

July 29, 2015

To: Jean-Pierre Perron  
Project Soil Engineer  
MTO Northeastern Region  
Downsview, Ontario

Re: Memorandum Dated July 13, 2015  
Draft Foundation Investigation Report  
Agreement # 5013-E-0033, Assignment # 8  
Spanish River Bridge Rehabilitation, Site No. 46-161  
GWP 5251-10-00, HWY 6

Ref : GS-TB-020906

The comments provided by MTO on the review of delivered items have been addresses as follow in green color and underlined text:

1. The Geocres No. for this project is **411-335**. This number should be provided in the Final Foundation Reports and Foundation Drawings (BH Location and Soil Strata).  
Geocres No. was added to the report and drawings.
2. **General:** Please include the GWP number in the title of the report.  
GWP No. was added to the report and drawing.
3. **Section 3.0 – Investigation Procedure and Laboratory Testing:** Please include Northing and Easting of Boreholes 1 and 2 in the report and in the borehole logs.  
Northing and Easting of Boreholes 1 and 2 were included both in the report and in the borehole logs.
4. **Section 4 – Description of Subsurface Conditions:** Remove the internal friction angle value and the unit weight, from Table 4.1 and Table 4.2.  
The internal friction angle value and the unit weight were removed from Table 4.1 and Table 4.2.
5. **Section 4 – Description of Subsurface Conditions:** In Tables 4.1 and 4.2, for each of the layer description where cobbles/boulders were encountered, instead of describing some cobbles/boulders, please replace the description with containing cobbles/boulders.  
In Tables 4.1 and 4.2, the descriptions were replaced with containing cobbles/boulders for each of the layer description where cobbles/boulders were encountered, instead of describing some cobbles/boulders.

6. **Section 4.2 – Fill-Sand and Gravel:** The heading for this section should be fill, the description of the fill is in the text. The description of the fill encountered in Borehole 1 and 2, should be sand and gravel containing trace silt. Furthermore, cobbles were encountered in both boreholes in the fill deposit. Please revise the section.

The heading of this section was changed to Fill. The description of the soil strata was revised and changed accordingly.

7. **Section 4.3 – Sand and Gravel:** Based on the borehole logs, the layer description should state trace to some silt and trace clay. Furthermore, instead of indicating gravel and sand with cobble, make a separate statement indicating that cobbles were encountered in this layer in Borehole 2. Also indicate in the report that Borehole 1 was terminated within this deposit upon auger refusal. The percentage of gravel in this deposit ranges from 55% to 85% and the fine percentage ranges from 3% to 14%, please revise the table accordingly. Please revise this section accordingly.

The description of the soil strata and table were revised and changed accordingly.

8. **Section 4.5 – Groundwater:** Please indicate whether the boreholes were dry upon completion of drilling.

The boreholes were dry upon completion of drilling was added to this section.

9. **Appendix C – Drawings:** Please include the Borehole Location and Soil Strata drawings, signed and stamped two Professional Engineers licensed by PEO, one of which shall be DST's MTO Foundation Designated Contact. The current drawing enclosed in the report is not sufficient; the drawing should include the plan view with the location of the boreholes and the soil strata on a cross section along the bridge centerline. The drawing should be presented on an 11x17 format.

As per discussion with Ms. Olta Kociu, P. Eng., the Borehole Location and Soil Strata drawings were revised accordingly and signed and stamped by two Professional Engineers licensed by PEO.

10. **Appendix D – General:** In all the borehole logs, under the soil descriptions please include the compactness or the consistency of the soil layer. The layer description for fill should be all lower case.

The compactness or the consistency of the soil layer was included in all the borehole logs, under the soil descriptions and the layer description for fill wrote in all lower case.

11. **Borehole 1 log:** In the fill deposit, instead of indicating some cobbles, indicate cobbles encountered at the elevation where cobbles were encountered. Also, please indicate if the borehole was dry upon completion or otherwise indicate the water level.

Instead of indicating some cobbles, cobbles were indicated at the elevation where cobbles were encountered in the fill deposit.

12. **Borehole 2 log:** As a general comments for all the layers encountered in this borehole, where cobbles and boulders were encountered, please make a separate statement indicating cobbles encountered/boulders encountered at the corresponding elevation where cobbles/boulders were encountered. Also, please indicate if the borehole was dry upon completion or otherwise indicate the water level.

A separate statement was made indicating cobbles encountered/boulders encountered at corresponding elevation where cobbles/boulders were encountered.

13. **Grain Size Distribution Charts:** Please separate the grain size test results according to the layer description, one chart for each soil layer and provide the layer description on the title box.

Grain size distribution graphs were altered to be separated by soil classification and titled accordingly.

14. The Final Foundation Investigation Report must be signed and stamped by two Professional Engineers licensed by PEO, one of which shall be DST's MTO Foundation Designated Contact.

The Final Foundation Investigation Report was signed and stamped by two Professional Engineers licensed by PEO.

Yours truly,

For DST CONSULTING ENGINEERS INC.



