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MacDonald



# **2014 Summer Winter Integrated Field Technologies (SWIFT) Conference, Vancouver, BC**



## **Etobicoke Creek Trunk Sanitary Sewer – Microtunnel Design under Runway 5-23 at Toronto Pearson International Airport**

**By Kevin Seow, MBA, P.Eng. Senior Associate – Airports Group**

September 16, 2014



# PRESENTATION OUTLINE →

- PROJECT DESCRIPTION
- HMM ROLE
- PROJECT HIGHLIGHTS
- STRATIGRAPHY
- PLAN AND PROFILE
- LESSONS LEARNED
- QUESTIONS



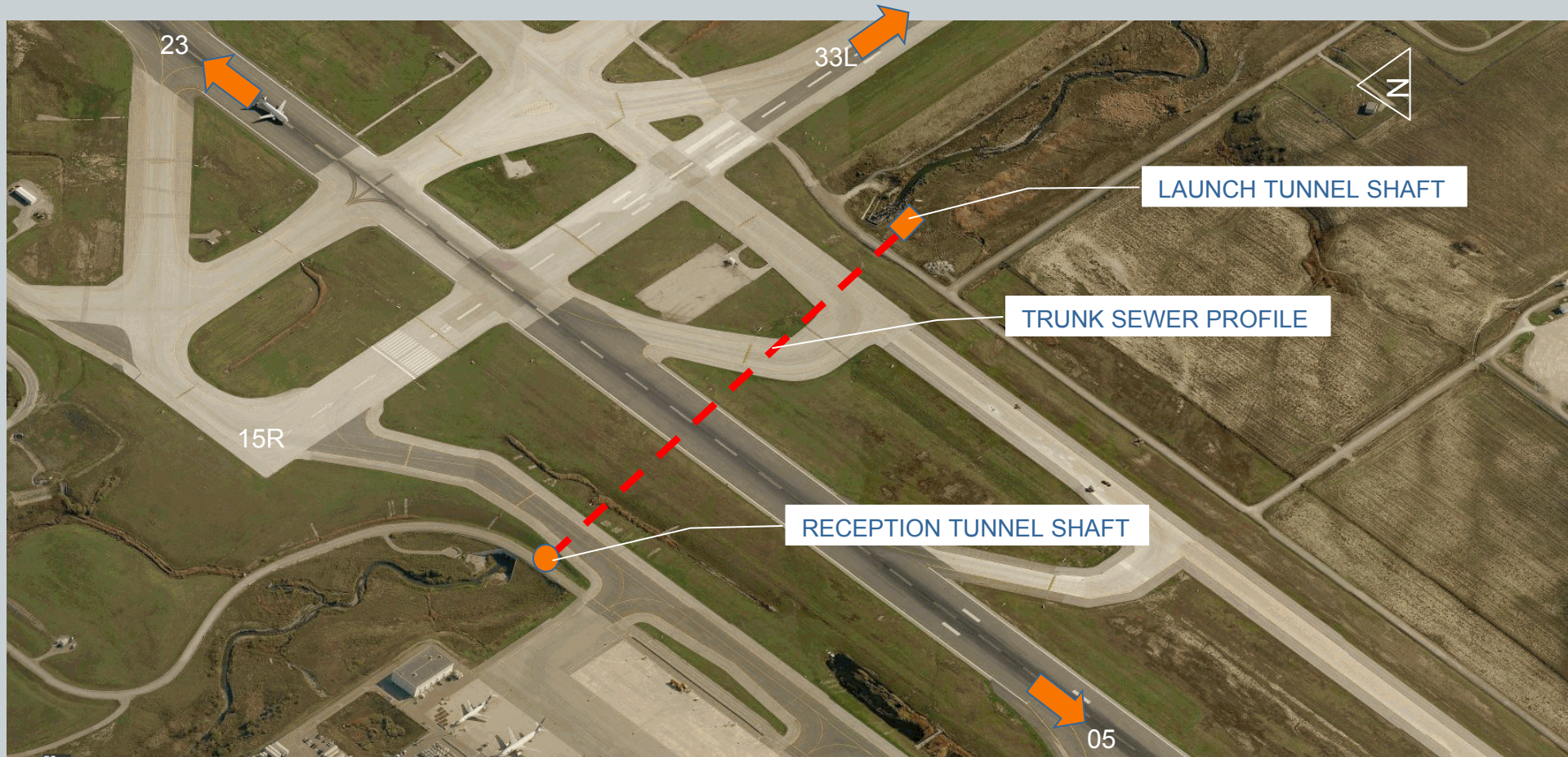
The presentation focuses on the microtunnel design under Runway 5-23 at Toronto Pearson International Airport. The new microtunnel will provide additional capacity for the transport of sanitary waste via “Twinning” of an existing sanitary sewer line under an operational runway for the Region of Peel.

