RED RIVER FLOODWAY

Outlet Control Works

EXPLORATIONS AND GEOLOGICAL INVESTIGATIONS

H.G. ACRES & COMPANY LIMITED
Consulting Engineers,
Niagara Falls, Canada

January 11, 1963
January 11, 1963
Job No. 940.19.04

RED RIVER FLOODWAY
Outlet Control Works

EXPLORATIONS AND GEOLOGICAL INVESTIGATIONS

The enclosed data concerning explorations and tests on materials from the outlet works are provided to assist prospective tenderers in assessing conditions of the site. In providing the exploratory drilling and testing data the Minister neither offers, nor implies, any warranty as to the fact other than that such drilling and testing have actually been carried out.

The approximate locations of the drill holes are shown on drawing No. 940-C-1003.
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Drilling Report

<table>
<thead>
<tr>
<th>Hole 01</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>02</td>
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<tr>
<td></td>
<td>03</td>
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<tr>
<td></td>
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<tr>
<td></td>
<td>05</td>
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<tr>
<td></td>
<td>06</td>
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</table>

Summary of Drilling and Testing Results

<table>
<thead>
<tr>
<th>Hole 01</th>
<th>SK-940-A-39</th>
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<tbody>
<tr>
<td></td>
<td>02</td>
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<td></td>
<td>05</td>
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</table>

Grain Size Curves, Silty Clay

<table>
<thead>
<tr>
<th>SK-940-A-48</th>
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<tr>
<td>Hole 01</td>
</tr>
<tr>
<td>Hole 03</td>
</tr>
<tr>
<td>Hole 05</td>
</tr>
<tr>
<td>From 45</td>
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</table>

Plasticity Chart

<table>
<thead>
<tr>
<th>SK-940-LS-49</th>
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<tbody>
<tr>
<td>Proctor Compaction Curves</td>
</tr>
<tr>
<td>50</td>
</tr>
<tr>
<td>51</td>
</tr>
</tbody>
</table>
**DRILLING REPORT**

**CLIENT:** Manitoba Dept. of Agriculture and Conservation  
**JOB No.** 940

**PROJECT:** Red River Floodway  
**HOLE No.** 01

**SITE:** Outlet Control Works  
**SHEET No.** 1 of 3

**CONTRACTOR:** Midwest Diamond Drilling  
**STARTED:** 2:30 P.M. November 20, 1961  
**FINISHED:** 1:00 A.M. November 23, 1961

**SOIL:** Flite auger - 42'  
**CASING DIAM.** NX - 46

**METHOD OF DRILLING:** Diamond Drilling - 54'  
**CORE DIAM.** NX 46 - 54

**LOCATION:***  
**LATITUDE**  
**ELEVATIONS:**  
**DATUM**  
**DEPARTURE**  
**BEARING**  
**INITIAL DIP** 90°  
**OTHER DIPS**

* See Acres' drawing No. 940-C-1003

---

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>SOIL TYPE</th>
<th>DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC.</th>
<th>SAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Humus</td>
<td>Black topsoil in cultivated field, very dry and crumbly</td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>Silty clay</td>
<td>Greyish brown silty clay mottled with small light and dark silt pockets, weathered, (fissured), very stiff, only slightly moist in top portion, slight increase in moisture and decrease in weathering with depth, unable to turn the vane in this material</td>
<td></td>
</tr>
<tr>
<td>14.5</td>
<td>Sandy silt (Till)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**SAMPLING METHOD**