Dr. M W Bo, P. Eng, P.Geo, Int. PE, C.Geol, C. Eng, Eur Geol, Eur Eng.  
Senior Vice President / Senior Principal



**FOUNDATION INVESTIGATION REPORT  
SPANISH RIVER BRIDGE - HIGHWAY 6  
TOWNSHIP OF MERRITT, SUDBURY DISTRICT  
AGREEMENT NO.: 5013-E-0033  
ASSIGNMENT NO.: 8  
SITE NO.: 46-161  
GWP 5251-10-00  
GEOCRES NO.: 41I-335**

**JULY 29, 2015  
GS-TB-020906**

**PREPARED FOR:**

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**FOUNDATION INVESTIGATION REPORT  
SPANISH RIVER BRIDGE - HIGHWAY 6  
TOWNSHIP OF MERRITT, SUDBURY DISTRICT  
AGREEMENT NO.: 5013-E-0033- ASSIGNMENT #8  
SITE NO.: 46-161**

**PART 1: FACTUAL INFORMATION**

**1. INTRODUCTION**

DST Consulting Engineers Inc. (DST) has been retained by the Ministry of Transportation (MTO), Geotechnical Section, Northeastern Region to conduct a foundation investigation in order to recommend the temporary protection systems at the existing Spanish River Bridge on Highway 6, Township of Merritt, Sudbury District. This work was carried out under Agreement No.: 5013-E-0033, Geotechnical Retainer, Assignment No. 8.

This report addresses the field investigation, laboratory test program, factual report on soils conditions at the bridge location.

## 2. SITE DESCRIPTION

The site is located on Highway 6, approximately 2.1 km South of the junction of Highway 6 and Highway 17 (latitude 46°16'5" N, longitude 81°46'25" W), Station 20+847, in the Township of Merritt, in the District of Sudbury.

Figure 2.1 and 2.2 illustrate the Spanish River Bridge looking both North and South respectively. Figure 2.3 and 2.4 show the East and West embankment respectively. All photographs (Figures 2.1 to 2.4) were taken by DST during the field investigations.

Geological information is available from published *Ontario Geological Survey Map #41ISW* by the *Ontario Ministry of Natural Resources* for the Merritt Township area. The map indicates that the local area landform is identified as sand, sandy glaciolacustrine plain. The topography in the area is mainly low local relief; plain with dry drainage conditions.



Figure 2.1 Spanish River Bridge (Looking North)



Figure 2.2 Spanish River Bridge (Looking South)





Figure 2.3 Embankment at the East side of bridge at BH 1 location



Figure 2.4 Embankment at the West side of bridge at BH 2 location



### **3. INVESTIGATION PROCEDURES AND LABORATORY TESTING**

Site work was carried out between April 6, 2015 and April 7, 2015 utilizing a CME 750 drill rig equipped for geotechnical drilling and operated by DST. A total of two boreholes were advanced to depths ranging from 9.8 m to 10.1 m. The minimum number and depth of the boreholes was specified by the Ministry of Transportation (MTO).

Borehole 1 (UTM Zone 17 440388 mE, 5124122 mN) was advanced at Station 20+847 (8.1 m South of the South expansion joint), 2.4 m right of centreline in the Northbound lane. Borehole 2 (UTM Zone 17 440240 mE, 5124272 mN) was advanced at Station 21+052 (8.7 m North of the North expansion joint), 2.6 m left of centreline in the Southbound lane. The slab joint at each end of the Bridge appears to be more than 7.0 m from the expansion joint, and boreholes were located 1.0 m from the on-site pavement crack assuming this as the end of the approach slab.

The borehole locations are referenced to the MTO station numbering system as indicated on the drawings provided by MTO. The ground surface elevations at the borehole locations were surveyed by DST personnel and referenced to a local BM (nail) located at the top of the guard rail post (9<sup>th</sup> post counting from the South of BH1) with elevation of 100.0 m. Table 3.1 summarizes the detail of borehole locations and depths.

All boreholes were abandoned using suitable abandonment barrier as described in Ontario Regulation 903 and its amendments. Boreholes were decommissioned by backfilling to the bottom of the road base with cuttings and/or bentonite chips. From the bottom of the road base, granular materials were replaced to the bottom of the asphalt and the asphalt was sealed with a cold patch.

The fieldwork was supervised on a full-time basis by DST personnel who located the boreholes in the field, performed sampling, in-situ testing and logged the boreholes. Soil samples were obtained from the auger flights and from the split spoon sampler used for the standard penetration test (SPT). The SPT involves driving a 51 mm diameter thick-walled sampler into the soil under the energy of a 63.5 kg weight falling through 760 mm. The number of blows required to drive the sampler 305 mm is known as the standard penetration blow count (N) which provides an indication of the condition or consistency of the soil. The soil samples collected during drilling were identified in the field, placed in labelled containers and transported to DST's laboratory in Thunder Bay for further analysis.

Classification and index tests were subsequently performed in the laboratory on samples collected from the boreholes to aid in the selection of engineering properties. Laboratory tests included moisture contents and particle size analyses. A total of twenty (20) moisture contents and twelve (12) sieve analyses have been carried out for this assignment. Laboratory test results are presented in the Boreholes Logs and in graphical plots attached Appendix D (Enclosures).

