GENIVAR

LETTER REPORT

DATE: February 15, 2013

FILE: 121 25215 00

TO: **DOUG BERG, C.E.T.**
Project Coordinator
Design and Construction Branch
Water and Waste Department
City of Winnipeg

FROM: **SILVESTRE S. URBANO JR., P.ENG.**
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RE: GEOTECHNICAL REPORT FOR THE CITY OF WINNIPEG VALVE CHAMBER

One testhole was drilled on February 6, 2013 at Waverley Street, Station 0+200 in Winnipeg, Manitoba. Based on one testhole, it was requested that foundation recommendations for a proposed valve chamber (4.9m x 4.5m) at 5.5m depth be provided. One deep testhole drilled to 12.2m (40 ft) revealed a general soil profile consisting of a layer of thin clay fill layer underlain by a thick clay layer which extended to the depth explored. Detailed description of the subsurface condition is shown on the attached testhole log, TH1 as well as the site plan.

Based upon the subsurface conditions encountered, the preferred foundation for the proposed City of Winnipeg Valve Chamber is a system of granular pad (300mm thick) foundation on stiff to firm clay.

Granular Pad Foundation

The proposed valve chamber (4.9m x 4.5m) may be supported by a granular pad (300mm thick) foundation founded on stiff to firm clay at a depth of 5.5m below grade. To reduce differential foundation settlement, the granular pad should be prepared as follows:

- Within the proposed valve chamber area and at least 1.0m (3.2 ft) beyond the structure perimeter, remove all organic material, peat moss, softened soil and ponded water to expose the underlying stiff to firm grey clay. Depth of site stripping is expected to be at least 5.5m below grade.

- Call for subgrade inspection and approval of the exposed stiff to firm clay by qualified geotechnical personnel. The granular pad should be founded on clay. Ensure that the clay subgrade soil maintain its moisture content to reduce shrinkage and swelling potential.

- Once the subgrade is approved, compact the subgrade uniformly with a heavy vibratory roller to at least 95% Standard Proctor density (ASTM D698). Placed and compact the 300mm thick of

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granular fill (19mm base course material) to 98 STD proctor density on top of compacted subgrade. If softened soil is encountered, this softened soil should be removed and replaced by a 450mm thick of 150mm down, clean, crushed aggregate followed by 150mm thick of 19mm down base course material. The base course material should be uniformly compacted to at least 98% Standard Proctor density (ASTM D698). All aggregate material used should passed the City of Winnipeg granular specification

- *For frost protection of the unheated structure and to maintain lateral earth pressures against walls, place non-frost susceptible (pit-run aggregate) around the perimeter and extending at least 1.0m beyond the edges of the granular pad foundation.*

Using a Factor of Safety of 3.0, the proposed granular pad should be built on a stiff to firm clay at 5.5m below grade. On the foregoing basis and contingent upon a minimum width of 300mm for the granular pad thickness, an allowable soil bearing pressure of 143.7 kPa (3000 psf) may be used. With Limit State Design (LSD), the Serviceability Limit State (SLS) in kPa is 143.7 and the Ultimate Limit State (ULS) is 316.1 kPa with a resistance factor of 0.55.

The associated total soil settlement is estimated to be 25 to 50mm. Differential settlements/heaving of the valve chamber is not expected to be significant provided that the weight of the valve chamber remains consistent.

To avoid potential long term settlement caused by the roots of fast growing trees, all existing and new trees should be offset from the edges of the valve chamber, a minimum horizontal distance equal to the tree's mature height.

Excavation and Lateral Earth Pressure

Excavations entirely within the clay at this site would likely remain stable at slopes of up to 1H: 3V over the short term. To limit spalling effects and sloughing conditions, excavation slopes should be covered by tarpaulins to reduce weathering. If workers are expected to be within the excavation, side slopes not steeper than 1H: 2V should be maintained. *Otherwise, a metal cage larger than the proposed valve chamber area should be used.* Workplace Health & Safety rules should be followed at all times.

