Schutta, Cyril Balitbit
   - BPTEC: Chuck Wiltzen
   - Stantec: David MacLaggan, Zoe Rezac

3. **Project Overview**

   - Two bridge projects: Kinnaird Bridge Rehabilitation on 82 Street between 111 Ave and 112 Ave, and Latta Bridge Replacement on Jasper Avenue between 90 Street and 91 Street.
   - Kinnaird Bridge will be rehabilitated to extend the service life of structure through regularly scheduled assessments and maintenance.
   - Latta Bridge will be replaced, meaning the existing bridge will be demolished and a new bridge will be reconstructed.
   - The City of Edmonton does regular condition assessments as part of our life cycle processes. Condition assessments evaluate the service life and determine whether the infrastructure is financially viable to maintain.
   - Impacts of the projects: Kinnaird is likely to have a partial closure and reduced vehicle and pedestrian access. Latta bridge is likely to involve a full closure and will have detour routes.

4. **Latta Bridge Replacement**

- The existing steel span and concrete bridge was constructed in 1936 and is at the end of its service life. The Condition Assessment in 2019 recommended replacement as the most cost effective option.
- We are in preliminary design phase and are looking at structural options.
- To meet current Design standards, the new bridge will be wider. The lanes will be widened. There will be a 4.2 meter shared use path on the east side of the facility (currently have a 1.5 sidewalk). 2.8 meter sidewalk on the west side of the roadway. There will be barriers between the roadway and sidewalks.
- It is looking like the full bridge closure is the most cost effective construction option.
- The trail below the structure is a maintenance trail. We expect this will be closed during construction.
- Vegetation clearing will be done for construction laydown and safety. We will be meeting with the City Forester to determine replacement or compensation values.

Questions and comments:

- BSOT: What impact will it have on the parkland?
- City: The area in yellow will have temporary fencing around it. The maintenance trail will be closed. People who sleep in this area will be displaced due to the construction worksite. We will have construction lay down areas in the green space adjacent to Jasper Avenue.
- BSOT: We have found that notice helps when people are being displaced.
- City: Construction activities will begin spring 2022. Part of this meeting will be to discuss communication of construction notices.
- BSOT: Population under that bridge is transient. It is a hang out spot. Those people will need an alternative hang out spot.
- City: We will consider this and do our best to accommodate an alternative gathering spot. The construction site will only allow access to authorized personnel.
- Stantec: What characteristics would be needed in an alternate hang out spot?
- BSOT: Be mindful that under the bridge isn't visible. At the top there are citizens who complain about our campers. The folks under there are there because it isn't visible.
- City: Have you done this for other projects? What is a similar example we can look into? Do you have any success stories we can look into?
- BSOT: Years ago we did go into Dawson and do surveys and questionnaires with people camped in there. We often are not involved in these types of projects and don't have a similar example I can think of.
- BSOT: I can't think of a comparable innovation to meet the need that the bridge does meet. Bridges are spots where transient people can sleep. Bridges are hidden and provide shelter from the elements. Latta is still close to services which is what makes it popular.
- BSOT: I wonder if you could look at the Rossdale LRT. We did have campers there, I don't know what the consultation was like prior to construction with the street population.
- City: We will reach out to the LRT team and double check, could you tell us what locations would be suitable?
- **Action item: Boyle Street Outreach Team to provide suggestions for alternate locations that would meet the needs of the transient population.**
- BSOT: I don't know how construction works. Will there be a time where the bridge is fenced, but still intact, where people may want to still use it?

- BPTEC: First activity will be demolition. There will not be much time between when the fence goes up and the demolition occurs.

5. Kinnaird Bridge Rehabilitation

- The Kinnaird Bridge was originally constructed in 1932 along 82 Street, between 112 Avenue and 111 Avenue. The Condition Assessment in August 2019 recommended minor rehabilitation work to maintain the service life of the bridge.
- This work will require staged lane and sidewalk closures, access will be maintained with reduced volumes.
- Vegetation will need to be cleared to accommodate construction activities.

Questions and comments:

- BSOT: Are these happening at the same time?
- City: Yes that is correct. They would happen simultaneously starting next year.
- Stantec: Regarding changes to local trails. There are unofficial trails that are used by the local population. They are steep. The bridge structure and access will be fenced off.
- BSOT: Would that entail a displacement of folks who are in that region?
- City: We will hire a contractor this spring. The contractor will make site specific decisions like temporary fencing. We are hoping to explore co-existing construction equipment and materials with folks who live in these locations.
- BSOT: Yes and it sounds like there is more detail stuff to be flushed out.

