# SOIL-MAT ENGINEERS & CONSULTANTS LTD.

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**PROJECT NO.: SM 166905-G** March 8, 2019

LANDFORM DEVELOPMENT GROUP INC.
980 Fraser Drive, Suite 205
Burlington, Ontario
L7L 5P5

Attention: Mr. Andrew Bear, CPA, CA

**SUPPLEMENTAL GEOTECHNICAL COMMENTS**
**PROPOSED MULTI-STOREY BUILDING**
**401 TO 417 MARTHA STREET**
**BURLINGTON, ONTARIO**

Dear Mr. Bear,

Further to our geotechnical investigation report [SM 166905-G, dated September 29, 2016] and subsequent supplemental slope stability assessment [SM 166905-G, dated March 24, 2017], it is understood that the City has requested further comment on the following:

1. Review/confirm long term stable top of slope and add this to a site plan.
2. Review/confirm top of bank and add this to a site plan.
3. Confirm toe erosion allowance
4. Review the proposed foundation locations and comment on construction of P2-P4 parking levels adjacent to the creek.

## SLOPE CONSIDERATIONS

The top of stable slope location is determined by the application of an erosion allowance at the toe and a stable slope inclination through the slope. Given the current condition of silty sand fill overlying Queenston Shale bedrock at relatively shallow depths, a conservative erosion allowance of 4 metres has been applied.

Table 4.3 of the Ministry of Natural Resources publication “Geotechnical Principles for Stable Slopes” indicates stable slope inclinations through cohesionless sands and gravels from 1.5 to 2.0 horizontal to 1.0 vertical. Based on the subsurface soil conditions and observations made on site, as described above as silty sand fill, a conservative stable slope allowance of 2.5 horizontal to 1 vertical has been considered. Applying the

erosion allowance and stable slope inclination from the 'toe' of the slope provides for a conservative long-term Top of Stable Slope location of approximately 6.7 and 3.5 metres back of the Physical Top of Slope [Top of Bank] as marked on the topographic survey created by Mackay, Mackay, & Peters Limited, dated April 27, 2017, for Slope Profiles A-A, and B-B respectively. This Top of Stable Slope line would roughly follow the contour of the Top of Bank, and has been illustrated on the attached Drawing No. 1

As stated in our initial slope stability assessment, the slope would predominately be considered stable in the short and long term, as much of the slope is flatter than 3.0 horizontal to 1.0 vertical, with only small areas of localized steepness observed. As this section of Rambo Creek is not under the jurisdiction of Conservation Halton, with much of the creek entombed upstream of the subject site, slope stabilisation efforts, such as an engineered earth embankment or retaining wall structure as mentioned in our March 24, 2017 report, can be appropriately implemented. This would have the benefit of further protecting the overall long-term stability of the slope, and could also effectively move the Top of Stable of Stable Slope closer to the Top of Bank. In addition, as the proposed structure is currently proposed to be founded roughly 14 metres below grade, well below the toe of the existing slope, no load would transfer from the foundations to the existing slope and so there would be no impact on the stability of the slope as a result of the new structure.

## UNDERGROUND CONSTRUCTION CONSIDERATIONS

As stated above, as the proposed structure is currently proposed to be founded roughly 14 metres below the grade of the existing roadway, well below the elevation of the creek, the foundations would not transfer any load to the existing slope. As discussed in our original September 29, 2016 geotechnical investigation report, excavations will to extend well into the Queenston Shale bedrock, and below the static groundwater elevation which has been measured at approximately 5 metres below the level of the roadway, roughly coincident with the level of the creek. Excavations into the Queenston Shale bedrock will become more difficult with depth requiring the use of mechanical rock splitter equipment. All excavation support must be designed as per the comments in our original report, the Occupational Health and Safety Act, and the Canadian Foundation Engineering Manual.

Significant groundwater infiltration should be expected through more permeable seams/fissures of the Queenston Shale bedrock. The groundwater control requirements will be influenced by the excavation shoring method. It may be possible to adequately control water infiltration through means of construction dewatering and permanent perimeter drainage by pumping, however a more in depth hydrogeological assessment

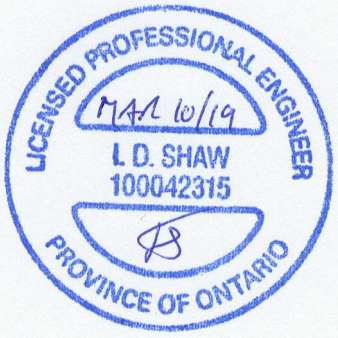
would be beneficial to help estimate the infiltration rate of water to be controlled. It is also noted that a permit to take water would be expected to be required for higher infiltration rates. This approach would require significant pumping for dewatering both during construction and in perpetuity to protect the structure.