Table 3.1      Detail of borehole locations

Borehole ID	Station	Elevation (m)	Depth (m)	Offset (m)
BH1	20+847	99.46	9.8	2.4 Rt
BH2	21+052	99.22	10.1	2.6 Lt

#### 4. DESCRIPTION OF SUBSURFACE CONDITIONS

The subsurface conditions are presented based on the information obtained during power auger drilling.

The generalized stratigraphy of the existing roadway embankment, based on the conditions encountered at Borehole 1 consists of surface layer of asphalt overlaying a granular sand fill layer underlain by gravel and sand. Gravel and sand formation is again underlain by possible bedrock. Borehole 2 consists of surface layer of asphalt overlaying a granular sand fill layer underlain by gravel and sand which is again underlain by sand layer. The summary of soil strata for Borehole 1 and Borehole 2 are listed in Table 4.1 and 4.2.

Table 4.1 Summary of soil strata for BH 1 at the bridge location

Layer	Depth (m)	Elevation (m)	Comments
Asphalt	0 to 0.1 m	99.5 to 99.4 m	
Fill-Sand and Gravel, trace Silt, containing Cobbles	0.1 to 0.9 m	99.4 to 98.6 m	Moisture Content between 2% to 4%
Gravel and Sand, trace to some Silt, trace Clay	0.9 to 9.8 m	98.6 to 89.7 m	Moisture Content between 1% to 5%

Table 4.2 Summary of soil strata for BH 2 at the bridge location

Layer	Depth (m)	Elevation (m)	Comments
Asphalt	0 to 0.2 m	99.2 to 99.0 m	
Fill-Sand and Gravel, trace Silt, containing Cobbles	0.2 to 2.5 m	99.0 to 96.7 m	Moisture Content between 1% to 5%
Gravel and Sand, trace Silt, containing Cobbles, Boulders	2.5 to 7.5 m	96.7 to 91.7 m	Moisture Content between 4% to 7%
Sand – trace to with Gravel, trace Silt	7.5 to 10.1 m	91.7 to 89.1 m	Moisture Content between 7% to 13%



#### 4.1 Asphalt

Asphaltic concrete was encountered at surface in Boreholes 1 and 2 with thickness of approximately 100 to 200 mm.

#### 4.2 Fill

Fill - sand and gravel containing trace silt in Boreholes 1 and 2 below the asphalt with a thickness of 0.8 m and 2.3 m at depths between 0.1 m to 0.9 m (Elev. 99.4 to 98.6 m) and depths between 0.2 m to 2.5 m (Elev. 99.0 to 96.7 m) respectively. Cobbles were encountered in both boreholes in the fill deposit.

SPT 'N' values vary from 32 to 50, indicating a dense to very dense condition. The moisture contents of samples tested range from 1 to 5%. The sieve analysis results of laboratory tests are summarized in Table 4.3.

Table 4.3 Summary of sand and gravel fill sieve analyses

Laboratory Results - Sieve Analyses	
Gravel %	32 to 48
Sand %	43 to 62
Fines %	6 to 10

#### 4.3 Gravel and Sand

Gravel and sand containing trace to some silt and trace clay was encountered in Boreholes 1 and 2 at strata depths of 0.9 m to 9.8 m (Elev. 98.6 m to 89.7 m) and 2.5 m to 7.5 m (Elev. 96.7 m to 91.7 m) respectively. Borehole 1 was terminated within this deposit upon auger refusal. Cobbles and boulders were encountered in Borehole 2.

SPT 'N' values vary from 13 to 50, indicating a compact to very dense condition. The moisture contents of samples tested range from 1 to 5%. The sieve analysis results of laboratory tests are summarized in Table 4.4.

Table 4.4 Summary of gravel and sand sieve analyses

Laboratory Results - Sieve Analyses	
Gravel %	55 to 85
Sand %	12 to 31
Fines %	3 to 14

#### 4.4 Sand

Sand with trace to some gravel and trace amount of silt was encountered in Borehole 2 at depth of 7.5 m (Elev. 91.7 m). The thickness of this stratum is not defined as borehole terminus was reached within this stratum.

SPT 'N' values are 17, indicating a compact condition. The moisture contents of samples tested range from 7 to 13%. The sieve analysis results of laboratory tests are summarized in Table 4.5.

Table 4.5 Summary of sand sieve analyses

Laboratory Results - Sieve Analyses	
Gravel %	7 to 33
Sand %	62 to 88
Fines %	5

#### 4.5 Groundwater

At the time of the field investigation groundwater was not observed in any of the boreholes. The boreholes were dry upon completion of drilling.

## **5. MISCELLANEOUS**

Fieldwork was supervised on a full time basis by Cheng Zhao who located the boreholes in the field, performed sampling, in-situ testing and logged the boreholes. Soil samples collected during drilling were identified in the field, placed in labelled containers and transported to DST's laboratory in Thunder Bay for further analysis. Interpretation of the data and preparation of the report was completed by Syed Ahmed, EIT and reviewed by Dr. Myint Win Bo, P. Eng., P. Geo., a designated principal contact for MTO projects.