- A - SPLIT TUBE  
- B - THIN WALL TUBE  
- C - PISTON SAMPLER  
- D - CORE BARREL

**SHIPPING CONTAINER**

- E - AUGER  
- F - WASH  
- H - INSERT  
- G - TUBE  
- P - WATER CONTENT TIN  
- Q - GLASS JAR

**INSPECTOR:** H.W. Ryder

**LOGGED BY:** H.W. Ryder

**APPROVED:**

**DATE:** November 1962
<table>
<thead>
<tr>
<th>Depth</th>
<th>Soil Type</th>
<th>Description</th>
<th>Colour, Consistency, Structure, Water Content, Plasticity, Compaction, Water Loss or Gain, Etc.</th>
<th>Sample</th>
<th>Penetration Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.5</td>
<td>Sandy silt (Till)</td>
<td>Light brown (yellowish) sandy silt containing many limestone and some granite boulders, very dry and dense with several somewhat more moist and softer seams at 31' and 35' noted, could be lack of cobbles encountered. Struck a water seam at 36'. In 36 hours water rose to 28.7'. Impossible to auger beyond 42'. Setup BBI-2 put down NX Casting to 42' drilled till to 46' (see next page).</td>
<td>4</td>
<td>AS</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td>AS</td>
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<td></td>
<td></td>
<td></td>
<td>6</td>
<td>AS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
<td>AS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>DEPTH</td>
<td>ROCK TYPE</td>
<td>DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>---------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54.0</td>
<td>Rock</td>
<td>Nodular dolomitic limestone or limestone. Pale grey with moderate brown to limonite yellow nodules, finegrained - Hardness - 3.0 - 3.5 in nodules 3.5 - 4.0 in pale grey component some irregular soft chalking inclusions and few hard siliceous inclusions in the grey component. Water Table constant at El. 724.1 upon completion of hole.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
DRILLING REPORT

CLIENT: Manitoba Dept. of Agriculture and Conservation
PROJECT: Red River Floodway
SITE: Outlet Control Works
JOB No.: 940
HOLE No.: 02
SHEET No.: 1 OF 3

CONTRACTOR: Midwest Diamond Drilling
STARTED: 2.00 P.M., November 21, 1961
FINISHED: 5.00 P.M., December 1, 1961

METHOD OF DRILLING:
- 4" Flite auger: 31.5'
- CASING DIAM.: NX - 44.5
- ROCK: Diamond Drilling: 62.0'
- CORE DIAM.: NX - 44.5 - 62.0

LOCATION:
- LATITUDE
- ELEVATIONS: G.S.C.
- DEPARTURE
- BEARING
- INITIAL DIP: 90°
- OTHER DIPS

* See Acres' drawing No. 940-C-1003

DEPT. | SOIL TYPE | DESCRIPTION, COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPACTNESS, WATER LOSS OR GAIN, ETC. | SAMPLE | PENETRATION TEST |
------|-----------|-----------------------------------------------------------------------------------------------|--------|----------------|
0.0   | Black topsoil, cultivated humus | Land, very dry and crumbly | 1 BO 2 5.0 pushed | Vane Test 7.0 |
1.0   | Silty clay changes to light | Mottled dark brown and grey-brown, weathered (fissured) and dry with weathering decreasing | 3 BO 2 15.0 pushed | Vane Test 12.0 |
1.0   | Light silt pockets and some gravel particles | Containing dark and limestone up to 6" | 4 BO 2 20 pushed | Vane Test 17.5 |
21.0  | Sandy silt (Till) | |  | |

SAMPLING METHOD:
- A - SPLIT TUBE
- B - THIN WALL TUBE
- C - PISTON SAMPLER
- D - CORE BARREL

SHIPPING CONTAINER:
- E - AUGER
- F - WASH
- G - WATER CONTENT TIN
- H - GLASS JAR
- I - INSERT
- J - PLIofilm BAG
- K - CLOTH BAG
- L - DISCARDED