The presentation will touch base on the “lessons learned” associated with the many stakeholders involved to allow for the proper design of the microtunnel work to be carried out.



- OVERALL LENGTH IS **550 METRES**
- NO OPPORTUNITY FOR AN INTERMEDIATE SHAFT
- **1650 mm** INSIDE DIAMETER (ID) PIPE
- UNDER MAIN **RUNWAY 5 -23** (LONGEST AT TPIA)
- DEPTH OF COVER RANGE FROM **4 TO 10 M**

# TRUNK SEWER PROFILE OVERVIEW →





- ENGINEERING DESIGN AND CONSTRUCTION SERVICES
- COORDINATION WITH REGION OF PEEL AND GTAA
- VERIFICATION OF TRUNK SEWER HYDRAULICS
- PLAN & PROFILE ALIGNMENTS
- IDENTIFICATION OF TUNNEL SHAFT AND STAGING AREAS
- ALL NECESSARY PERMITS AND APPROVALS
- CONTRACT DOCUMENTS, REPORTS AND DRAWINGS



- PROJECT MANAGEMENT
- RISK ANALYSIS
- QA/QC
- SCHEDULE CONTROL
- CONSTRUCTABILITY ASSESSMENT
- COST ESTIMATING

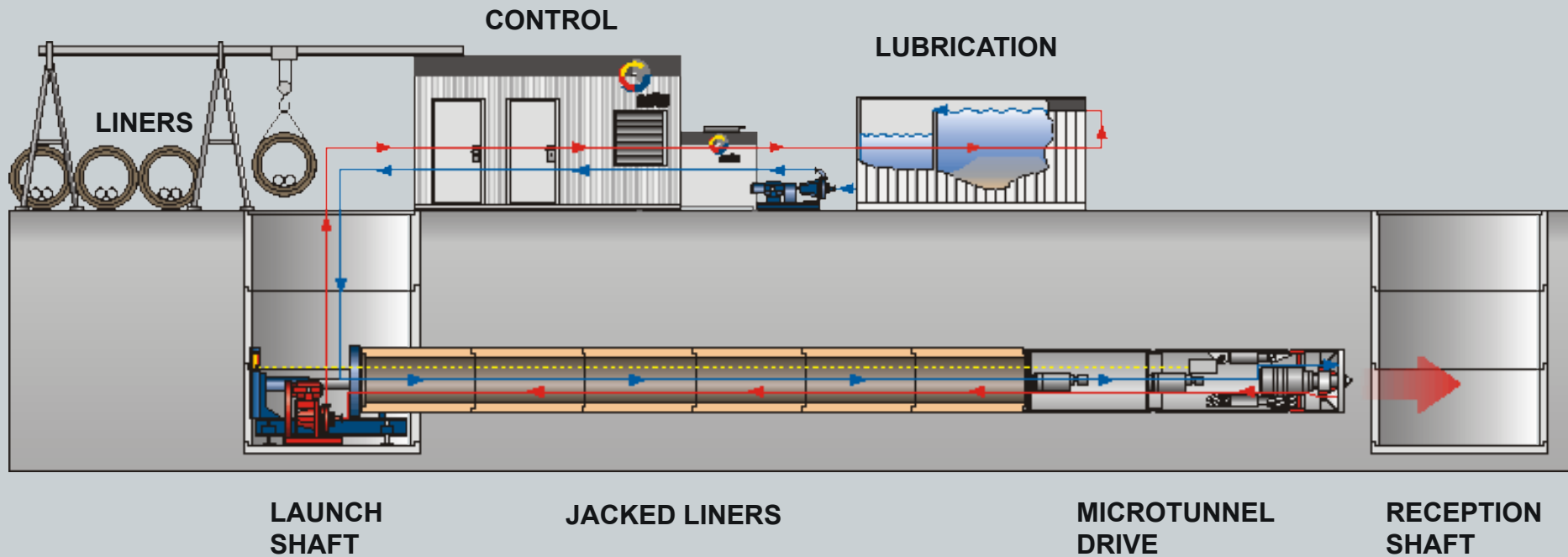