## 6. LIMITATIONS OF REPORT

A description of limitations which are inherent in carrying out site investigation studies is given in Appendix 'A', and this forms an integral part of this report.

For DST Consulting Engineers Inc.

Prepared by:



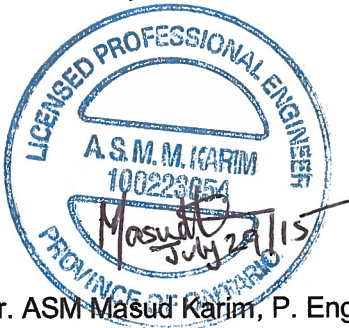
Syed Ahmed, M.Sc.  
Engineer in Training

Reviewed by:



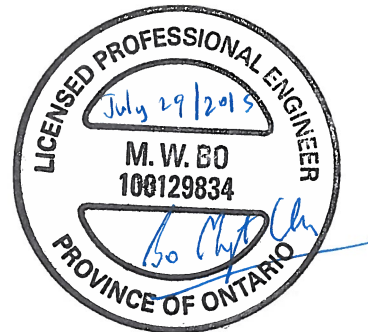
Bernardo Villegas, M.Sc.  
Manager

Reviewed By:



Dr. ASM Masud Karim, P. Eng.  
Senior Geotechnical Engineer

Reviewed By:



Dr. M W Bo, P. Eng, P.Geo, Int PE,  
C.Geol, C. Eng, Eur Geol, Eur Eng  
Senior Vice President / Senior Principal





**Appendix B**

**DESCRIPTION OF TERMS**

## EXPLANATION OF TERMS USED IN REPORT

**SPT 'N' VALUE:** THE STANDARD PENETRATION TEST (SPT) N VALUE OF THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51 mm O.D. SPLIT BARREL SAMPLES TO PENETRATE 0.3 m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5 kg, FALLING FREELY A DISTANCE OF 0.76 m. FOR PENETRATION OF LESS THAN 0.3 m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS  $\bar{N}$ .

**DYNAMIC CONE PENETRATION TEST (DCPT):** CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51 mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3 m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

### ***SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS***

#### **TEXTURAL CLASSIFICATION OF SOILS**

BOULDERS	COBBLES	GRAVEL	SAND	SILT	CLAY
GREATER THAN 200 mm	75 TO 200 mm	4.75 TO 75 mm	0.075 TO 4.75 mm	0.002 TO 0.075 mm	LESS THAN 0.002 mm

#### **COARSE GRAIN SOIL DESCRIPTION (50% GREATER THAN 0.075 mm)**

TERMINOLOGY	TRACE OR OCCASIONAL	SOME	WITH	ADJECTIVE (e.g. SILTY OR SANDY)	AND (e.g. SAND AND SILT)
	LESS THAN 10%	10 TO 20%	20 TO 30%	30 TO 40%	40 TO 60%

#### **CONSISTENCY\*: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH ( $C_u$ ) AND SPT 'N' VALUES AS FOLLOWS**

$C_u$ (kPa)	0 – 12	12 – 25	25 – 50	50 - 100	100 - 200	> 200
N (BLOWS / 0.3 m)	<2	2 - 4	4 - 8	8 - 15	15 - 30	>30
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

#### **DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS ON DENSENESS AS INDICATED BY SPT 'N' VALUES AS FOLLOWS**

N (BLOWS / 0.3 m)	0 – 5	5 – 10	10 – 30	30 – 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

### **ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND/OR STRENGTH**


**RECOVERY:** SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN

**MODIFIED RECOVERY:** SUM OF THOSE INTACT CORE PIECES, 100 mm+ IN LENGTH EXPRESSED AS A PERCENTAGE OF THE LENGTH OF THE CORING RUN.

THE **ROCK QUALITY DESIGNATION (R.Q.D)** FOR MODIFIED RECOVERY IS:

R.Q.D (%)	0 – 25	25 – 50	50 – 75	75 – 90	90 – 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