INSPECTOR: H.W. Ryder
LOGGED BY: H.W. Ryder
APPROVED:
DATE: November 1962

FORM NO. 91A
<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Soil Type</th>
<th>Description</th>
<th>Sample Type</th>
<th>Size</th>
<th>Depth (ft)</th>
<th>Penetration Test (Blow/ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.0</td>
<td>Sandy silt (Till)</td>
<td>Light brown (yellowish) sandy silt with some clay and limestone pebbles. Very dry mainly with some areas more moist, very crumbly and dense, not cohesive unless quite moist</td>
<td>5</td>
<td>BC</td>
<td>2</td>
<td>25.0</td>
</tr>
<tr>
<td>30.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26.5 16</td>
</tr>
<tr>
<td>39.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30.8 10 78</td>
</tr>
<tr>
<td>42.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>42.0 10.5</td>
</tr>
<tr>
<td>44.5</td>
<td>Rock</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEPTH</td>
<td>ROCK TYPE</td>
<td>DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.</td>
<td>% CORE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-----------</td>
<td>-------------------------------------------------------------------------------------------------------------------</td>
<td>--------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nodular dolomitic limestone, or limestone, sound, core recovery 85% no water loss from 44.5 to 51.0 feet. 51.0 feet all water lost and 7 gpm would not raise water level above elevation 724.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62.0</td>
<td></td>
<td>2&quot; Ø well drive point installed in bedrock with 2&quot; Ø stand pipe to surface.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Water level elevation 724+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Drilling Report

**Client:** Manitoba Dept. of Agriculture and Conservation  
**JOB No.:** 940  
**Project:** Red River Floodway  
**HOLE No.:** 03  
**Site:** Outlet Control Works  
**Sheet No.:** 1 of 3

**Contractor:** Midwest Diamond Drilling Limited  
**Started:** 1:00 P.M. November 22, 1961  
**Finished:** 5:00 P.M. December 10, 1961  
**Method of Drilling:** Rock Diamond Drilling  
**Soil:** 4" Ø Flite auger - 23.0'  
**Casing Dia.:** NX 41.0'  
**Core Dia.:** NX 410 - 93.5

**Location:**
- **Latitude:**
- **Elevation:**
  - **Datum:** G.S.C.
  - **Drill Platform:**
  - **Ground Surface:** 753.2
  - **Rock Surface:** 712.2
  - **Bottom of Hole:** 659.1
  - **Water Table:** 724.2

*See Acres' dwg. No. 940-C-1003*

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Soil Type</th>
<th>Description: Colour, Consistency, Structure, Water Content, Plasticity, Compaction, Water Loss or Gain, Etc.</th>
<th>Sample No.</th>
<th>Type</th>
<th>Size</th>
<th>Depth</th>
<th>Ret'd</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Humus</td>
<td>Black dry and crumbly cultivated land</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>Silty clay</td>
<td>Mottled dark brown, very dry and weathered (fissured) to depth of 7' containing gravel particles and cobbles, and light and dark silt pockets. Below 7' mottled medium brown with increasing water content</td>
<td></td>
<td>BO</td>
<td>2</td>
<td>5.0</td>
<td>pushed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vane Test 13.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.0</td>
<td>Sandy silt (till)</td>
<td>Light brown (yellowish) dry sandy silt with many gravel particles and cobbles. Unable to auger beyond 23.0'</td>
<td></td>
<td>BO</td>
<td>2</td>
<td>20</td>
<td>pushed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vane Test 18.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Sampling Method:**
- A - Split Tube  
- B - Thin Wall Tube  
- C - Piston Sampler  
- D - Core Barrel  
- E - Auger  
- F - Wash  
- G - Rotor  
- H - Water Content Tin  
- I - Glass Jar