## PROJECT HIGHLIGHTS →

- USE OF KEY PERSONNEL WITH AIRPORT TPIA EXPERIENCE TO ADDRESS CHALLENGES WORKING ADJACENT TO KEY RUNWAY AND WORKING WITH THE AIRPORT.
- USE OF DETAILED GEOTECHNICAL INVESTIGATION (BORING AND GEOPHYSICS) TO MAP BEDROCK CONTACT SURFACE AND STRATIGRAPHY OF SOIL STRUCTURE.
- CANNOT SHUT DOWN RUNWAY 5 – 23.
- CHALLENGE TO MINIMIZE SIZE OF SHAFTS AND CONSTRUCTION ADJACENT TO ACTIVE RUNWAY – TO MINIMIZE IMPACTS TO AIR TRAFFIC.

- THE USE OF THE CORRECT TUNNELLING METHOD TO BALANCE WORK IN TIMELY AND COST-EFFECTIVE MANNER.
- TO ENSURE NO SETTLEMENT OF OVERLYING RUNWAY (NOTE: RUNWAY 5 -23 TO REMAIN OPEN DURING TUNNELLING).
- CHALLENGES IN COMPLETING “LIVE” TIE-INS TO BOTH UPSTREAM AND DOWNSTREAM EXISTING CONNECTION STRUCTURES.
- ENCOUNTERING EXISTING UNKNOWN UTILITIES.

# TYPICAL SETUP - MICROTUNNEL →





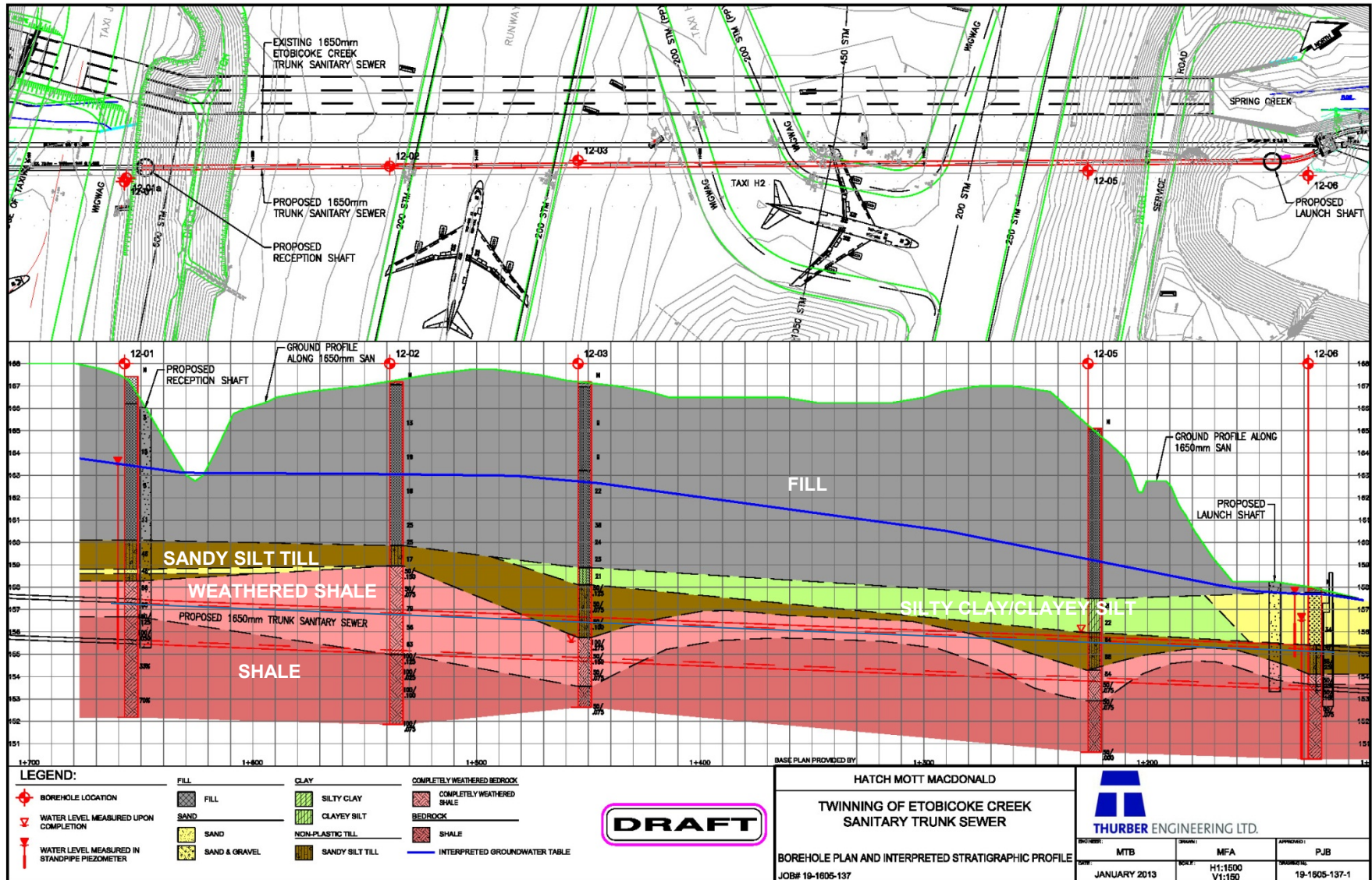
- SUITABLE FOR A WIDE RANGE OF GROUND CONDITIONS