#### **LEGEND OF RECORDS FOR BOREHOLES: SYMBOLS AND ABBREVIATIONS FOR SAMPLE TYPE**

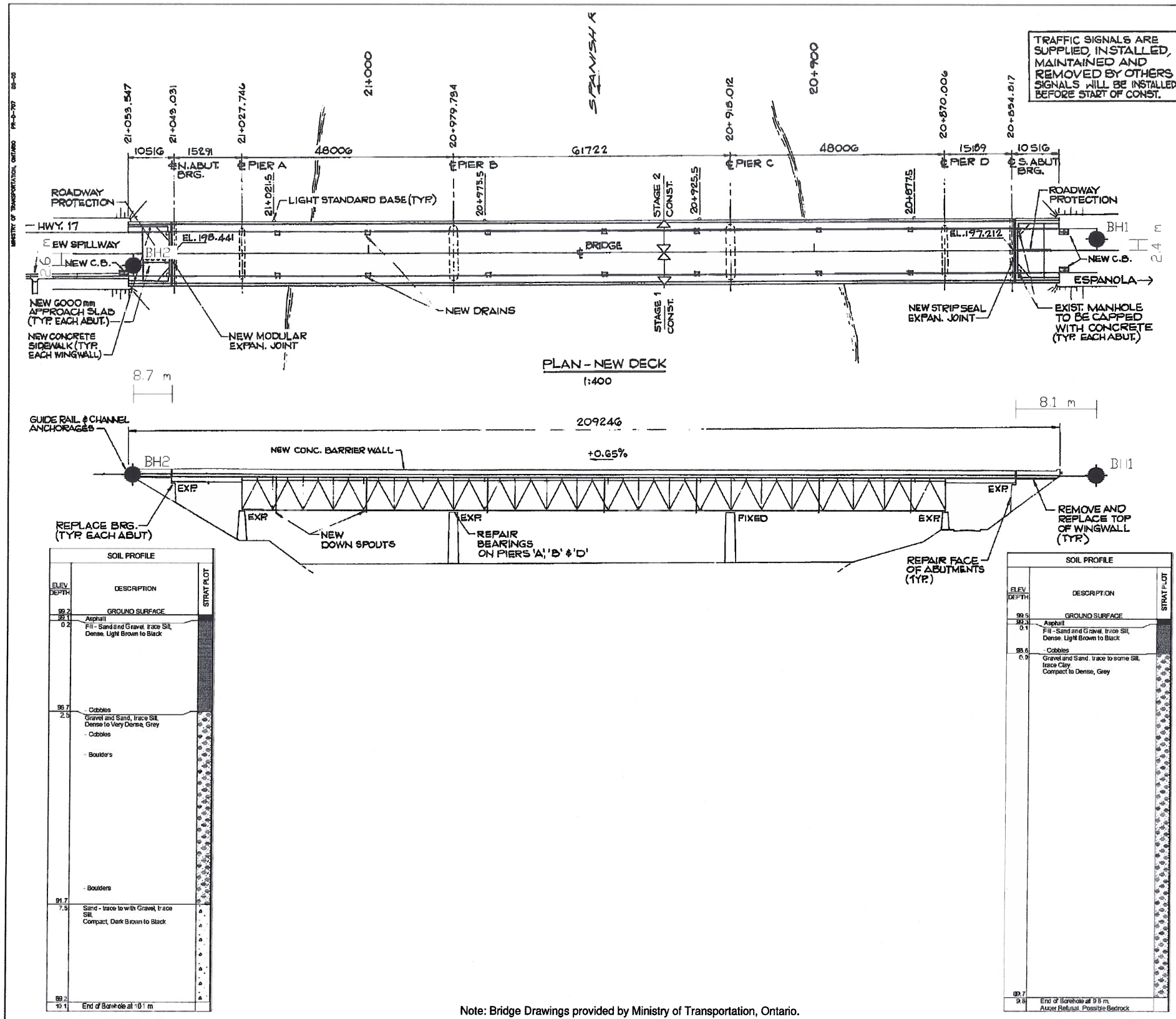
SS	SPLIT SPOON SAMPLE	WS	WASH SAMPLE
TW	THIN WALL SHELBY TUBE SAMPLE	AS	AUGER (GRAB) SAMPLE
PH	SAMPLER ADVANCED BY HYDRAULIC PRESSURE	TP	THIN WALL PISTON SAMPLE
WH	SAMPLER ADVANCED BY SELF STATIC WEIGHT	PM	SAMPLER ADVANCED BY MANUAL PRESSURE
SC	SOIL CORE	RC	ROCK CORE
	WATER LEVEL	$SENSITIVITY = \frac{UNDISTURBED\ SHEAR\ STRENGTH}{REMOLDED\ SHEAR\ STRENGTH}$	

\*HIERARCHY OF SOIL STRENGTH PREDICTION: **1)** LABORATORY TRIAXIAL TESTING. **2)** FIELD INSITU VANE TESTING. **3)** LABORATORY VANE TESTING. **4)** SPT VALUES. **5)** POCKET PENETROMETER.



# **Appendix C**

## **DRAWINGS**



METRIC

CONT No xxxx-x-xxxx  
GWP No 5251-10-00  
SITE No 46-161  
GEOCRES No 411-335  
BRIDGE REPAIR-HWY 6  
SPANISH RIVER BRIDGE  
STA 20+847 TO STA 21+052  
Survey 13-06 Revised

SHEET

KEY PLAN

LEGEND

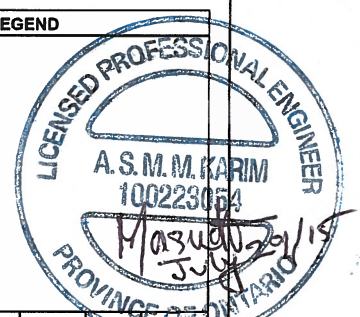
◆ Borehole

No.	Elevation	Northing	Easting	Station	Offset
BH1	98.46 m	5124121 m N	440367 m E	20+847	2.4 m RT
BH2	99.22 m	5123319 m N	440358 m E	21+052	2.6 m LT

NOTE:  
The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed by interpolation and may not represent actual conditions.