6. Discussion

Ideas on how to mitigate the displacement of individuals:

- BSOT: I think co-existing is the right place to start. Maybe this is a liberal perspective. I imagine there would be less vandalism if the community could stay there. If there is nobody in the area except those walking by. People watch out for their own home. To work with population in there would be the best thing.
- BSTO: There are actual campers in there to the left and the right. People don’t sleep under those bridges because they are scary. To the northeast and south campers stay in there. They have structures. Nobody is underneath Kinnaird.
- BSOT: Mitigating displacement. I don’t know if this is something you would have control over. If a worker is down there and sees a camper, there could be a plan in place to not just call the police right away. We could do education to workers and provide a referral service.
- BSOT: Out team has done education for offices before, not construction specific though. We for sure could do this though.
- City: I think that if Boyle Street could prepare education materials or a 4 step guide for construction personnel that would be really beneficial.
- BSOT: We have certainly done presentations to clean up crews who will come across inhabited camps and interact with vulnerable people. If you wanted written materials instead of a presentation, we would have a prototype that we could adjust. 3-4 weeks of notice for us would be good.

How best to communicate impacts to people who may use the area? What lines of communication exist?

- BSOT: For us knowing as a team, our team and other outreach services, let us know that. If you could provide signage that is easy to interpret for people. A basic sign that will be saying the bridge will be closing. And put it under the bridge. That would help people make that connection. Set it up with ample time. Let other agencies know in the surrounding areas.
- BSOT: We can distribute information for you. We can do it in a respectful manner. You are being thoughtful in the process. We can help by talking to community before hand.
- BSOT: There is an encampment response team who interact on Wednesdays. That would be an easy way to disseminate information. There are also park rangers who are familiar with the population.
- BSOT: Another thing would be to have broad areas where signage should go. The washrooms in Dawson Park would be a good spot. The Husky gas station, and the stairs that go down to the river valley would also be good spots. Also having the coordinates (Street numbers/names) of the bridge on the signage. Not everyone knows the bridges by the names, so having the street location on the signage would be important.

Other questions or comments for the project team?

- BSOT: The weather is going to be an impact for displacement, especially if it is really cold. If there is an emergency response type solution for the folks there. The weather is something to keep in mind.
- BPTEC: The work would not start until the spring. There may be freezing weather when we do start. Over the following winter there may be cold weather. There may be some winter considerations.
- BSOT: One thing for the contractor is mindfulness about the safety of folks who may have gotten through that barrier overnight. If there is a risk of danger to people under the bridge, there should be daily checks to make sure no one gets injured.
- City: Educating contractor personnel will be a good thing. That will be critical to the success of the project.

7. Timelines

- Preliminary Engineering, Fall 2020
- Stakeholder Meeting #1 (today) and Public Communications, Winter 2020/2021
- Detailed Design, Winter 2021/2022
- Stakeholder Meeting #2 and Public Information Session, Winter 2021/2022
- Construction, Spring 2022
- Bridges Operational, Winter 2023

8. Next Steps

- Project information is available on the City websites:

- edmonton.ca/lattabridge
- edmonton.ca/kinnairdbridge

The meeting adjourned at 1:30 PM

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Ltd.

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Meeting Notes

River Valley Alliance Stakeholder Meeting

Latta Bridge Replacement and Kinnaird Bridge Rehabilitation

Date/Time:	March 23, 2021 / 1:00 PM
Place:	Google Meet
Next Meeting:	TBD
Attendees:	Kristine Archibald, Makennah Walker, Mitchell Schutta, Cyril Balitbit, David MacLaggan, Chuck Wiltzen, Zoe Rezac
Absentees:	n/a
Distribution:	All

Safety Moment: Distracted Driving

Item:

1. **Welcome & Territory Acknowledgement**

2. **Introductions**

   - River Valley Alliance (RVA): Kristine Archibald, Makennah Walker
   - City of Edmonton (City): Mitchell Schutta, Cy Balitbit
   - BPTEC: Chuck Wiltzen
   - Stantec: David MacLaggan, Zoe Rezac

3. **Agenda Overview**

4. **Project Overview**

   - Two bridge projects: Kinnaird Bridge Rehabilitation on 82 Street between 111 Ave and 112 Ave, and Latta Bridge Replacement on Jasper Avenue between 90 Street and 91 Street.
   - Kinnaird Bridge will be rehabilitated to extend the service life of structure through regularly scheduled assessments and maintenance.
   - Latta Bridge will be replaced, meaning the existing bridge will be demolished and a new bridge will be reconstructed.
   - The City of Edmonton does regular condition assessments as part of our life cycle processes. Condition assessments evaluate the service life and determine whether the infrastructure is financially viable to maintain.
   - Impacts of the projects: Kinnaird is likely to have a partial closure and reduced vehicle and pedestrian access. Latta bridge is likely to involve a full closure and will have detour routes.