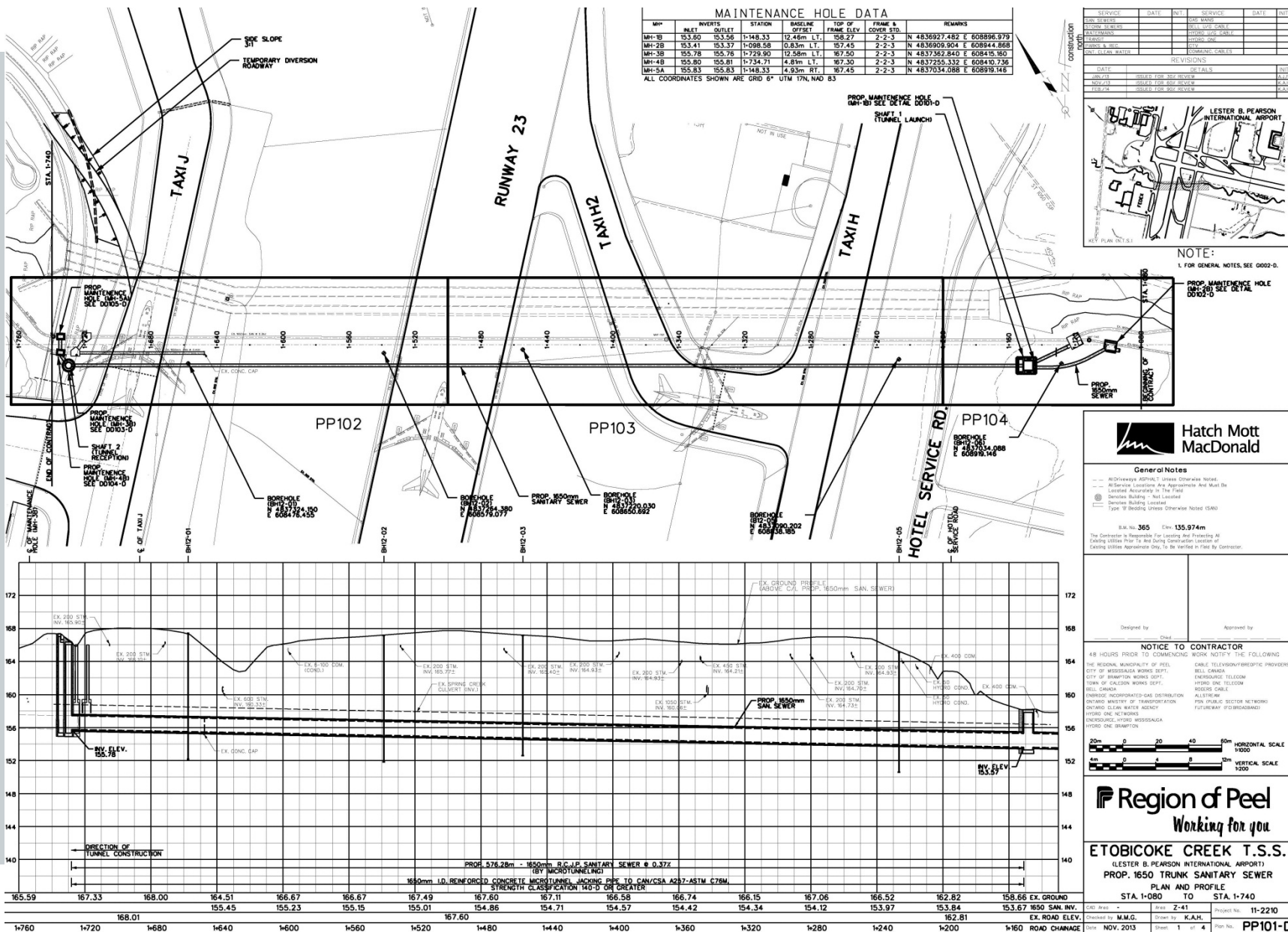
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles									
Clay	Silt						Sand						Gravel						Rock
0.001	0.002	0.01			0.06		0.1	Particle size (mm)			1	2	10			60	100		
FACE SUPPORT METHODS																			
OPEN FACE HANDSHIELD/BACKACTER				← May require a ground treatment method →												Blasting →			
EARTH PRESSURE BALANCE MACHINE – EPBM																			
CUTTER BOOM																CUTTER BOOM →			
TUNNEL BORING MACHINE – TBM				← Compressed air – Slurry shield – Crushing capacity →												Rock head →			
MICRO TUNNELLING – Machine type dependent on ground conditions																		Rock head →	