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DRAWING 1



**Appendix D**  
**ENCLOSURES**

# RECORD OF BOREHOLE No BH1

1 OF 1

METRIC

W.P. \_\_\_\_\_ LOCATION STA: + RT m: UTM Zone 1 4mE, 5mN  
 DIST \_\_\_\_\_ HWY HIGHWAY 6 BOREHOLE TYPE Hollow Stem Auger - 80 mm ID  
 DATUM Local DATE 2015 04 06

ORIGINATED BY CZ  
 COMPILED BY MD  
 CHECKED BY DB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
								<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>			
99.5	GROUND SURFACE							20	40	60	80	100			
99.3	Asphalt		AS1	AS		DR <div><div></div></div>	99								42 50 (8)
0.1	Fill - Sand and Gravel, trace Silt, Dense, Light Brown to Black		SS1	SS	32										41 51 (8)
98.6	- Cobbles														
0.9	Gravel and Sand, trace to some Silt, trace Clay, Compact to Dense, Grey														
			SS2	SS	27			98							
			SS3	SS	32			97							66 24 (10)
			SS4	SS	13			96							
			SS5	SS	36			95							62 28 (10)
			SS6	SS	34			94							
								93							
			SS7	SS	50			92							55 3 <div><div></div></div> (14)
			SS8	SS	28		91								
89.7			SS9	SS	50		90							85 12 (3)	
9.8	End of Borehole at 9.8 m. Auger Refusal, Possible Bedrock														

ONL MOT-HIGH VANES GS-TB-020906 SPANISH RIVER BH LOGS.GPJ DST\_MIN.GDT 16/7/15

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

# RECORD OF BOREHOLE No BH2

1 OF 1

METRIC

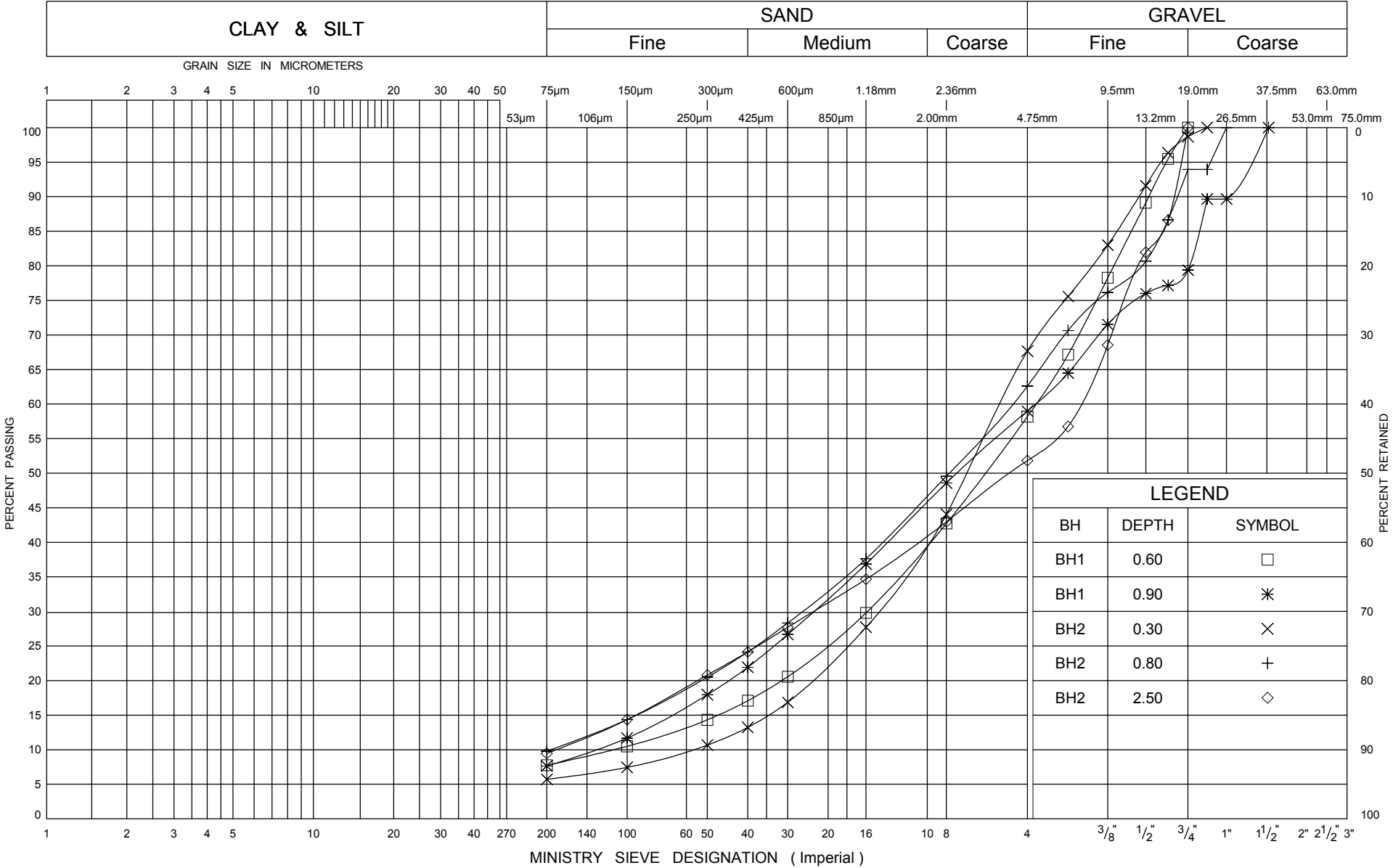
W.P. \_\_\_\_\_ LOCATION STA: + T m: UTM Zone 1 4 mE, 5 mN ORIGINATED BY CZ  
DIST \_\_\_\_\_ HWY HIGHWAY 6 BOREHOLE TYPE Hollow Stem Auger - 80 mm ID COMPILED BY MD  
DATUM Local DATE 2015 04 07 CHECKED BY DB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>					
99.2	GROUND SURFACE							20	40	60	80	100					
99.1	Asphalt		AS1	AS			99										32 62 (6)
0.2	Fill - Sand and Gravel, trace Silt, Dense, Light Brown to Black		AS2	AS													37 53 (10)
			SS1	SS	34		98										
			SS2	SS	50												
96.7	- Cobbles Gravel and Sand, trace Silt, Dense to Very Dense, Grey		SS3	SS	50		97										48 4 (9)
2.5	- Cobbles - Boulders		SS4	SS	55		96										
							95										
			SS5	SS	53		94										67 2 (9)
			SS6	SS	37		93										
	- Boulders						92										
91.7							91										33 62 (5)
7.5	Sand - trace to with Gravel, trace Silt, Compact, Dark Brown to Black		SS7	SS	17		90										
			SS8	SS	17												7 88 (5)
89.2																	
10.1	End of Borehole at 10. m.																