**Shipping Container:**
- N - Insert  
- O - Tube  
- P - Water Content Tin  
- Q - Glass Jar

**Inspector:** H.W. Ryder  
**Logged By:** H.W. Ryder  
**Approved:**  
**Date:** November 1962
<table>
<thead>
<tr>
<th>Depth</th>
<th>Soil Type</th>
<th>Description: Colour, Consistency, Structure, Water Content, Plasticity, Compaction, Water Loss or Gain, etc.</th>
<th>Sample</th>
<th>Penetration Test</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Auger refusal at 23.0' using BBS-2 drilled NX casing</td>
<td></td>
<td></td>
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<tr>
<td>23.0</td>
<td>Boulder</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>24.2</td>
<td>Silty sand (till)</td>
<td>Lost drill water at 37' Recovered drill water when casing set in rock</td>
<td></td>
<td></td>
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<tr>
<td>41.0</td>
<td>Rock</td>
<td>(See next page)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DEPTH</td>
<td>ROCK TYPE</td>
<td>DESCRIPTION: COLOUR, TEXTURE, FOLIATION, JOINTING, FRACTURING, FAULTING, ALTERATION, WATER LOSS OR GAIN, CAVING, LOST CORE, CEMENTING, ETC.</td>
<td>% CORE CORE</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-----------</td>
<td>-----------------------------------------------------------------------------------------------------------------</td>
<td>-------------</td>
<td></td>
</tr>
<tr>
<td>41.0</td>
<td>Dolomitic</td>
<td>Nodular, pale grey with moderate brown to limonite yellow nodules, both components fine grain, hardness:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>limestone or limestone</td>
<td>3-3.5 nodules</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.5-4 pale grey components.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>In pale grey components there are a few irregular dessimated white and chalky and a few hard siliceous inclusions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Evidence of leaching decreasing with depth, no leaching near bottom, rock grinds easily</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41.0</td>
<td></td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51.0</td>
<td></td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61.0</td>
<td></td>
<td>80</td>
<td></td>
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</tr>
<tr>
<td>71.0</td>
<td></td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>81.5</td>
<td></td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>91.5</td>
<td></td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>93.5</td>
<td></td>
<td>End of hole</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water table constant at elevation 724' upon completion of hole</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**DRILLING REPORT**

**CLIENT**  
Manitoba Dept. of Agriculture and Conservation  
JOB No. 940

**PROJECT**  
Red River Floodway  
HOLE No. 04

**SITE**  
Outlet Control Works  
SHEET No. 1 OF 2

**CONTRACTOR**  
Midwest Diamond Drilling Limited  
STARTED 4:00 P.M. November 22, 1961  
FINISHED 10:00 A.M. November 23, 1961

**SOIL**  
4" Ø Flite auger

**CASING DIAM.**

**LOCATION:**  
*LATITUDE*  
*ELEVATIONS:*  
*DATUM*  
DRILL PLATFORM  
GROUND SURFACE  
756.0

**BEARING**  
ROCK SURFACE  
729.0

**INITIAL DIP**  
BOTTOM OF HOLE  
WATER TABLE  
-

**OTHER DIPS**

*See Acres’ dwg. No. 940-C-1003*

<table>
<thead>
<tr>
<th>DEPTH</th>
<th>SOIL TYPE</th>
<th>DESCRIPTION: COLOUR, CONSISTENCY, STRUCTURE, WATER CONTENT, PLASTICITY, COMPAKTNESS, WATER LOSS OR GAIN, ETC.</th>
<th>SAMPLE</th>
<th>PENETRATION TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Humus</td>
<td>Black dry and crumbly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>Silty clay</td>
<td>Mottled dark brown, dry and weathered (fissured) containing gravel-sized</td>
<td>1 BO</td>
<td>pushed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>particles and cobbles and light and dark silt pockets. Weathering decreasing</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>and water content increasing with depth</td>
<td>2 BS</td>
<td>pushed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.0</td>
<td></td>
<td></td>
<td>4 BO</td>
<td>pushed</td>
</tr>
</tbody>
</table>

**SAMPLING METHOD**

A - SPLIT TUBE
B - THIN WALL TUBE
C - PISTON SAMPLER
D - CORE BARREL

**SHIPPING CONTAINER**

E - AUGER
F - WASH
G - WATER CONTENT
H - GLASS JAR
I - CLOTH BAG
J - PLEXIFILM BAG
K - DISCARDED

**INSPECTOR**  
H.W. Ryder

**LOGGED BY**  
H.W. Ryder

**APPROVED**  
November 1962
<table>
<thead>
<tr>
<th>Depth</th>
<th>Soil Type</th>
<th>Description: Colour, Consistency, Structure, Water Content, Plasticity, Compaction, Water Loss or Gain, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sandy silt</td>
<td>Light brownish-yellow, taining, medium dense, con-</td>
</tr>
<tr>
<td></td>
<td>(till)</td>
<td>taining gravel particles and boulder</td>
</tr>
<tr>
<td>27.0</td>
<td></td>
<td>Could not auger beyond 27.0'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>End of hole</td>
</tr>
</tbody>
</table>