Alternatively, it would be technically preferred for the foundation walls and basement floor slab to be designed to be water-tight and eliminate the need for permanent drainage systems. This would involve the use of appropriate available membrane systems against the foundation walls, around the footings, and beneath the basement slab. The manufactures of such systems should be consulted on the most appropriate and effectively options for the give conditions. This office should also be involved in review of the design and construction of the water proofing system. The foundation walls and slab would also be designed and constructed to resist the hydrostatic pressures.

We trust that this supplemental geotechnical report is sufficient for your present requirements. Should there be any questions regarding the content or comments within this report please do not hesitate to contact our office.

Yours very truly,
SOIL-MAT ENGINEERS & CONSULTANTS LTD.

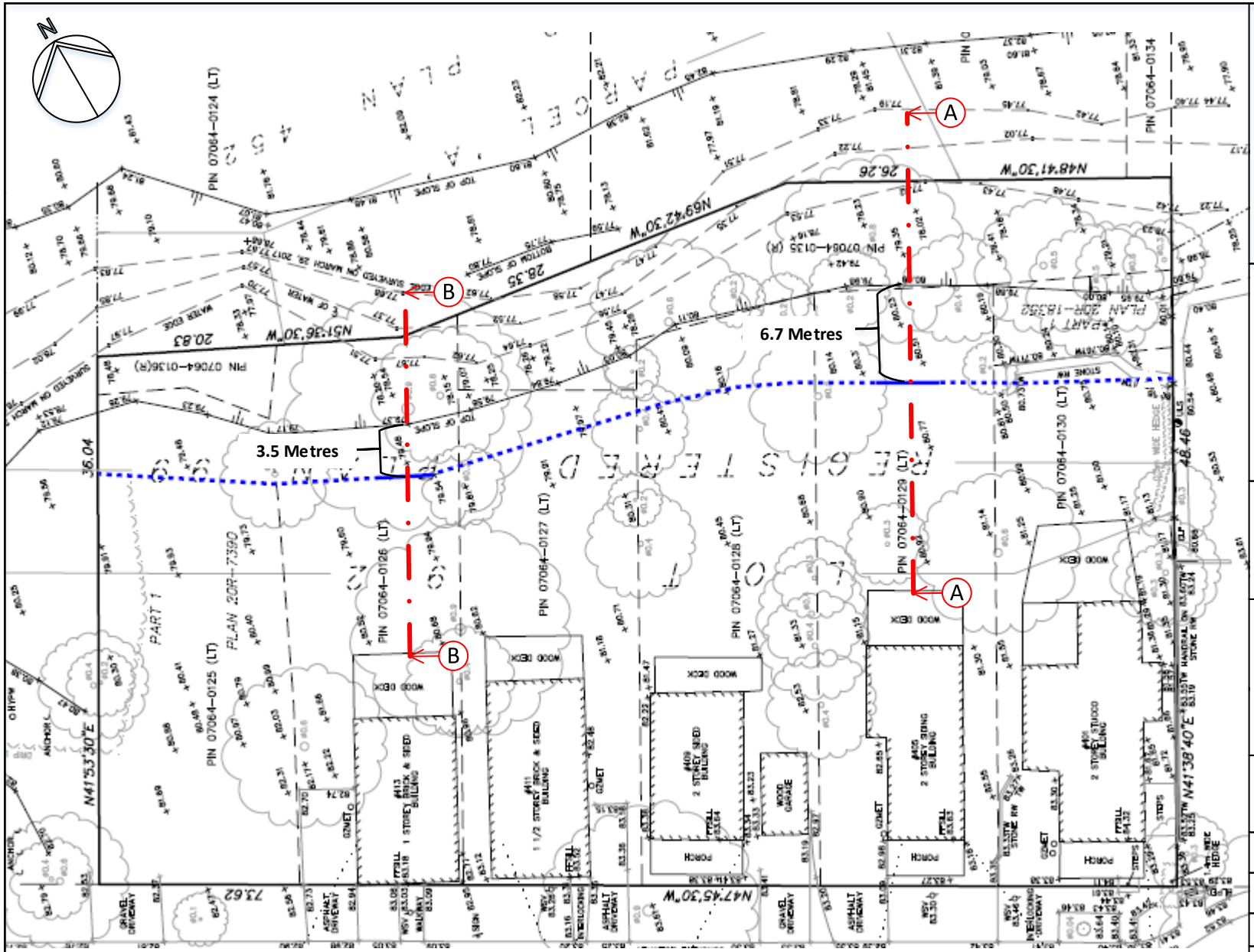
Adam Roemmele, P.Eng.
Project Engineer




Ian Shaw, P. Eng.
Senior Engineer

Enclosures: Drawing No. 1, Slope Profile Location Plan
Drawing No. 2 and 3, Slope Profiles A-A and B-B

Distribution: Landform Development Group Inc. [1, plus pdf]




## LEGEND

Slope Profile Location

Top of Stable Slope

## NOTES

1. This drawing should be read in conjunction with SOIL-MAT ENGINEERS & CONSULTANTS LTD. Supplemental Report No. SM 166905-G.