The design of the walls should be capable of resisting earth pressure based on the following formula:

$$P = Ko(\bullet H + q)$$

where: P = horizontal earth pressure at depth H (kPa)
Ko = earth pressure coefficient (0.5)
• = soil unit weight (18 kN/m^3)
H = height of soil against wall (m)
q = surcharge at ground surface within distance H of excavation wall (kPa)

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It is assumed that the groundwater table will be lower than the bottom of the valve chamber. It is recommended that excavation slopes be located at least a distance H away from settlement sensitive structures, where H is the depth of cut for vertical walls.

Any concrete used should be manufactured with sulphate-resistant (Type 50) cement, minimum compressive strength of 32 mPa and air content between 4% and 7%. Any concrete subject to cycles of freezing and thawing should be air entrained in accordance with the latest edition of CSA A23.1, Concrete Materials and Methods of Concrete Construction.

The findings and recommendations provided in this report were prepared by GENIVAR (the Consultant) in accordance with generally accepted professional engineering principles and practices. The recommendations are based on the results of field and laboratory investigations and are reflective only of the actual testhole(s) and/or excavation(s) examined. If conditions encountered during construction appear to be different than those shown by the testhole(s) and/or excavation(s) at this site, the Consultant should be notified immediately in order that the recommendations can be reviewed and modified as necessary to address actual site conditions.

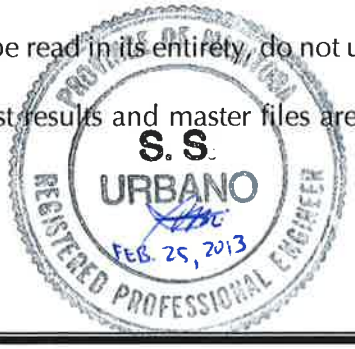
This report is limited in scope to only those items that are specifically referenced in this report. There may be existing conditions that were not recorded in this report. Such conditions were not apparent to the Consultant due to the limitations imposed by the scope of work. The Consultant, therefore, accepts no liability for any costs incurred by the Client for subsequent discovery, manifestation or rectification of such conditions.

This report is intended solely for the Client named as a general indication of the visible or reported physical condition of the items addressed in the report at the time of the geotechnical investigation. The material in this report reflects the Consultant's best judgment in light of the information available to it at the time of preparation.

This report and the information and data contained herein are to be treated as confidential and may be used only by the Client and its officers and employees in relation to the specific project that it was prepared for. Any use a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. The Consultant accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The report has been written to be read in its entirety, do not use any part of this report as a separate entity.

All files, notes, source data, test results and master files are retained by the Consultant and remain the property of the Consultant.