**Sample**

<table>
<thead>
<tr>
<th>No</th>
<th>Type</th>
<th>Size</th>
<th>Depth (ft)</th>
<th>Penetration Test (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>A0</td>
<td>2</td>
<td>25.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25.5</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>26.0</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>26.5</td>
<td>70</td>
</tr>
</tbody>
</table>

**Clients:**

Client: Manitoba Dept. of Agriculture and Conservation

Client Job No.: 940

**Projects:**

Project: Red River Floodway

Project Hole No.: 04

**Sites:**

Site: Outlet Control Works
## Drilling Report

**Client:** Manitoba Dept. of Agriculture and Conservation  
**Job No.:** 940  
**Project:** Red River Floodway  
**Hole No.:** 05  
**Site:** Outlet Control Works  
**Sheet No.:** 1 of 3  
**Contractor:** Midwest Diamond Drilling Limited  
**Started:** 11:00 A.M., November 23, 1961  
**Finished:** 5:00 P.M., December 6, 1961  
**Soil Method:** Flite auger 27.0  
**Casing Diam.:** NX 46.5  
**Drilling Method:** Diamond Drilling 27.0-72.5  
**Core Diam.:** NX - 46.5 - 72.5

**Location:**  
**Latitude:**  
**Elevation:** G.S.C.  
**Datum:**  
**Departure:** --  
**Bearing:**  
**Initial Dip:**  
**Other Dips:**  

*See Acres' drawing No. 940-C-1003*

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Soil Type</th>
<th>Description, Colour, Consistency, Structure, Water Content, Plasticity, Com., Water Loss or Gain, Etc.</th>
<th>Sample Type</th>
<th>Size</th>
<th>Depth</th>
<th>Ret'd</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Humus</td>
<td>Black topsoil, cultivated land</td>
<td>BO</td>
<td>2</td>
<td>5.0</td>
<td>pushed</td>
</tr>
<tr>
<td>2.5</td>
<td>Silty clay</td>
<td>Dark brown dry and stiff clay, lightly weathered, containing light and dark silt pockets.</td>
<td>ER</td>
<td>1</td>
<td>6.5</td>
<td>18</td>
</tr>
<tr>
<td>5.0</td>
<td>Silty clay</td>
<td>Mottled light brown, moist and stiff, light and dark silt pockets, rust-stained throughout</td>
<td>EP</td>
<td>1</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>showing effects of weathering (fissured)</td>
<td>BS</td>
<td>3</td>
<td>11.5</td>
<td>0</td>
</tr>
<tr>
<td>16.0</td>
<td>(Till)</td>
<td></td>
<td>BO</td>
<td>2</td>
<td>15.0</td>
<td>pushed</td>
</tr>
</tbody>
</table>

**Sampling Method:**  
- A - Split tube  
- B - Thin wall tube  
- C - Piston sampler  
- D - Core barrel  

**Shipping Container:**  
- E - Auger  
- F - Wash  
- G - Tube  
- H - Water content tin  
- I - Glass jar  
- N - Insert  
- O - Cloth bag  
- P - Pluviometer bag  
- Q - Discarded  

