REPORT OF SUBSURFACE EXPLORATION

PAVEMENT CORES – SHELBYVILLE
ALONG RAMPART ROAD, MICHIGAN ROAD, AND MAUSOLEUM ROAD
SHELBYVILLE, INDIANA
PROJECT NUMBER: 23-1481-01G

PREPARED FOR:

THE CITY OF SHELBYVILLE
44 WEST WASHINGTON STREET
SHELBYVILLE, INDIANA 46176

Patriot Engineering and Environmental, Inc.
6150 East 75th Street
Indianapolis, Indiana 46250

November 8, 2023

November 8, 2023

Mr. John Kuntz, PE
City of Shelbyville
44 West Washington Street,
Shelbyville, Indiana 46176

Re: Report of Subsurface Exploration
Pavement Cores – Shelbyville
Along Rampart Road, Michigan Road, and Mausoleum Road
Shelbyville, Indiana
Patriot Project No.: 23-1481-01G

Dear John:

Attached is the report of our subsurface exploration for the above referenced project. This exploration was completed in general accordance with our Proposal No. P23-1759-01G dated September 20, 2023. This report includes graphic logs of nine (9) soil borings drilled at the proposed project site. Also included in the report are the results of laboratory tests performed on samples obtained from the site, and a pavement core summary.

The purpose of this exploration is to determine the general near surface and subsurface conditions within the project area of the existing roadways. This was achieved by pavement coring, drilling soil borings, and by conducting laboratory tests on soil samples taken from the borings. This report contains the results of our findings.

PROJECT INFORMATION

The proposed project is located along Rampart Road, Michigan Road, and Mausoleum Road and ends at Enterprise Drive in Shelbyville, Indiana. We understand that the new development proposed along Enterprise Drive will add about 500 new trucks per day along Rampart Road, Michigan Road, and Mausoleum Road. The Client would like to evaluate existing pavement conditions along these roads to mitigate potential problems with the addition of new trucks.

EXISTING PAVEMENT CONDITIONS

Our interpretation of the existing pavement condition is based upon a total of nine (9) pavement core samples collected along the alignments at the approximate locations shown on the Boring Location Maps (Figure No. 2) in Appendix “A”, while the remaining is based on visual observations of the road surface made during the boring program. Refer to Appendix “B” for a pavement core summary and photographs for each pavement core obtained.

Based on visual observations, the pavement sections throughout the alignments consist of asphalt pavement layers. The nine (9) pavement core samples collected varied in total thickness from approximately 5 to 17.5 inches. In boring B-4 and B-5, a layer of concrete was encountered beneath the asphalt surface. The concrete layer was about 6 to 7 inches thick. The crushed stone thicknesses below the pavement were approximately 2 to 8 inches thick. Crushed stone was not observed below the pavement section in boring B-4, B-5, and B-6.

A summary of the pavement thickness at each core location is shown below in Table No.1. Our interpretation of the existing pavement conditions is based upon visual observations made in our soil borings collected along the alignments at the approximate locations shown on the Boring Location Map (Figure No. 2) in Appendix “A”.

Table No. 1: Summary of Existing Pavement Thickness at Core Locations

Boring Location	Pavement Thickness (in)		Crushed Stone Thickness (in)
	Asphalt	Concrete	
B-1	14	-	2
B-2	12	-	2
B-3	13.5	-	3
B-4	6	7	-
B-5	3	6	-
B-6	17.5	-	-
B-7	10.5	-	8
B-8	10.5	-	8
B-9	5	-	4

Based on our experience, Patriot classified the relative conditions of the pavement cores obtained by visual observations of the wearing surface, apparent material layers soundness or quality, and visual observations of the bonding between layers. From our visual evaluations, nine (9) pavement cores appear to be in “fair condition”. Note that the core samples showed minor problems such as voids within the surface and intermediate layers.

Additionally, the pavement surface along the roadway alignment was observed to be in fair condition. Minor edge cracking was noted as well as minor transverse and longitudinal cracking. Longitudinal and Transverse cracking is generally caused by issues with the pavement such as temperature changes, aging, and/or bonding during construction. The lack of edge support, such as a paved or stone shoulder was most likely the cause of the edge cracking observed.

SUBSURFACE CONDITIONS

Our interpretation of the subsurface conditions is based upon nine (9) soil borings drilled at the approximate locations shown on the Boring Location Map (Figure No. 2) in Appendix "A". Soil boring B-1 through B-9 were drilled along the existing roadway alignments.

The following discussion is general; for more specific information, please refer to the boring logs presented in Appendix "C". It should be noted that the dashed stratification lines shown on the soil boring logs indicate approximate transitions between soil types. In-situ stratification changes could occur gradually or at different depths. All depths discussed below refer to depths below the existing pavement surface. Our soil boring locations were not surveyed. However, existing ground surface elevations were provided based on the aerial maps.

