



**re: Settlement Surcharge Monitoring Program**

Proposed Commercial Development  
5510 Boundary Road - Ottawa, Ontario

**to:** Day and Ross – **Tony Reid** – [tony.reid@dayross.com](mailto:tony.reid@dayross.com)

**date:** August 12, 2024

**file:** PG4592-MEMO.02

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Further to your request, Paterson Group (Paterson) has prepared the following memorandum to outline the scope of work to complete a settlement surcharge monitoring program for the proposed building to be located at the subject site. The current memorandum should be read in conjunction with the Geotechnical Investigation Report (Paterson Group Report PG4592-1 dated September 10, 2018).

## **1.0 Background**

Paterson reviewed the following drawing prepared by Novatech as part the current memorandum:

- Grading Plan – 5110 Boundary Road – Project No. 118168, Drawing No. 118168-GR, Revision 2 dated May 28, 2024.

Based on our review of the above-noted drawing, it is understood that the proposed finished grading for the proposed building will exceed the permissible grade raise recommendations provided by Paterson. To reduce and/or remove the requirements for lightweight fill (LWF) within portions of the proposed development, Paterson has prepared a settlement surcharge monitoring program for the proposed building, and servicing alignments within the subject site. Paterson should be notified if any changes to the proposed grading occur to review whether changes to the proposed surcharge program should be made.

## **2.0 Surcharge Fill Placement**

The proposed settlement monitoring program for the subject building will consist of one surcharge pile, extending 2 m above the proposed finished floor elevation (FFE), corresponding to a height of approximately 5.5 to 5.7 m above the native ground surface and 3.5 to 3.6 m above the existing ground surface, within the specified area. Reference should be made to the Proposed Surcharge and Settlement Plate Location Plan drawing, attached to the current memorandum, for the specified area to be surcharged.





The existing ground surface is located at, or slightly below, the proposed finished grades due to the existing fill material located across the site. It is recommended that the surcharge pile be built over the existing ground surface, extending 2 m above the finished floor slab elevation and 2.4 m horizontally beyond the exterior of the foundation walls. However, it should be noted that the surcharge material would need to be removed to the underside of footing elevation, at the location of the building strip and pad footings at the time of construction. Material located beneath the building floor slab, which has been surcharged, can remain in place.

Fill material placed for construction of the surcharge pile may consist of imported fill material used for site grading and/or site sourced fill material, silty clay to silty sand, glacial till, and/or blast rock, free of oversized boulders, and approved by Paterson at the time of placement. Precautions should be taken to avoid mixing of the existing site-excavated fill material and any imported granular fill to be reused for grading on site. It should be noted peat and topsoil are not suitable for placement as surcharge pile material.

A materials testing and inspection program should be completed by Paterson to review the subgrade prior to fill placement and determine the level of compaction achieved during fill placement. Following completion of the monitoring program and removal of the surcharge materials, a final subgrade review for building construction will be required. Any soft or poor performing areas should be removed and backfilled with appropriate backfill material. Additional fill placement for subgrade improvement is detailed under the latest revision to the geotechnical report.

### **3.0 Settlement Surcharge Monitoring Program**

The program outlined on the following page provides recommendations for the scope of work required to construct the settlement surcharge monitoring program, installation of the settlement monitoring plates and temporary benchmark (TBM), two independent baseline surveys to establish the initial elevation of the monitoring points, follow-up settlement monitoring survey events, progress memorandum reports and a final review and memorandum report upon completion of the settlement monitoring program.

#### **3.1 Surcharge Pile Construction and Fill Placement Details**

The surcharge pile for the current program should be implemented according to the following recommendations:

- Topsoil should be removed from within the footprint of the proposed building.
- The surcharge pile should extend across the area identified on the drawing Proposed Surcharge and Settlement Plate Location Plan, attached to the current memorandum, based on proposed construction plans.