ONL MOT-HIGH VANES GS-TB-020906 SPANISH RIVER BH LOGS.GPJ DST\_MIN.GDT 16/7/15

+ <sup>3</sup>, × <sup>3</sup>: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

UNIFIED SOIL CLASSIFICATION SYSTEM



GRAIN SIZE DISTRIBUTION

□□□□□□ SAND □ AND □□ RA □□□

ENCLOSURE 1

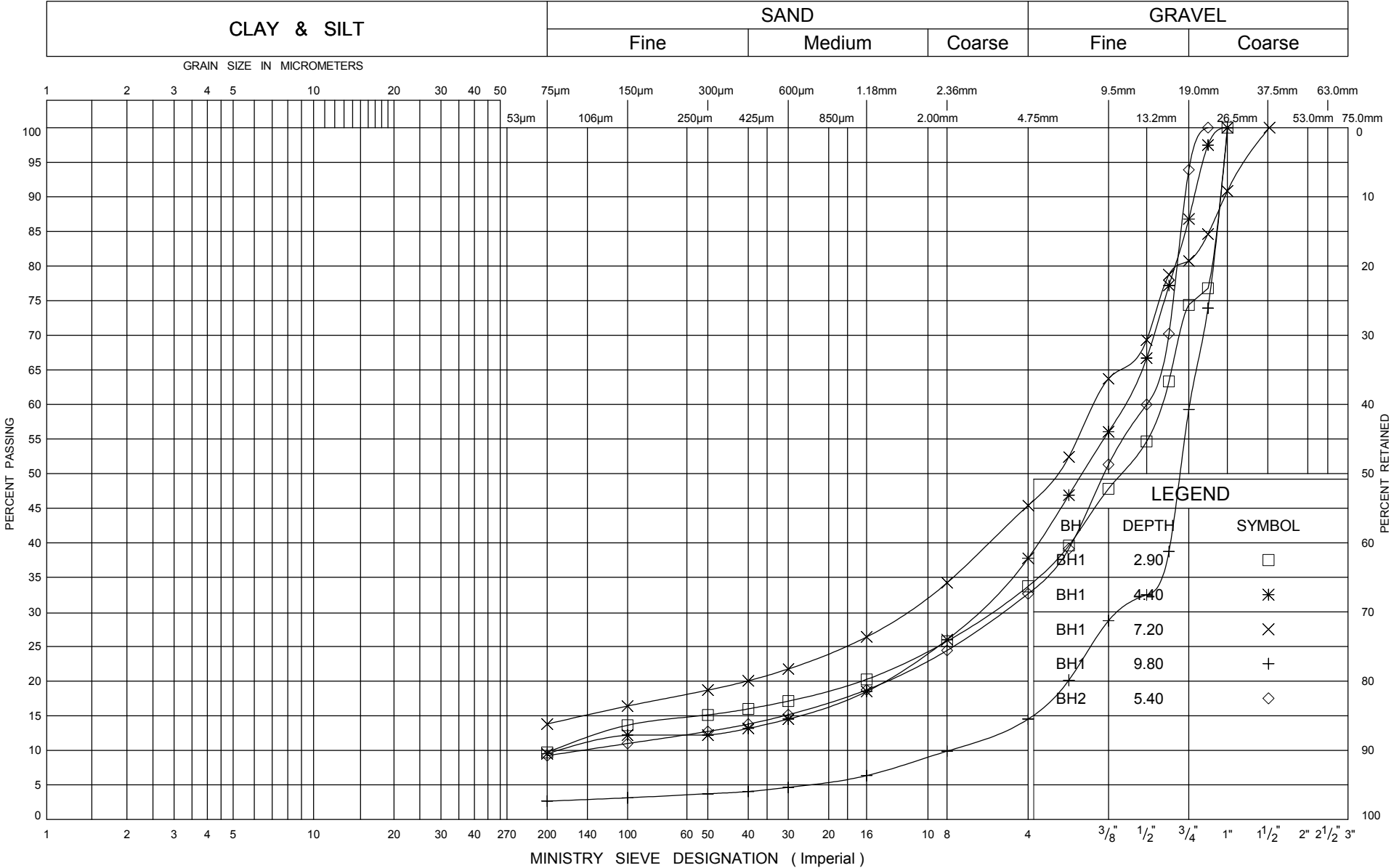
W P □□□□□□□□

HIGHWAY 6