The pavement is generally underlain by brown to gray, slightly moist to very moist, soft to hard silty and/or sandy clay. The silty and/or sandy clay layers typically extend to boring termination depths of 10 feet below the existing ground surface. The natural moisture content of these materials ranged from 7 to 27 percent (%). Standard Penetration Test N-values (blow counts) in this material varied from 3 to more than 50 blows per foot (bpf).

GROUNDWATER CONDITIONS

The term groundwater pertains to any water that percolates through the soil found on site. This includes any overland flow that permeates through a given depth of soil, perched water, and water that occurs below the "water table", a zone that remains saturated and water-bearing year-round.

Groundwater was not observed during drilling, nor upon completion of drilling activities. It should be recognized that fluctuations in the groundwater level should be expected over time due to variations in rainfall and other environmental or physical factors. The true static groundwater level can only be determined through observations made in cased holes over a long period of time, the installation of which was beyond the scope of this investigation.

EXPLORATIONAL PROCEDURES

A total of nine (9) soil borings were drilled, sampled, and tested at the project site between October 5, 2023, and October 6, 2023, at the approximate locations shown on the Boring Location Map (Figure No. 2) in Appendix "A". The depths that the soil borings were advanced to are shown on the Boring Logs in Appendix "A". All depths are given as feet below the existing ground surface.

The borings were advanced using 3¼ inch inside diameter hollow-stem augers. Samples were recovered in the undisturbed material below the bottom of the augers using the standard drive sample technique in accordance with ASTM D 1586-74. A 2 inch outside diameter by 13/8 inch inside diameter split-spoon sampler was driven a total of 18 inches with the number of blows of a 140-pound hammer falling 30 inches recorded for each 6 inches of penetration. The sum of blows for the final 12 inches of penetration is the Standard Penetration Test result commonly referred to as the N-value (or blow-count). Split-spoon samples were recovered at 2.5 feet intervals, beginning at a depth of 1 foot below the existing surface grade, extending to a depth of 10 feet, and at 5 feet intervals thereafter to the termination of the boring.

Water levels were monitored at each borehole location during drilling and upon completion of the boring. The boreholes were backfilled with a mixture of auger cuttings and were patched prior to demobilization.

Upon completion of the boring program, samples retrieved during drilling were returned to Patriot's soil testing laboratory where they were visually examined and classified. A laboratory-generated log of each boring was prepared based upon the driller's field log, laboratory test results, and our visual examination. Test boring logs and a description of the classification system are included in Appendix "A" in this report. Indicated on each log are the primary strata encountered, the depth of each stratum change, the depth of each sample, the Standard Penetration Test results, groundwater conditions, and selected laboratory test data. The laboratory logs were prepared for each boring giving the appropriate sample data and the textural description and classification.

Representative samples recovered in the borings were selected for testing in the laboratory to evaluate their physical properties and engineering characteristics. Laboratory analysis includes natural moisture content determinations (ASTM D 2216), and an estimate of the cohesive soil strength was determined utilizing a hand penetrometer (qp). The results of laboratory tests are summarized in Section 3.2 "General Subsurface Conditions". Soil descriptions on the boring logs are in accordance with the Unified Soil Classification System (USCS).

Respectfully submitted,
Patriot Engineering and Environmental, Inc.