- ❑ The surcharge pile should be placed to the elevations indicated on the above-noted plan, corresponding to a height of 3.5 to 3.6 m above the existing ground surface.
- ❑ Fill material for the surcharge program should be placed in maximum 300 mm thick loose lifts and compacted with the tracks of the leveling equipment (i.e. bulldozer), **under dry conditions and above freezing temperatures**. Based on our experience, surcharge material that is not placed according to these recommendations typically consolidates well below the proposed elevation requiring a future top-up.
- ❑ Care should be taken not to introduce snow and ice to the fill material. Any snow and ice present should be scraped off the surcharge pile as well as fill stockpiles prior to placement. Based on our experience, snow and ice left in place during fill placement significantly contributes to consolidation below the proposed height requiring a future top-up.
- ❑ The top of the surcharge pile should extend a minimum of 2.4 m horizontally beyond the building footprint.
- ❑ The side slopes of the surcharge pile should be placed at a minimum of 1.5H:1V to achieve stable side slopes and mitigate sloughing, with a small ramp (2 m wide) being constructed at a minimum of 2H:1V to provide access for the survey crew.
- ❑ Top-ups of the fill material may be required in the future as total settlement occurs and lowers the height of the surcharge pile.

### 3.2 Settlement Plate and Benchmark Installation

The installation of the SPs and TBMs, as well as the initial baseline surveys and data preparation will be conducted according to the following methodology:

- ❑ Paterson will install a total of **4 settlement monitoring plates (SPs)** within the proposed pile, using a hydraulic excavator supplied by the site contractor.
- ❑ The settlement plates will be placed at the proposed underside of footing elevation within the footprint of the proposed building.
- ❑ The settlement plates will be extended to the top of the surcharge pile.
- ❑ Paterson will install a total of **1 temporary benchmark (TBM)**, consisting of a settlement plate placed on undisturbed, native soil, a minimum of 1.8 m below the existing ground surface and a minimum of 30 m from the edge of the nearest pile.
- ❑ **Fill stockpiles should not be placed within 30 m of the TBM.**
- ❑ The TBM will serve as a geodetic elevation reference point to accurately monitor the settlement of the surcharge pile. Paterson will assign a geodetic elevation to the TBM using a high accuracy GPS unit.
- ❑ The SP and TBM materials will be supplied and installed by Paterson Group.



- ❑ Paterson will conduct two independent baseline surveys, immediately following settlement plate installation, to establish the initial geodetic elevation of the settlement plates and verify the accuracy of the survey results.
- ❑ Backfilling around the settlement plates should be done immediately after installation to avoid frost migration into the underlying soil.
- ❑ The settlement plates should be installed once the fill material reaches an approximate geodetic elevation of 78.0 m.
- ❑ At the time of installation, a protective cone of fill material should be placed around each settlement plate and extend to the proposed top of surcharge pile height.
- ❑ The constructability methodology is presented below:

#### Settlement Plate Installation

- The contractor can begin fill placement prior to the installation of the settlement plates.
- The settlement plates should be installed when the fill has reached a geodetic elevation of 78.0 m.
- Each SP will be installed by excavating to the underside of footing elevation, placing the SP on the existing fill material or native soil subgrade, backfilling and extending the plate and cone up to the proposed surcharge elevation.
- Paterson will conduct the baseline survey immediately following backfilling the SPs (or construction of the cone) and TBM establishment.
- The contractor will then place the remaining fill material up to the proposed top of surcharge elevation.

### **3.3 Settlement Monitoring Program**

The settlement monitoring program will consist of the following:

- ❑ A two-person crew will complete a settlement monitoring survey event of the settlement plates using a high accuracy, digital level. The surveys will be conducted on a monthly basis.
- ❑ The newly established TBM will be utilized as geodetic elevation reference point for the periodic monitoring events.
- ❑ The first settlement survey event will be conducted one month from the date of the initial baseline survey.
- ❑ It is anticipated that a total of 18 months will be required to complete the settlement monitoring program, corresponding to 18 survey events, with the first survey event being conducted one month from the date of the initial baseline survey and the final survey event taking place approximately 18 months from the completion of fill placement and the initial baseline survey.