**Inspector:** H.W. Ryder  
**Logged By:** H.W. Ryder  
**Approved:**  
**Date:** November 1962
### DRILLING REPORT

**CLIENT**  
Manitoba Dept. of Agriculture and Conservation  
**JOB NO.** 940

**PROJECT**  
Red River Floodway  
**HOLE NO.** 05

**SITE**  
Outlet Control Works  
**SHEET NO.** 2 OF 3

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Soil Type</th>
<th>Description, Colour, Consistency, Structure, Water Content, Plasticity, Com. Pacity, Water Loss or Gain, Etc.</th>
<th>Sample No.</th>
<th>Type</th>
<th>Size</th>
<th>Depth (ft)</th>
<th>Penetration Test Blows/6&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.0</td>
<td>Sandy silt (till)</td>
<td>Light brown (yellow), dry to slightly moist, medium dense with many gravel particles and cobbles mostly limestone</td>
<td>10</td>
<td>ER</td>
<td>16.0</td>
<td>16.0</td>
<td></td>
</tr>
<tr>
<td>16.0</td>
<td></td>
<td></td>
<td>11</td>
<td>EP</td>
<td>17.0</td>
<td>17.0</td>
<td></td>
</tr>
<tr>
<td>16.0</td>
<td></td>
<td></td>
<td>12</td>
<td>EP</td>
<td>19.0</td>
<td>19.0</td>
<td></td>
</tr>
<tr>
<td>13.0</td>
<td></td>
<td></td>
<td>13</td>
<td>AS</td>
<td>20.0</td>
<td>20.0</td>
<td></td>
</tr>
<tr>
<td>14.0</td>
<td></td>
<td></td>
<td>14</td>
<td>ER</td>
<td>20.0</td>
<td>20.0</td>
<td></td>
</tr>
<tr>
<td>15.0</td>
<td></td>
<td></td>
<td>15</td>
<td>EP</td>
<td>22.0</td>
<td>22.0</td>
<td></td>
</tr>
<tr>
<td>16.0</td>
<td></td>
<td></td>
<td>16</td>
<td>EP</td>
<td>24.0</td>
<td>24.0</td>
<td></td>
</tr>
<tr>
<td>17.0</td>
<td>Auger refusal at 27.0'</td>
<td>Continued with BBS-2 and NX casing</td>
<td>17</td>
<td>AS</td>
<td>25.0</td>
<td>25.0</td>
<td></td>
</tr>
<tr>
<td>27.0</td>
<td>Boulder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>28.2</td>
<td>Sandysilt</td>
<td>Till as described above, lost drill water at 33', between 33' and 43', recovered 2' of gravel and one 8&quot; piece of core in core barrel</td>
<td></td>
<td></td>
<td></td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Boulder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>46.5</td>
<td>Rock</td>
<td>See next page</td>
<td></td>
<td></td>
<td></td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Depth</td>
<td>Rock Type</td>
<td>Description: Colour, Texture, Foliation, Jointing, Fracturing, Faulting, Alteration, Water Loss or Gain, Caving, Lost Core, Cementing, Etc.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>-------</td>
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<td>----------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46.5</td>
<td>Dolomitite or limestone</td>
<td>Pale grey with moderate brown to limonite yellow. nODULES, fine grained, unsound. hardness: 3.0 - 3.5 nodules 3.5 - 4.0 pale grey component few chalky inclusions core breaks average 2 - 3 inches 46.5 - 61.5 strongly leached with few 2 - 3% solution cavities and a few interconnecting solution channels 1/4&quot; in diameter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46.5 - 49</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49 - 53</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53 - 63</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63 - 72.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72.5</td>
<td>End of hole</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**DRILLING REPORT**

**CLIENT**  Manitoba Dept. of Agriculture and Conservation  
**JOB No.**  940  
**PROJECT**  Red River Floodway  
**HOLE No.**  06  
**SITE**  Outlet Control Works  
**SHEET No.**  1 of 3  

**CONTRACTOR:** Midwest Diamond Drilling Limited  
**STARTED:**  1:00 P.M.  November 23, 1961  
**FINISHED:**  5:00 P.M.  December 14, 1961  

**METHOD OF DRILLING:**  
- Soil: 4" Flite auger 0 30.0' 
- Casing Diam.: NX - 48.0'  
- Rock: Diamond Drilling 0.73.5' 
- Core Diam.: NX - 48.0 - 73.5'  