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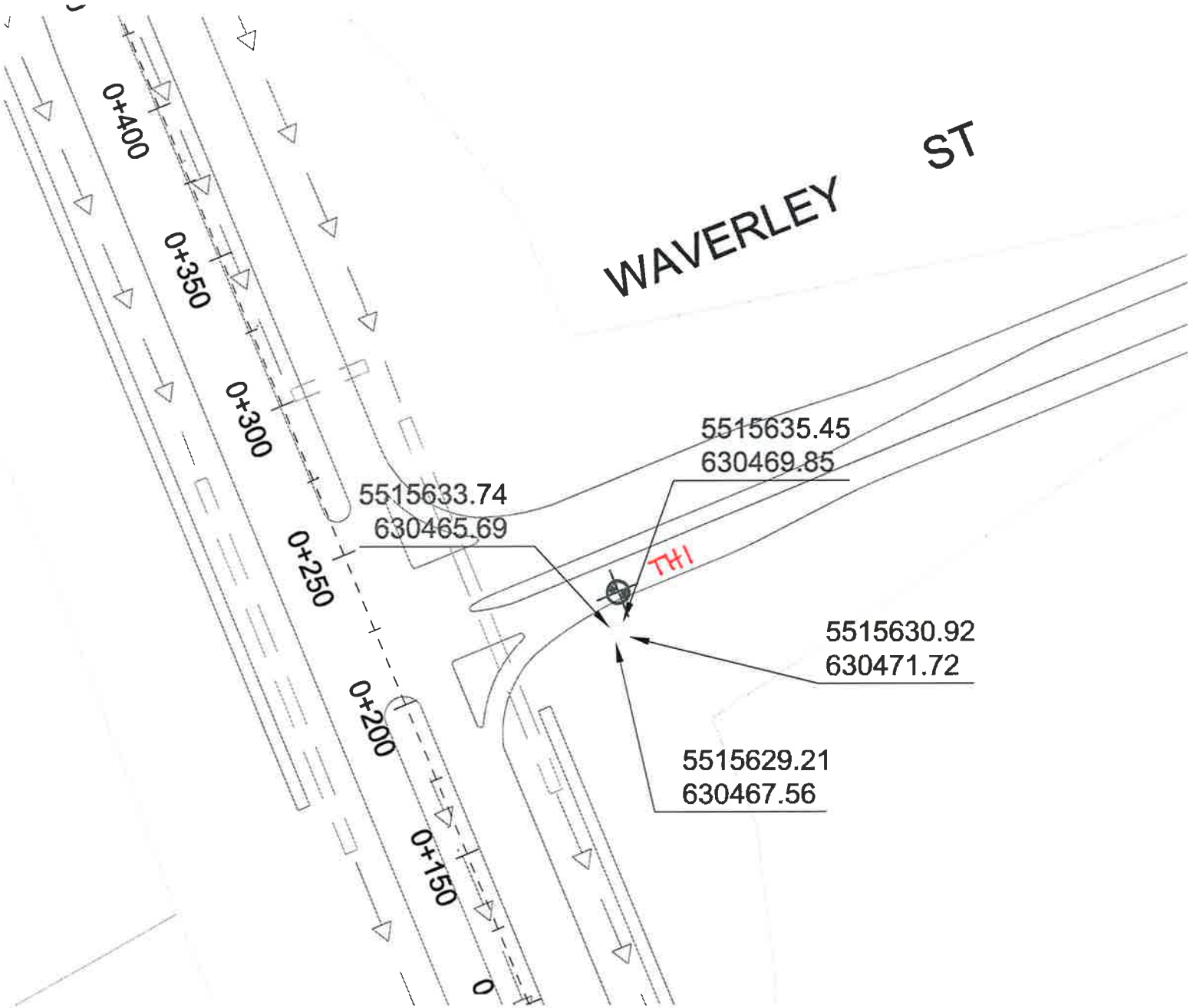
WAVERLEY ST
0+400
0+350
0+300
0+250
0+200
0+150
0
5515635.45
630469.85
5515633.74
630465.69
TH1
5515630.92
630471.72
5515629.21
630467.56

GENIVAR

Project No: 121-25215-00

TH1

Project: City of Winnipeg Valve Chamber

Client: City of Winnipeg

Enclosure:

Location: Waverley Street, Sta 0+200

Engineer: SSU

SUBSURFACE PROFILE

Depth	Symbol	Description	Elevation, m	Field Vane(m-kg)	Blows/0.3m	Pocket Penetrometer Test kPa	Water Content %
ft / m		Ground Surface	100			50 150 250 350	Wp |----0----| Wl 20 40 60 80
0 / 0		***FILL*** 150mm thick; clay, mixed, trace of fine gravel					
1 / 1							
2 / 2							
3 / 3						100	
4 / 4						100	
5 / 5		***CLAY*** frost to 1.2m depth; brown, fissured; stiff below 1.2m;SILTY between 1.5 and 1.65m, firm, tan-brown; stiff below 1.65m; grey at 5.2m; stiff to firm below 9.1m; trace of till inclusions below 11.4m.				80	
6 / 6							
7 / 7						80	
8 / 8							
9 / 9						75	
10 / 10							
11 / 11						50	
12 / 12			87.9				
40						50	

Drill Method: S/S Auger

Drill Date: 2/06/13

Hole Size: 125mm

GENIVAR
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Winnipeg, Mb.
R2J 3J8

Datum:

Checked by: SSU

Sheet: 1 of 1