5. **Latta Bridge Replacement**

- The existing steel span and concrete bridge was constructed in 1936 and is at the end of its service life. The Condition Assessment in 2019 recommended replacement as the most cost effective option.
- We are in the preliminary design phase and are looking at structural options.
- To meet current Design standards, the new bridge will be wider. The lanes will be widened. There will be a 4.2 meter shared use path on the east side of the facility (currently have a 1.5 sidewalk). 2.8 meter sidewalk on the west side of the roadway. There will be barriers between the roadway and sidewalks.
- It is looking like the full bridge closure is the most cost effective and efficient construction option.
- The trail below the structure is a maintenance trail. We expect this will be closed during construction.
- Vegetation clearing will be done for construction laydown and safety. We will be meeting with the City Forester to determine replacement or compensation values.

Questions and comments:

- RVA: Good information. Thank you for that overview. No questions at this time.

6. **Kinnaird Bridge Rehabilitation**

- The Kinnaird Bridge was originally constructed in 1932 along 82 Street, between 112 Avenue and 111 Avenue. The Condition Assessment in August 2019 recommended minor rehabilitation work to maintain the service life of the bridge.
- This work will require staged lane and sidewalk closures, access will be maintained with reduced volumes.
- Vegetation will need to be cleared to accommodate construction activities.

Questions and comments:

- RVA: No questions at this time.

7. **Timelines**

- Preliminary Engineering, Fall 2020
- Stakeholder Meeting #1 (today) and Public Communications, Winter 2020/2021
- Detailed Design, Winter 2021/2022
- Stakeholder Meeting #2 and Public Information Session, Winter 2021/2022
- Construction, Spring 2022
- Bridges Operational, Winter 2023

8. Discussion

- Stantec: The project team would like to know whether RVA can advise on connectivity issues, or potential access/detours that could impact trails users during construction of the projects?
    - RVA: I think as far as connectivity goes. There is a lot of activity due to the LRT bridge. Connectivity coming in from the north is limited already. We see these projects as helping improve that issue. Refurbishing trails and building new helps us with our mandate.

- RVA: Regarding Latta Bridge, what impact will that have to access Dawson Park?
    - City: Impacts will be to the one unofficial trail underneath the bridge. We can't explore keeping that open due to construction safety concerns.
    - RVA: Ok that makes sense. It will really be the small neighbourhood around that area that would be impacted. It appears not to impact regional connectivity from end to end of Dawson Park.

- RVA: We understand some things need to be closed for safety reasons. What is the duration of closure?
    - City: It will likely be two full seasons.
    - RVA: I assume there will be signage. Do you have links to information we can share for when we get inquiries?
    - City: We have project websites, edmonton.ca/lattabridge, and edmonton.ca/kinnairdbridge. Information on the websites will be updated as the project progresses.
    - Stantec: Other than providing information on the websites, do you expect your users to have any other communication needs?
    - RVA: I don't see the Latta trail affecting our users very much. It is more general connectivity our users are concerned with.

- Stantec: Are there any other questions or concerns you would like to discuss with the project team?
    - RVA: Not at this point. We will take the information away, compare it against our regional maps, and let you know if we have any questions.

- City: One last note I would like to touch on is the impact to trails near Kinnaird Bridge. [Referencing aerial image on slide] There is no official trail under the bridge that runs left to right. There should be no impact to the official trails east of Kinnaird Bridge as a result of this project.

9. Next Steps

- Project information is available on the City websites:
    - edmonton.ca/lattabridge
    - edmonton.ca/kinnairdbridge

The meeting adjourned at 2:00 PM

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Ltd.