**LOCATION:**  
- Latitude:  
- Elevation:  
- Datum: G.S.S.C.  
- Departure:  
- Bearing:  
- Initial Dip: 90°  
- Other Dips:  

*See Acres' drawing*

<table>
<thead>
<tr>
<th>DEPTH (ft)</th>
<th>SOIL TYPE</th>
<th>DESCRIPTION</th>
<th>SAMPLE</th>
<th>PENETRATION TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Humus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>Silty</td>
<td>Very dark brown dry and clay, stiff, extremely weathered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>Silty clay</td>
<td>Mottled medium greyish-brown, stiff dry to moist, weathered. Containing light and dark silt pockets and gravel particles.</td>
<td>1 BO 2</td>
<td>Vane Test 8.0 pushed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.5</td>
<td>Silt</td>
<td>Pale yellow, dry, silt layer</td>
<td></td>
<td>Vane Test 17.5 hit boulder</td>
</tr>
<tr>
<td>17.5</td>
<td>Silty clay</td>
<td>Mottled light brown, stiff, moist, less weathered, containing light and dark silt pockets and gravel particles.</td>
<td>5 BO 2</td>
<td>Vane Test 23.0 pushed</td>
</tr>
<tr>
<td>24.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SAMPLING METHOD**  
- A - Split Tube  
- B - Thin Wall Tube  
- C - Piston Sampler  
- D - Core Barrel  

**SHIPPING CONTAINER**  
- E - Auger  
- F - Wash  
- G - Tube  
- H - Insert  
- O - Tube  
- P - Water Content Tin  
- Q - Glass Jar  
- S - Plofilm Bag  
- T - Cloth Bag  

**INSPECTOR**  H.W. Ryder  
**LOGGED BY**  H.W. Ryder  
**APPROVED**  
**DATE**  November 1962
<table>
<thead>
<tr>
<th>Depth</th>
<th>Soil Type</th>
<th>Description</th>
<th>Sample</th>
<th>Penetration Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>Type</td>
</tr>
<tr>
<td>24.5</td>
<td>Silty sand and gravel</td>
<td>Light brown (yellow) dry and dense with many gravel particles.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.0</td>
<td>Sand and gravel (Till)</td>
<td>Light brownish (yellow) fine sand with many gravel particles, dry and dense Auger refusal at 30' Due to misalignment of auger hole, redrilled hole 2' to north utilizing DTS-2 with NX casing At 25' water began to return from auger hole.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.0</td>
<td>Boulders</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33.0</td>
<td>Sands (?)</td>
<td>Fine-grained deposit with few gravel particles water return via auger hole lost all water at 46'</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48.0</td>
<td>Rock</td>
<td>See next page</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Drilling Report**

**Client:** Manitoba Dept. of Agriculture and Conservation  
**Project:** Red River Floodway  
**Site:** Outlet Control Works

<table>
<thead>
<tr>
<th>Depth</th>
<th>Rock Type</th>
<th>Description: Colour, Texture, Foliation, Jointing, Fracturing, Faulting, Alteration, Water Loss or Gain, Caving, Lost Core, Cementing, Etc.</th>
<th>% of Core</th>
</tr>
</thead>
</table>
| 48.0  | Dolomitic limestone or yellow nodules, fine grained.  
limestone            | Pale grey with moderate brown to limonite hardness: 3.0 - 3.5 nodules  
48.0 - 54.0 minor leaching  
54.0 - 64.0 core breaks at 1 to 1-1/2 feet sound  
48 - 52  
52 - 73.5 | 73.5 | End of hole. |