2. Slope profile and And top of stable slope locations are approximate.

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Supplemental Comments
Proposed Condominium Building
401 - 417 Martha Street
Burlington, Ontario

Slope Profile and Borehole Location Plan

Project No. SM 166905-G

Date: March 2019

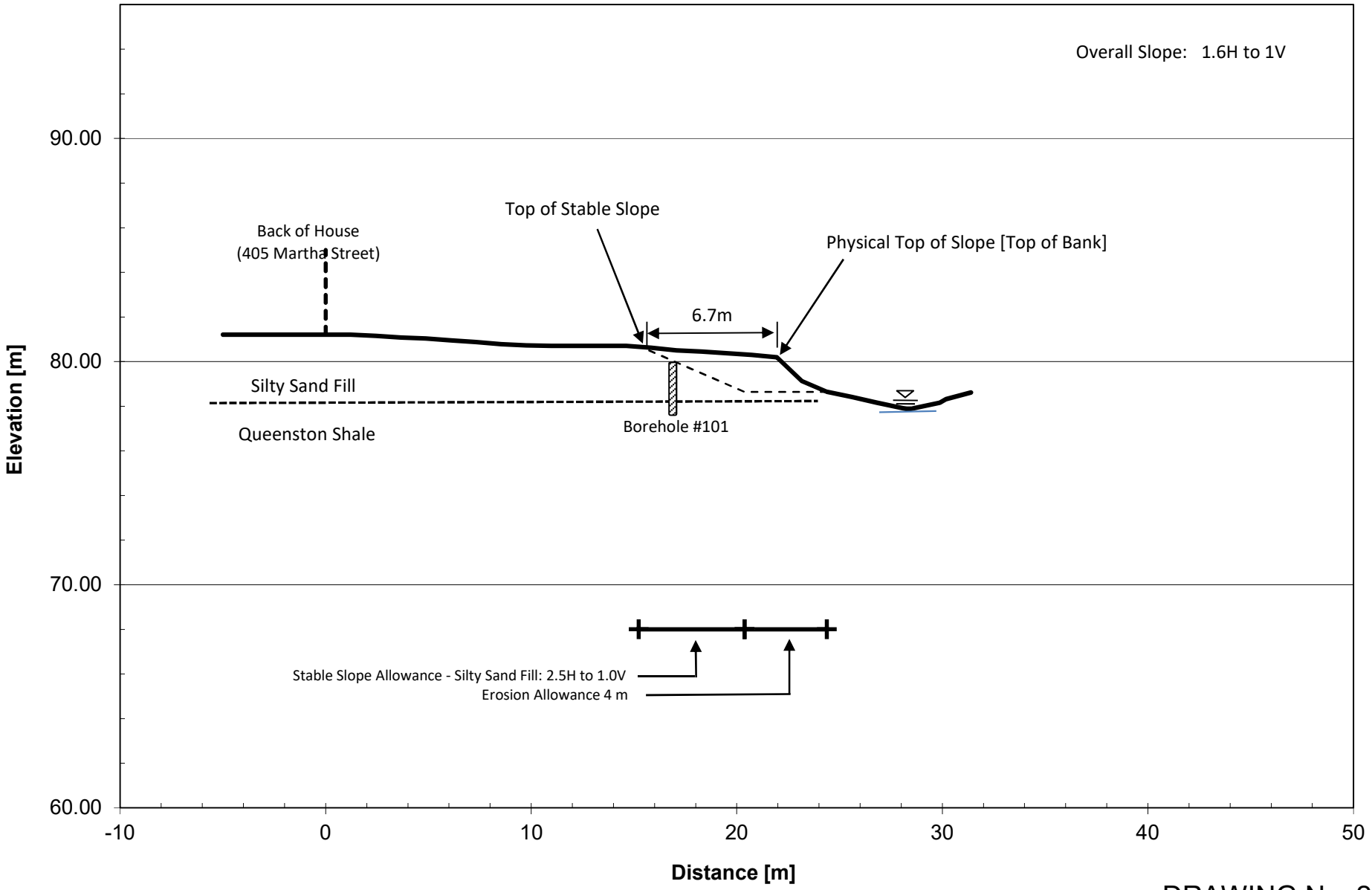
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SM 166905-G Slope Profile Location Plan