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Meeting Notes

Edmonton Historical Board Stakeholder Meeting

Latta Bridge Replacement and Kinnaird Bridge Rehabilitation

Date/Time:	March 24, 2021 / 9:00 AM
Place:	Google Meet
Next Meeting:	TBD
Attendees:	Dan Rose, Mitchell Schutta, Cyril Balitbit, David MacLaggan, Chuck Wiltzen, Zoe Rezac
Absentees:	n/a
Distribution:	All

Safety Moment: Spring Ice Conditions

Item:

1. **Welcome & Territory Acknowledgement**

2. **Introductions**

   - Edmonton Historic Board (EHB): Dan Rose
   - City of Edmonton (City): Mitchell Schutta, Cy Balitbit
   - BPTEC: Chuck Wiltzen
   - Stantec: David MacLaggan, Zoe Rezac

3. **Agenda Overview**

4. **Project Overview**

   - Two bridge projects: Kinnaird Bridge Rehabilitation on 82 Street between 111 Ave and 112 Ave, and Latta Bridge Replacement on Jasper Avenue between 90 Street and 91 Street.
   - Kinnaird Bridge will be rehabilitated to extend the service life of the structure through regularly scheduled assessments and maintenance.
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   - The City of Edmonton does regular condition assessments as part of our life cycle processes. Condition assessments evaluate the service life and determine whether the infrastructure is financially viable to maintain.
   - Impacts of the projects: Kinnaird is likely to have a partial closure and reduced vehicle and pedestrian access. Latta bridge is likely to involve a full closure and will have detour routes.

5. Latta Bridge Replacement

- The existing steel span and concrete bridge was constructed in 1936 and is at the end of its service life. The Condition Assessment in 2019 recommended replacement as the most cost effective option.
- We are in the preliminary design phase and are looking at structural options.
- To meet current Design standards, the new bridge will be wider. The lanes will be widened. There will be a 4.2 meter shared use path on the east side of the facility (currently have a 1.5 sidewalk). 2.8 meter sidewalk on the west side of the roadway. There will be barriers between the roadway and sidewalks.
- It is looking like the full bridge closure is the most cost effective and efficient construction option.
- The trail below the structure is a maintenance trail. We expect this will be closed during construction.
- Vegetation clearing will be done for construction laydown and safety. We will be meeting with the City Forester to determine replacement or compensation values.

Questions and comments:

- EHB: Thanks for the info. My first thought as a cyclist is that the shared use path will be wonderful. I don't think the structure is flagged as a historical resource. You referenced the plaque, I am not sure whether it is a EHB plaque. I will have to confirm whether that sits under the City of Edmonton proper. I would like to make sure we have some provision on where that ends up. Biggest question I have is whether there has been any consideration of salvage of material?
- City: We have considered saving the plaque and the second is the time stamped stones (the date block). We would like to preserve those date stones. As far as the steel or concrete is concerned, we have not considered preserving those. It is not an aesthetically pleasing bridge.
- BPTEC: The existing paint is lead. Handling or saving bridge steel that is painted with lead is challenging. We are looking at a handrail design to maintain the look and feel of the bridge.
- EHB: Salvage of the material for other uses was the question.
- Stantec: The team answered your question in terms of preservation or reuse of existing bridge elements. Was part of your question about sustainability and whether the material can be recycled?
- EHB: Yes.
- BPTEC: This material could not be reused or recycled due to the lead paint. There is no structural salvage capacity.
- EHB: We appreciate the simplicity of the design that you have proposed.
- City: A couple options we are considering is steel versus concrete bridge. Do you have any recommendations for one or the other?
- EHB: I don't think we would have a strong opinion on the subject, given that the structure doesn't have a level of historic protection. If you are interested in replicating the design, that is awesome. But there is no historical status so we are not too concerned.
- BPTEC: We have received Historical Resources approval. One of the conditions of the approval was to provide Alberta Culture (AC) with documentation including historical documentation and black and white photographs. That has been completed and

submitted to AC. In addition the bridge was also laser scanned but this wasn't submitted to AC.
- EHB: Have you spoken to the City of Edmonton Heritage Management unit (David Johnston and Scott Ash)?
- City: We reached out to David Johnston early in the project.

6. Kinnaird Bridge Rehabilitation

- The Kinnaird Bridge was originally constructed in 1932 along 82 Street, between 112 Avenue and 111 Avenue. The Condition Assessment in August 2019 recommended minor rehabilitation work to maintain the service life of the bridge.
- This work will require staged lane and sidewalk closures, access will be maintained with reduced volumes.
- Vegetation will need to be cleared to accommodate construction activities.