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GRAIN SIZE DISTRIBUTION

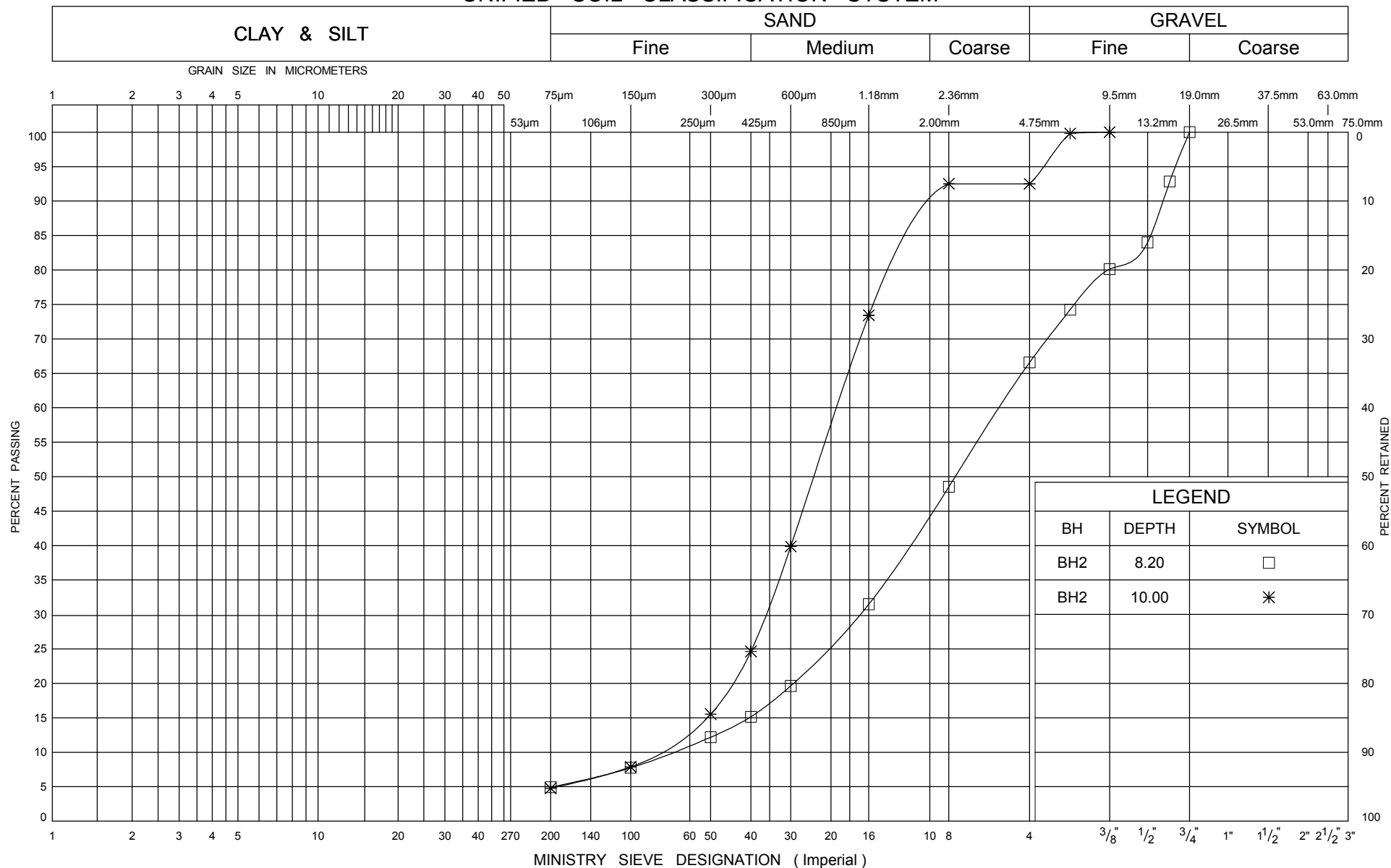
□ RA □ □ □ □ AND SAND

ENCLOSURE □

W P □ □ □ □ □ □ □ □

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## GRAIN SIZE DISTRIBUTION

### SAND

ENCLOSURE 

W P    □□□□□□□□

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