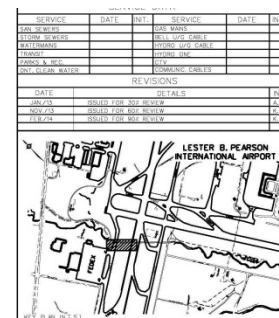


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# STRATIGRAPHIC PROFILE →

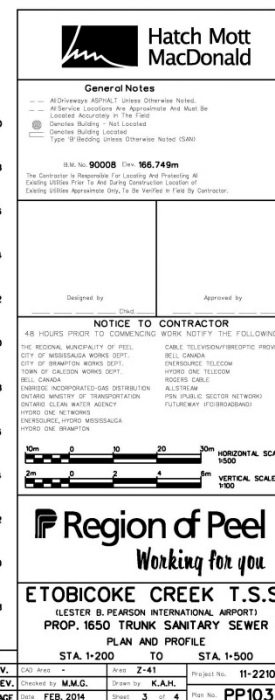


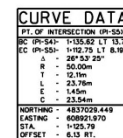




NOTE:  
1. FOR GENERAL NOTES, SEE G1002-D

<div style="display: inline-block; vertical-align: middle; margin-left: 10px;"> <h1 style="margin: 0;">Hatch Mott MacDonald</h1> </div>			
<h2 style="margin: 10px 0;">General Notes</h2>			
<p>— (A) (Where Applicable), (Where Otherwise Noted);</p> <p>— All Service Locations Are Approximate And Must Be Located According To The Plans;</p> <p>⑧ Denotes Building - Not Located</p> <p>⑨ Denotes Building - Located</p> <p>* Type "W" Denotes Unless Otherwise Noted (S&amp;W)</p>			
<p><b>R.M.N. 90008      Eas. 166.749m</b></p>			
<p>The Contractor is Responsible For Locating And Protecting All Existing Utilities Prior To And During Construction Location of Existing Utilities Approximate Only To Be Verified In Field by Contractor.</p>			
<div style="display: flex; justify-content: space-between; align-items: center; padding: 10px;"> <div>Designed by</div> <div>Approved by</div> </div>			
<p style="margin: 0;">Title      <b>CH-1</b></p> <h2 style="margin: 0;">NOTICE TO CONTRACTOR</h2>			
<p>48 HOURS PRIOR TO COMMENCING WORK NOTIFY THE FOLLOWING:</p>			
<p>THE REGIONAL MUNICIPALITY OF PEEL CITY OF MISSISSAUGA WORKS DEPT. CITY OF BRAMPTON WORKS DEPT. TOWN OF GALTON WORKS DEPT. BELL CANADA EMERG. NEGOTIATION/CAUSE DETERMINATION ONTARIO DEPT. OF TRANSPORTATION ONTARIO CLEAN WATER NETWORK HYDRO ONE NETWORKS INDUSTRIOUS ENERGY MISSISSAUGA HYDRO ONE BRAMPTON</p>	<p>CABLE TELEVISION/BROADCAST PROVIDER BELL CANADA TELEPHONE TELEVISION HYDRO ONE TELECOM ROBBERS CABLE PINK SPACELC SYSTEM NETWORKS FUTURESAT (FIBROBROADBAND)</p>		
<h1 style="margin: 0;">Region of Peel</h1> <p style="margin: 0;"><i>Working for you</i></p>			
<h2 style="margin: 0;">ETOBOCOO CREEK T.S.S.</h2> <p style="margin: 0;">(LESTER B. PEARSON INTERNATIONAL AIRPORT)</p> <h3 style="margin: 0;">PROP. 1655 TRUNK SANITARY SEWER</h3>			
<p style="margin: 0;"><b>PLAN AND PROFILE</b></p>			
<p style="margin: 0;"><b>STA. 1-50.0      STA. 1-74.0</b></p>			
<p>By <b>C.D.B. Area -</b></p>	<p>Drawn by <b>Z-41</b></p>	<p>Project No. <b>N-2210</b></p>	
<p>Checked by <b>M.M.G.C.</b></p>	<p>Drawn by <b>K.J.H.A.</b></p>	<p>Project No. <b>N-2210</b></p>	
<p>Date <b>NOV. 2013</b></p>	<p>Sheet <b>2</b> of <b>4</b></p>	<p>Plan No. <b>PP102-C</b></p>	