Questions and comments:

- EHB: No questions, I think that is straightforward. Structural work makes sense.
- EHB: There is a fair amount of history in Rat Creek as well. I think this first crack is pretty good. The scale of rehabilitation seems appropriate. I am glad you are considering rehabilitation. By the time you get to replacement we will have it designated and will ask you to preserve it.
- City: The dimensions are not changing, sidewalks are not changing, structure is staying the same. Regarding aesthetics we have not indicated paint colour.
- Stantec: The paint would be specified to match what is there now.
- EHB: If it was a designated or protected bridge we would request that you keep the handrails.
- Stantec: We are not changing the handrails. The roadway barrier on Kinnaird is similar to what is on Latta. The railing is not exactly the same. The only thing we are doing on Kinnaird is repairing some broken grout pads and bolts.
- EHB: Are those railings originals? In an old picture it looks like they are similar.
- Stantec: I would have to double check. They may have been upgrading in 2004. (Post meeting confirmation that railings were replaced in 2004.)
- EHB: That is a common upgrade because the railings were notoriously low. Safety will always trump the heritage concern. The Kinnaird bridge structure inspires curiosity and that is the type of aesthetic that we seek to preserve.

7. Timelines

- Preliminary Engineering, Fall 2020
- Stakeholder Meeting #1 (today) and Public Communications, Winter 2020/2021
- Detailed Design, Winter 2021/2022
- Stakeholder Meeting #2 and Public Information Session, Winter 2021/2022
- Construction, Spring 2022
- Bridges Operational, Winter 2023

8. Discussion

- Stantec: We have spoken about this already, the project team was interested in your advice regarding the heritage and historical features associated with the bridge projects. Is there anything else you would like to add to what you have already provided?
  - EHB: I think this has been a thorough overview. Knowing the plaque and date stamp is covered is good. Minor design treatments, ways to incorporate the history of the people who the bridge was named for are nice to do. Could it be incorporated into a sidewalk stamp perhaps? Can you physically embed some interpretation? Similar to a public art approach.
  - City: It is a good question. I'd say fundamentally we are keeping the name. In one respect that is continuing the 'heritage and history' of the bridge. If we wanted to make a passionate argument for the steel option we could do that since Mr. Latta was a blacksmith. We do have the plaque and the date stones that we are intending to preserve.
  - EHB: Preserving the name, and the case for steel is a nice touch and homage to the structure and the history.

9. Next Steps

- Project information is available on the City websites:
  - edmonton.ca/lattabridge
  - edmonton.ca/kinnairdbridge
  - Questions can be directed to the project email on the website

The meeting adjourned at 10:00 AM

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Ltd.

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Stakeholder Meeting

Latta Bridge Replacement and Kinnaird Bridge Rehabilitation

Transportation Planning and Design

Integrated Infrastructure Services
Infrastructure Planning and Design

Agenda

- Project Overview
- Latta Bridge Replacement
- Kinnaird Bridge Rehabilitation
- Timelines
- Discussion
- Next Steps

Edmonton

Project Overview

Rehabilitation (Kinnaird):
Extend service life of structure through regularly scheduled assessments and maintenance.

Replacement (Latta):
When infrastructure has reached a point where rehabilitation is no longer economical. Existing bridge does not meet current City standards. Includes demolition and construction of a new bridge.