We trust that the current submission meets your immediate requirements.

Best Regards,

**Paterson Group Inc.**

Kevin A. Pickard, P.Eng.



David J. Gilbert, P.Eng.

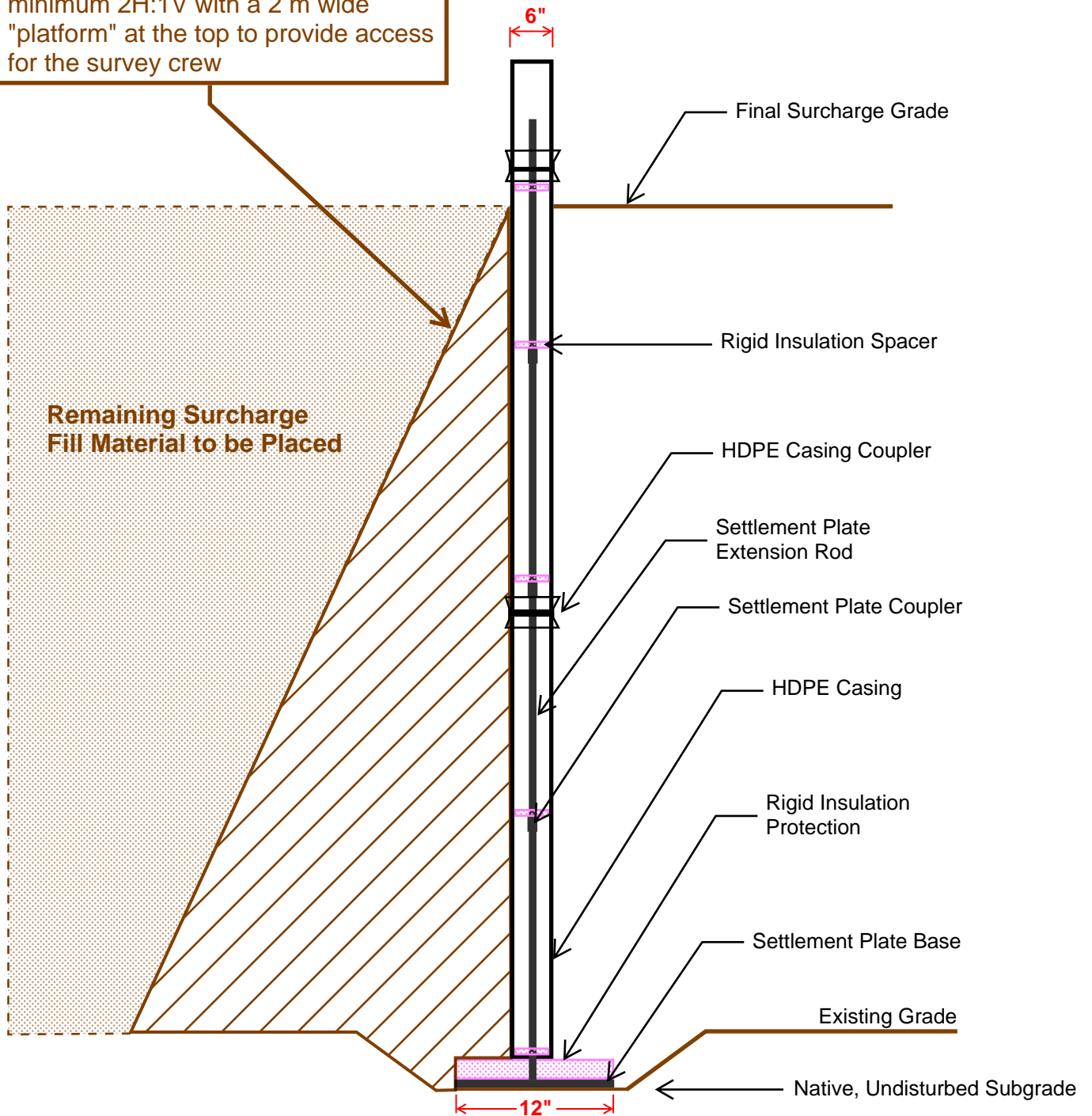
**Attachments:**

- Figure 1 – Typical Settlement Plate Detail
- Proposed Surcharge and Settlement Plate Location Plan



**Protective cone around settlement plate during fill placement:**

- Cone to be placed to proposed surcharge height.
- One side of cone should be placed minimum 2H:1V with a 2 m wide "platform" at the top to provide access for the survey crew



**NOTE:** If pre-engineering is required below the underside of footing or road sub-base, the settlement plate will be placed on the top side of the engineered fill.