SERVICE DATA					
SERVICE	DATE	INT.	SERVICE	DATE	INT.
CALL NO. SERVICE			CALL NO. SERVICE		
1. CUSTOMER NAME			2. DATE ORDERED		
3. ORDER NUMBER			4. ORDER NO. - CABLE		
5. ADDRESS - B. BOX			6. PHONE NO.		
7. CITY - STATE - ZIP			8. EQUIPMENT - CABLES		

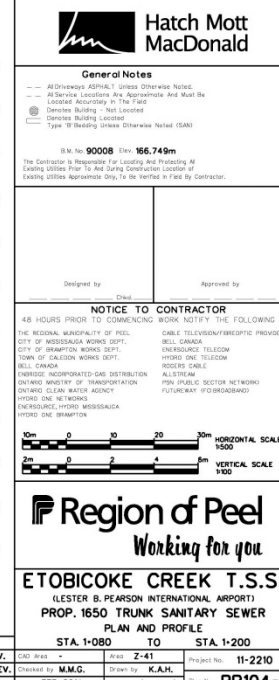
  

REVISIONS					
DATE	BY	NO.	REASON	DATE	BY
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00/00/00	000000	2.00	2.00	00/00/00	000000
00/00/00	000000	3.00	3.00	00/00/00	000000
00/00/00	000000	4.00	4.00	00/00/00	000000

LESTER B. PEARSON INTERNATIONAL AIRPORT

NOTE:  
1. FOR GENERAL NOTES, SEE G1002-D





## LESSONS LEARNED →

- INITIATE THE MAIN CRITICAL PERMITS FIRST (FACILITY ALTERATION PERMIT [FAP])
- HAVE SCHEDULED REGULAR FOLLOW-UP TO INFORMATION REQUESTS AND APPROVALS. STAKEHOLDERS HAVE DIFFERENT SCHEDULES AND PRIORITIES.
- ALLOT MORE TIME FOR THE APPROVAL PROCESS. ASSIGNED PROJECT MANAGER FACILITATES THE APPROVAL PROCESS. MANY STAKEHOLDERS (I.E. ENGINEERING, OPERATIONS, CONSTRUCTION CONTROL, ETC.) – ARE REQUIRED FOR THE APPROVAL PROCESS.
- ENSURE THE KEY DECISION MAKERS FROM BOTH PARTIES ARE PRESENT DURING MEETINGS WHERE THE DESIGN TEAM REQUIRES CRITICAL FEEDBACK. HELPFUL IN THE APPROVAL PROCESS.



## LESSONS LEARNED →

- REQUEST FOR A SUMMARIZED INITIAL LIST OF INFORMATION AND REQUIREMENTS. SO NO SURPRISES DOWN THE ROAD.
- ENSURE THAT THE REGION OF PEEL AND THE AIRPORT ARE ON THE SAME PAGE – WITH RESPECT TO FUTURE INFRASTRUCTURE PLANNING. (SOME EXAMPLES - ARE THE PREVIOUSLY INSTALLED SEWER STUB AND PLANS OF THE FUTURE RUNWAY).
- BEST TO USE THE AIRPORT'S SERVICES AND UTILITIES "LOCATES" SERVICE PROVIDER. WOULD STREAMLINE THE PROCESS. MUCH EASIER.



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\* THANK YOU \*

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QUESTIONS