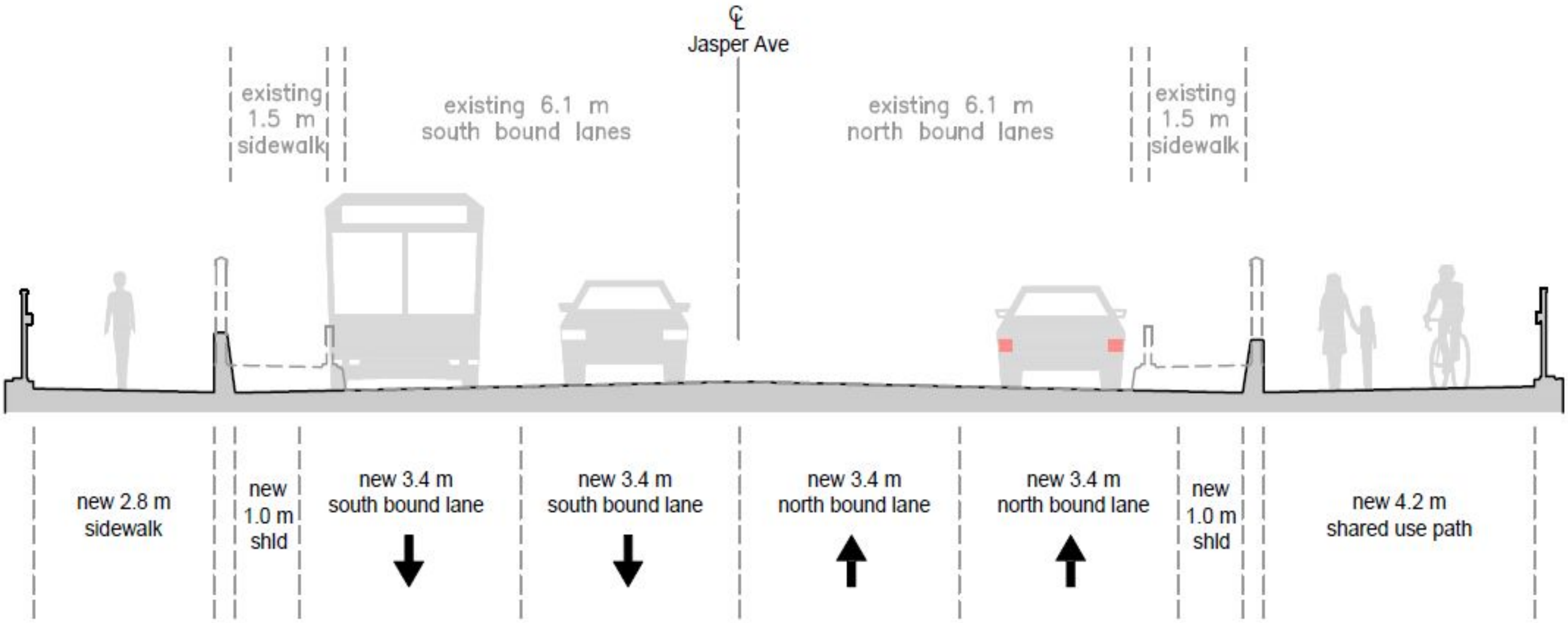
Latta Bridge Replacement

Activities:

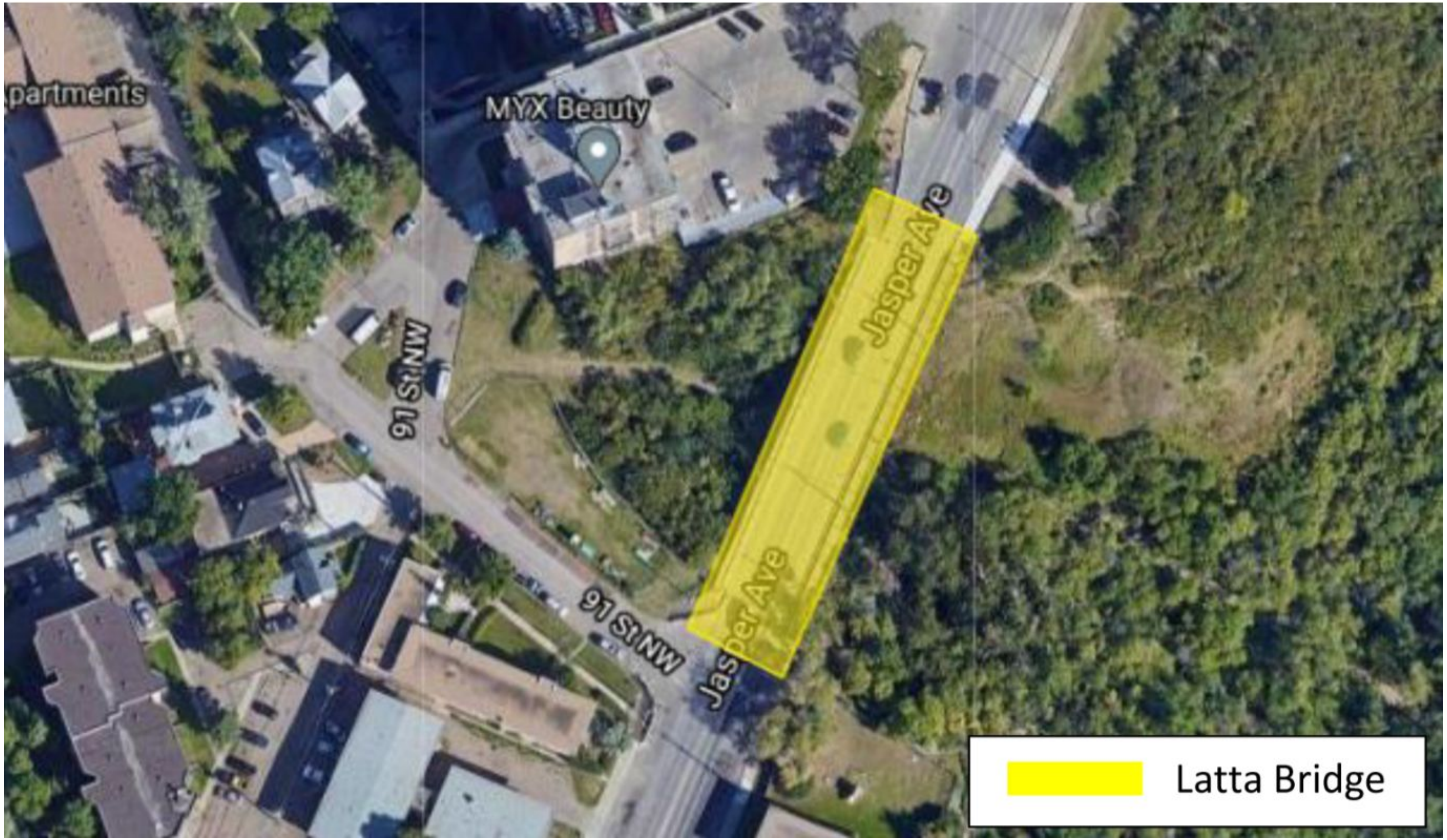
- Demolish and remove existing structure
- Utility coordination
- Installation of new bridge and foundation
- Replace sidewalk and adding new shared-use pathway
- Install new light poles