Drawing No. 1

# Slope Stability Analysis
# Proposed Condominium Building
# 401 - 417 Martha Street, Burlington
# Slope Profile A-A

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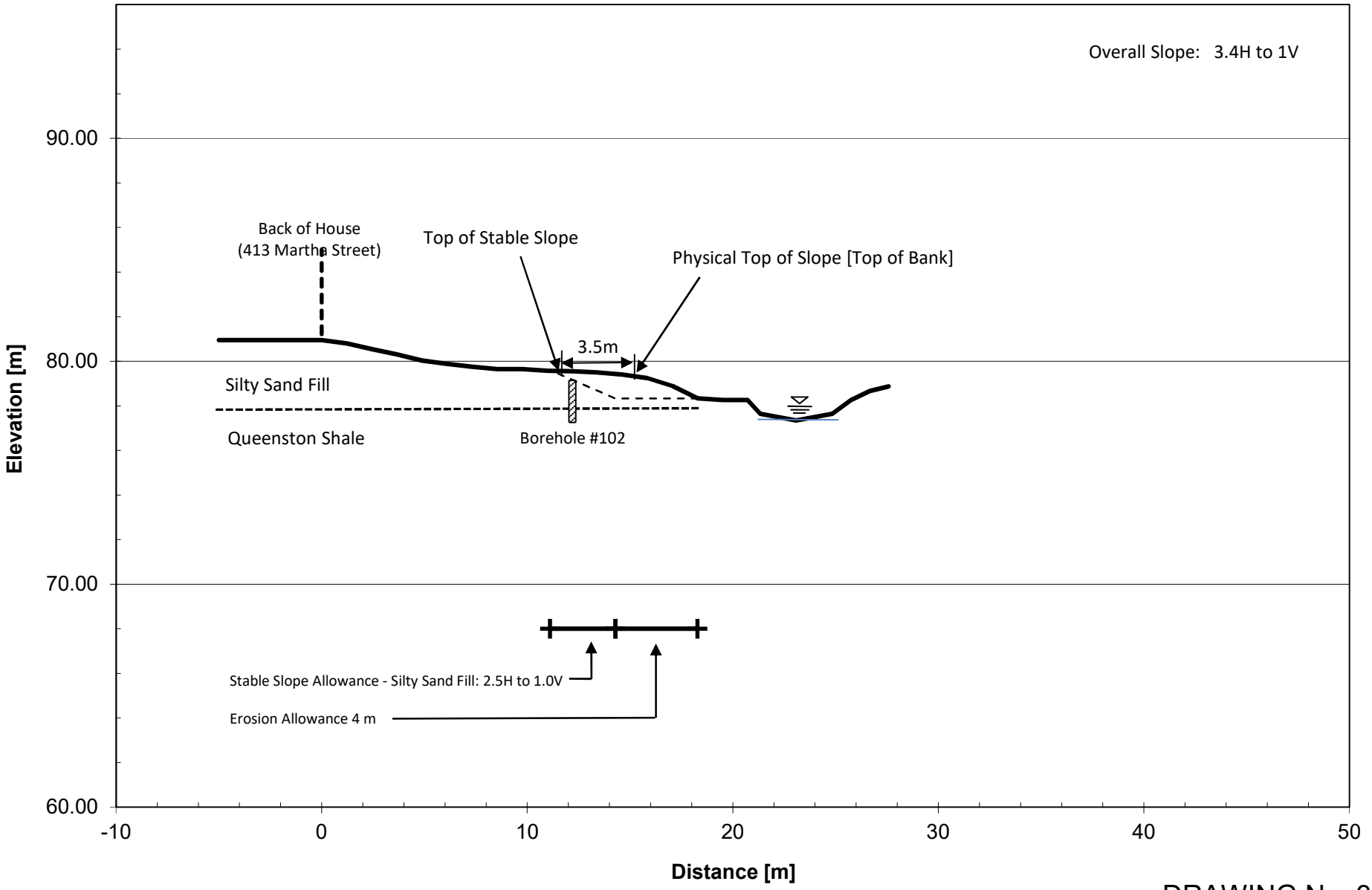



Project No.: SM 166905-G

DRAWING No. 2

# Slope Stability Analysis
# Proposed Condominium Building
# 401 - 417 Martha Street, Burlington
# Slope Profile B-B

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Project No.: SM 166905-G

DRAWING No. 3