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June 20, 2014
Project No. ED-1569

Via e-mail: lsmith@williamsengineering.com
Original will remain on file

Williams Engineering Canada Inc.
Suite 200 10065 Jasper Avenue
Edmonton, Alberta
T5J 3B1

ATTN: Lauchlin Smith, P. Eng.
Structural

RE: RCMP Patrol Cabin
12 Northland Drive Janvier, Alberta
Sink Hole Assessment

Dear Mr. Smith:

INTRODUCTION

As requested, a site visit was conducted at the subject site located at the above address on June 12, 2014. The purpose of the visit was to assess a sink hole at the site consequent to a sanitary sewer line break. The site visit was requested by Mr. Lauchlin Smith, P. Eng. of Williams Engineering Canada Inc. on behalf of George Meija, Assistant Facility Manager of SNC Lavalin O&M Inc, on June 11, 2014. The site assessment was conducted by Ramon Facundo, P. Eng. of Parkland Geo Environmental Ltd. (ParklandGEO). Present during the visit was Rahmon Burrill and in constant communication with David Blair, owner of Blue Rose Contracting Ltd. based in Ft. McMurray.

KNOWN EVENTS

The following events were provided to ParklandGEO:

1. The incident was discovered with a plugged toilet and eventual backed up floor drain upon toilet flushing.

2. Blue Rose Contracting was commissioned to repair the sewer. The line was power-snaked and a camera was lowered and ran though the pipe. It was determined that the pipe had a breakage and obstruction (plug) was found.

3. Another contractor was called-in for second investigation and the same conclusion was given.

4. In the attempt to repair the sewer line, the ground around the sewer pipe collapsed. The whole was half full of sewer water.

5. The resulting hole grew bigger in diameter with continuous top and side materials caving into the hole.

6. The repair was abandoned pending engineering assessment.

OBSERVATION

The following observation was noted during the site visit:

1. The patrol cabin was a trailer unit on temporary foundation(timber and/or blocks). A second trailer was located adjacent and west of the patrol cabin. The trailers are contained within the same lot on the west side of Northland Drive. Both trailers were abandoned.

2. The lot was lower in elevation than the road by approximately 1.0 m. The bottom of the ditch separating the lot from the road varies from 0.0 to 0.5 m with the ditch lower in elevation however, standing water was observed in the ditch as well as in the front of the patrol cabin trailer.

3. The hole was located on the east side of the patrol cabin. It measured approximately 3.0 m by (from)1.0 varying to 2.0 m underneath the trailer. Standing sewer water about 0.5 m from grade was observed in the hole. The depth of water could not be determined.

4. The sink hole was larger in circumference than the pictures taken one day previous. It appeared that the hole sides were still caving - in at the time of the visit. Evidence of the unstable side walls were seen with the presence of tension cracks along the top of bank.

5. The trailer had a distinct tilt of approximately 2 - 3% sloping towards the hole.

6. The site was cordoned off and the gate locked at the time of the visit.

CONCLUSIONS AND RECOMMENDATIONS

Based on the information provided, site observations and engineering assessment, the following conclusions and recommendations are presented:

1. Sink holes occur when a continuous supply of water with pore pressure high enough to dislodge and carry soil particles (boiling) to an access out or exit resulting to an

underground cavity. Usually a sink hole will go unnoticed until the void exceeds a critical size that the crust, usually pavement or frozen soil, collapses into the void.

In the case of patrol cabin, the supply of water originated from the sewer pipe break and the exit is the sewer line down gradient. When the soil particles plugged the line, the sewer water accumulated in the void. The soil "roof" collapsed creating the observed hole.

2. It is not known if the water in the hole was all from the broken pipe or surface water due to the lower lot elevation.

3. It is not known if the tilt in the trailer is caused by the weakening of the subgrade soils along the east side of the trailer, or a typical differential settlement of the temporary foundation.

4. Because of the accessibility issue, consequently safety issue, it is recommended that the trailer be moved prior to any repair to be able to proceed with proper repair and backfilling.

5. The sewer water should be pump out by an environmental waste removal company or by a septic tank pump truck. There is no certainty however, that the hole would not stay dry after one removal.

6. Upon removal of the trailer, an experienced geotechnical engineer should be commissioned to verify the cause of the trailer tilt, and identify if the soil around the foundation weakened in relation to the sink hole or just plain differential settlement. The current foundation should also be inspected if required replacement.

7. There is no evidence that the second trailer was affected.

8. Weakened soil/subgrade must be removed around the perimeter of the hole prior to backfilling. For backfill materials it is expected that native soils will be used at the site. Ideally, backfill should be low to medium plastic, inorganic clay; well graded sand; or select coarse graded gravel. Typically the native soils are expected to be relatively moist, firm to stiff lacustrine soils and native clay tills. Granular soils such as sand or gravel, or clay till are generally considered to be suitable for backfill and typical lacustrine soils are generally considered marginally suitable, provided they can be dried to a lower moisture content to achieve proper compaction.

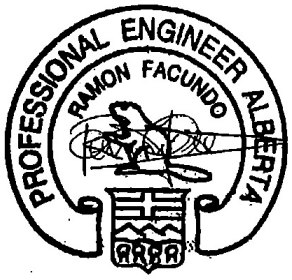
   To minimize fill settlement under self-weight, excavated soil with a water content exceeding the plastic limit of the soil by more than 5 percent should not be used as fill unless the moisture content is lowered. Wet fill material should be dried or blended with drier material prior to use as backfill. If this is not practical, the wet material should be wasted. If required, suitable replacement soils would include imported clay with an appropriate moisture content relative to its optimum for compaction or imported sand materials suitable for compaction.

Good compaction of backfill is important to minimize future potential settlement. Backfill should be placed and uniformly compacted in thin lifts to at least 95 percent of Standard Proctor Maximum Dry Density (SPMDD). Uniformity of compaction is most important. The lift thicknesses should be governed by the ability of the selected compaction equipment to uniformly achieve the recommended density. It is recommended to use lifts with a maximum thickness of 200 mm for granular fill and 150 mm for clay fill. To reduce compactive effort needed to achieve maximum density in engineered fills it is recommended to place granular fill at moisture contents 0 to 2 percent below optimum moisture content (OMC) and clay fill at moisture contents about two percent above OMC.

CLOSURE

We trust that this report meets with your current requirements. If there are any questions, please contact the undersigned at 780.416.1755.

Yours truly,
PARKLAND GEO-ENVIRONMENTAL LTD.



Ramon Facundo, P.Eng.
Senior Geotechnical Engineer