Edmonton

Latta Bridge Cross Section



Latta Bridge Project Limits



Kinnaird Bridge Rehabilitation

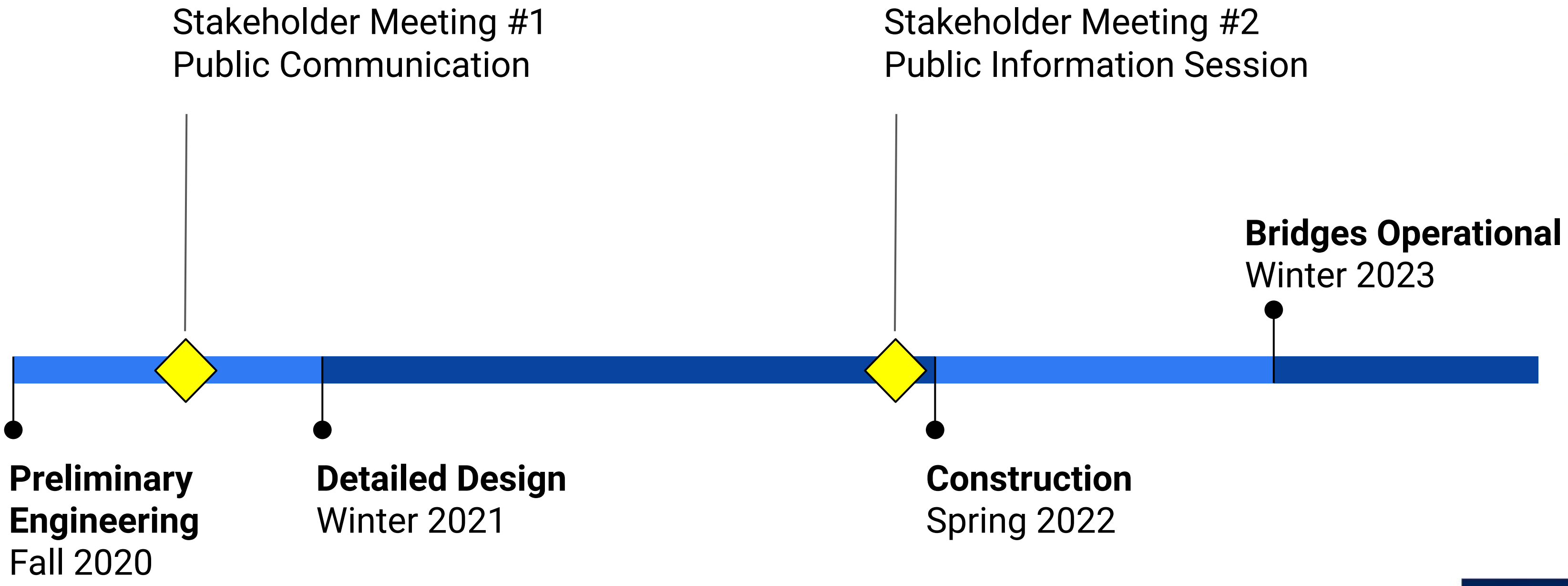
Activities:

- Sealing the deck
- Strengthening piers for increased load
- Regrading under bridge
- Installing non-skid epoxy on sidewalks
- Painting bottom of piers and sidewalk supports

Edmonton

Kinnaird Bridge Project Limits

Anticipated Timelines



Discussion

Next Steps

Project information is available on our websites:

edmonton.ca/**lattabridge**
edmonton.ca/**kinnairdbridge**

Thank you

Contact information:
Mitchell Schutta, Project Manager
transportationplanninganddesign@edmonton.ca

Appendix O: Mitigation and Permitting Actions Summary by Project Phase

Project Phase		Proposed Mitigation or Management Action	Required to meet Regulations/Bylaw, i.e., Mandatory*	Completed or Outstanding
Detailed Design	**VEC**			
	Slope Stability	Ensure that detailed design includes requirements to: 1) Complete a grouting program at each bridge foundation location in advance of foundation construction to fill any voids and prevent future subsidence. 2) Construct a pile wall near the toe of the south headslope.	See note below**	
	Slope Stability	See measures summarized in EIA, Section 5.2.1 and refer to Thurber (2021a) Appendix B.		
	Soil Contamination	Update draft Construction Management Plan (aka Soil Contamination Risk Management Plan) for the project to ensure that all contaminated soil within the project footprint will be removed, disposed of, and replaced with clean soil.	Yes	
	Vegetation	City Forestry to assess/value forested lands in project area and City to comply with Coporate Tree Management Policy C456C		Forestry conducted a site review in June 2021
	Vegetation	Prepare a landscape/reclamation plan and use only native species		
	Vegetation	Attempt to design to avoid impacting Heritage Tree; compensate for loss if not possible		
Construction				
	Permit Acquistion	City of Edmonton Parkland Bylaw (Bylaw 2202) – City or contractor		
	Slope Stability	1) Complete a grouting program at each bridge foundation location in advance of foundation construction to fill any voids and prevent future subsidence. 2) Construct a pile wall near the toe of the south headslope.		
	Slope Stability	See measures summarized in EIA ,p. 32, Section 5.2.1 and refer to Thurber (2021a) Appendix B.		
	Soil Contamination	Contractor to comply with final construction management plan or adapt plan for approval by City.	Yes	
	Vegetation	Contractor to prepare Tree Protection Plan		
	Vegetation	Contractor to prepare ECO Plan that includes weed management measures for construction and during warranty period	Enviso requirement	
	Wildlife	Avoid tree and shrub clearing/removal during the period 15 February and 20 August.	Yes	
	Wildlife	If clearing/removal must occur during this time period, nest sweeps by a qualified biologist will be required to identify active nests and appropriately buffer them until the nest is no longer active.	Yes	
	Wildlife	ECO Plan to include appropriate wildlife/worker encounter protocols		
	Historical Resources	In the event of Discovery of Historic Resources suspend all work and contact ACMSW as described in the project's *Historic Resources Ac* t Approval.	Yes	
	General Environmental Management	During demolition, Contractor to ensure proper containment measures in place to capture all lead paint and other debris from entering the environment. Store and dispose of in compliance with legislation.	Yes	
	General Environmental Management	Contractor to provide a spill prevention and emergency response plan and hazardous waste management plan. The plans must also include construction monitoring protocols and frequency.	Enviso requirement	
	General Environmental Management	Contractor to prepare a site-specific, temporary ESC plan, to City of Edmonton specifications, and a site-specific care of water plan.	Enviso requirement	
	Monitoring Commitments	Weekly monitoring by contractor as part of ECO Plan during site preparation and construction, including ESC monioring by a CPESC, and weed control monitoring	Enviso requirement	
	Monitoring Commitments	City to monitor implementation and efficacy of Tree Protection Plan		
	Monitoring Commitments	Contractor to implement ongoing slope stability monitoring of the geotechnical instrumentation		
Operation		No mitigation measure required for operation, other than standard City road maintenance environmental measure protocols		

** if not identified as mandatory, proposed mitigation should be treated as a recommended project action that would meet guidelines or result in best management practice*
*** recommended by geotechnical specialist to achieve acceptable design*