---

Note: The table contains detailed descriptions of the rock samples taken during drilling, including their physical properties and characteristics, which are crucial for understanding the geological structure of the site. The % of Core column indicates the percentage of the core that was recovered from each depth interval.
<table>
<thead>
<tr>
<th>ELEV IN FEET</th>
<th>WATER CONTENT IN PERCENT</th>
<th>UNDRAINED SHEAR STRENGTH IN KIPS PER 50 FEET</th>
<th>DEGREE OF SATURATION IN PERCENT</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>760</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>750</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>740</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>730</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>720</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>710</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>700</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>690</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>680</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>670</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>660</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SOIL DESCRIPTION AND SAMPLE LOCATION:
- Silty Clay
- Ground Water Level
- Till
- Limestone

TESTED BY
Underwood McClellan

OUTLET CONTROL WORKS
SUMMARY OF DRILLING & TEST RESULTS
HOLE CI

RED RIVER FLOODWAY

H.G. ACRES & COMPANY LIMITED
CONSULTING ENGINEERS

PROVINCE OF MANITOBA
DEPARTMENT OF AGRICULTURE AND CONSERVATION
WATER CONTROL AND CONSERVATION BRANCH

DATE MARCH 7, 1962

H.G. ACRES & COMPANY LIMITED
<table>
<thead>
<tr>
<th>Soil Description and Sample Location</th>
<th>Elevation (Feet)</th>
<th>Water Content (%)</th>
<th>Undrained Shear Strength (ips per sq ft)</th>
<th>Degree of Saturation (%)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silty Clay</td>
<td>660</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground Water Level</td>
<td>670</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Till</td>
<td>680</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravel</td>
<td>690</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limestone</td>
<td>700</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottom of Hole</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- G: Ground Surface
- O: Undrained Compression Test
- Δ: Field Vane Test
- Liquid Limit
- Natural Strength
- Plastic Limit
- Remoulded Strength

Water content values are shown for various elevations.

Degree of saturation values are shown for different elevations.

Undrained shear strength values are shown for different elevations.

Remarks: Tested by Acres.
<table>
<thead>
<tr>
<th>Soil Description and Sample Location</th>
<th>Elev in Feet</th>
<th>Water Content in Percent</th>
<th>Undrained Shear Strength in Kips per 50 Feet</th>
<th>Degree of Saturation in Percent</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silty Clay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Till</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limestone</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottom of Hole</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Tested by**: Underwood McLe lan

**SOIL SAMPLE**

○ Undrained Compression Test

- Natural Water Content
- Field Vane Test

- Liquid Limit
- Natural Strength
- Failure Strain
- Plastic Limit
- Remoulded Strength

**Outlet Control Works**

H.G. Acres & Company Limited Consulting Engineers

Province of Manitoba

Department of Agriculture and Conservation

Water Control and Conservation Branch

Red River Floodway

**Summary of Drilling & Test Results**

Hole 05

Date March 7, 1962

5K-940-A-43
NOTE:
MIXED SAMPLE FROM HOLE 02 AT 10 FT. DEPTH
AND HOLE 04 AT 12 FT. DEPTH
TESTED BY ACRES
NOTE:
SAMPLES TESTED IN UNDERWOOD M.C. LEELAN LABORATORY
ON PORTION OF SAMPLE PASSING No. 40 SIEVE
NOTE:
Samples tested in Underwood M. L. Ellman Laboratory on portion of sample passing No. 40 sieve.
LEGEND

CLAY SAMPLES: • TEST AT UNDERWOOD McLELLAN
                  x TEST AT ACRES

TILL SAMPLE: △ TEST AT ACRES

NOTE:

UNDERWOOD McLELLAN PLASTICITY TESTS PERFORMED ON SOIL PREVIOUSLY OVEN DRIED.

ACRES' TESTS PERFORMED ON SOIL NOT PREVIOUSLY DRIED.
SILTY CLAY

CURVE 1 HOLE 05 DEPTH 11 FT.
CURVE 2 HOLE 05 DEPTH 6 FT.
TESTED BY UNDERWOOD McLELLAN
Silty Clay
Mixed sample from Hole 02 at 10 ft. depth
and Hole 04 at 12 ft. depth
Tested by Acres