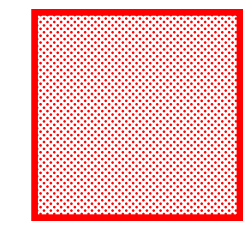
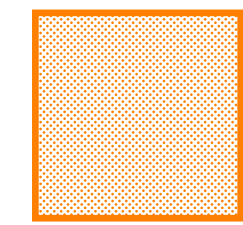


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**Figure 1 - Typical Settlement Plate Detail**

**PG4592**

**5110 Boundary Road**

**LEGEND**

-  - PROPOSED SURCHARGE PILE
-  - PROPOSED SURCHARGE PILE SIDE SLOPE
-  **SP 1-24** - PROPOSED SETTLEMENT PLATE
-  **TBM 1-24** - PROPOSED TEMPORARY BENCHMARK (TBM)

**NOTES**

- FINISHED FLOOR ELEVATION = 79.5 m.
- TOP OF SURCHARGE PILE ELEVATION = 81.5 m.
- THE TOP OF THE SURCHARGE PILE SHOULD EXTEND A MINIMUM OF 2.4 m BEYOND THE BUILDING FOOTPRINT IN ALL DIRECTIONS.
- THE SIDE SLOPES OF THE SURCHARGE PILE SHOULD BE SLOPED AT A MINIMUM OF 1.5H:1V.
- THE SETTLEMENT PLATES SHOULD BE PLACED AT THE UNDERSIDE OF FOOTING ELEVATIONS AND EXTEND TO THE TOP OF THE SURCHARGE PILE.
- THE TBMs SHOULD BE PLACED ON NATIVE, UNDISTURBED SOIL, A MINIMUM OF 1.8 m BELOW THE EXISTING GROUND SURFACE, AND LOCATED A MINIMUM OF 30 m FROM THE NEAREST EDGE OF THE SURCHARGE PILE.
- PATERSON WILL SUPPLY AND INSTALL THE SETTLEMENT PLATES AND TBMs.
- THE SETTLEMENT PLATES SHOULD BE INSTALLED WHEN THE FILL HEIGHT IS AT AN APPROXIMATE ELEVATION OF 78.0 m. A PROTECTIVE CONE OF FILL MATERIAL, EXTENDING TO THE TOP OF PILE ELEVATION, SHOULD BE PLACED AROUND EACH SETTLEMENT PLATE.
- TOPSOIL SHOULD BE STRIPPED WITHIN THE FOOTPRINT OF THE PROPOSED BUILDING
- ACCEPTABLE FILL ABOVE THE EXISTING GROUND SURFACE MAY CONSIST OF NON-FROZEN, EXISTING FILL MATERIAL, BROWN SILTY CLAY, SILTY SAND, GLACIAL TILL AND/OR BLAST ROCK, FREE OF OVERSIZED BOULDERS. THE FILL SHOULD BE PLACED IN MAXIMUM 300 mm THICK LOOSE LIFTS AND COMPACTED USING THE TRACKS OF THE EQUIPMENT TO MINIMIZE VOIDS.
- NO ADDITIONAL FILL SHOULD BE PLACED WITHIN 30 m OF THE SURCHARGE PILE THROUGHOUT THE SETTLEMENT MONITORING PERIOD.
- THE CURRENT DRAWING IS BASED ON DRAWING 118168-GR - GRADING PLAN - REVISION 2 DATED MAY 28, 2024, PREPARED BY NOVATECH.