Irfan Syed
Geotechnical Engineer

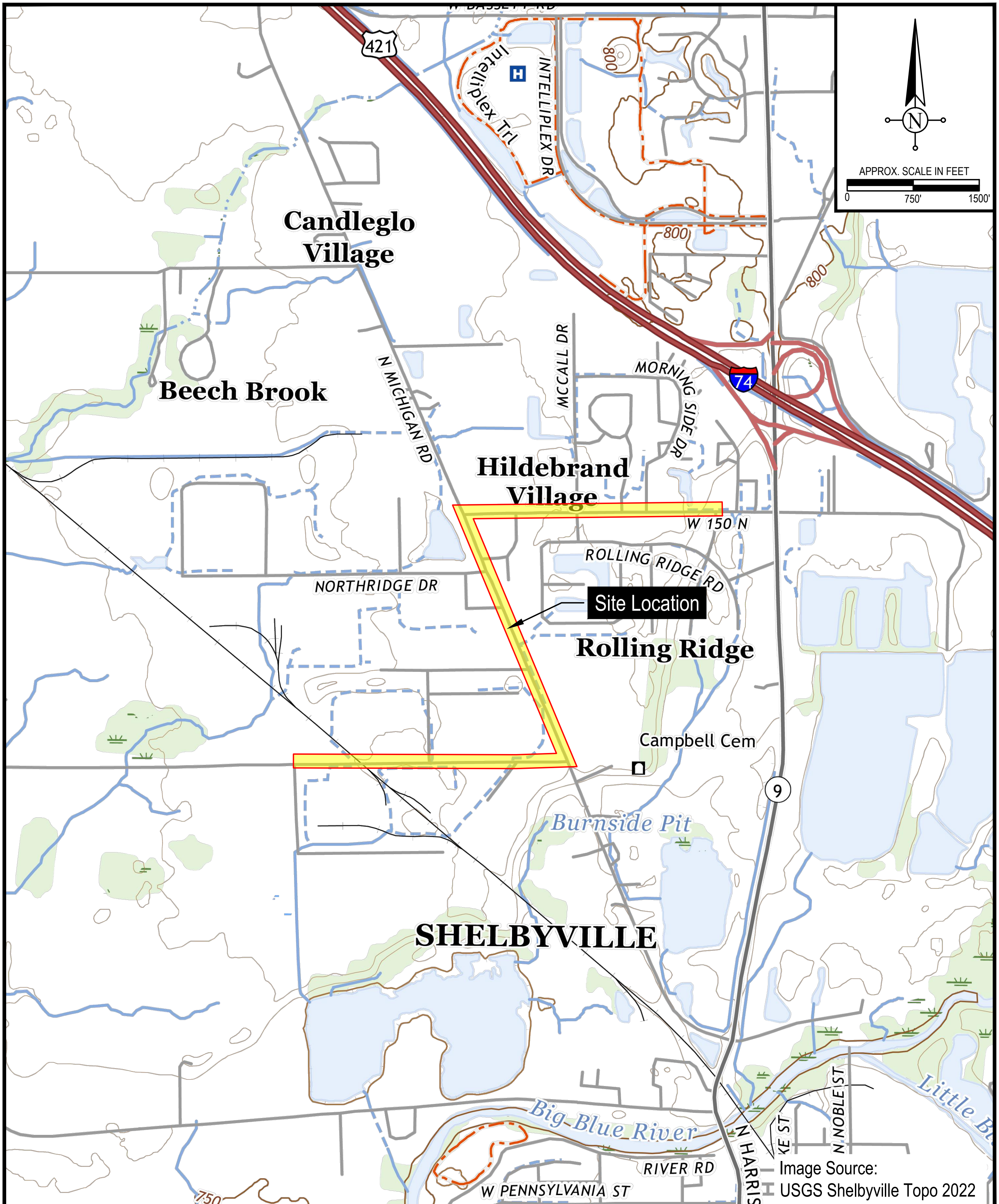
Ben Lauletta, P.E.
Project Engineer

Appendix A: Alignment Vicinity Map (Figure No. 1)
Core/Boring Location Map (Figure No. 2)
Appendix B: Pavement Core Summary & Photographs
Appendix C: Boring Logs
Boring Log Key
Unified Soil Classification System (USCS)
Appendix D: General Qualifications
Standard Clause for Unanticipated Subsurface Conditions

APPENDIX A

ALIGNMENT MAP (FIGURE NO. 1)

CORE/BORING LOCATION MAP (FIGURE NO. 2)



Patriot Engineering & Environmental, Inc.

Project: Pavement Cores - Shelbyville
Rampart Rd., Michigan Rd. & Mausoleum Rd.
Shelbyville, Indiana

	Drawn By: J. DuMond
Project Number:23-1481-01	Approved: I. Syed
Date: November 1, 2023	DWG: 23-1481-01_geo

Figure 1

Site Vicinity Map

Patriot Engineering & Environmental, Inc.

NOTES:

1. Boring locations were staked by PATRIOT. All locations are shown as approximate.
2. All locations were determined in the field with references to existing landmarks.
3. Image Source: Bing Maps
4. Scale as shown.

Project: Pavement Cores - Shelbyville
Rampart Rd., Michigan Rd. & Mausoleum Rd.
Shelbyville, Indiana

	Drawn By: J. DuMond
Project Number: 23-1481-01	Approved: I. Syed
Date: November 1, 2023	DWG: 23-1481-01_geo

Figure 2

Soil Boring Location Map

APPENDIX B

PAVEMENT CORE SUMMARY

PAVEMENT CORE REPORT

Pavement Cores – Shelbyville
West Rampart Road
Shelbyville, Indiana
The City of Shelbyville
Patriot Project No.: 23-1481-01G

Core No.	Date Cored	Core Dia.	Latitude	Longitude
B-1	10/05/2023	6”	39°32'51.12"N	85°46'42.06"W

Depth (in)	Pavement Type	Notes	Recovered Core Length (in)	In-hole Depth (in)	Recovery (%)
0 – 14	Asphalt	Intact	14	14	100
14 – 16	Crushed Stone	-			

PAVEMENT CORE REPORT

Pavement Cores – Shelbyville
West Rampart Road
Shelbyville, Indiana
The City of Shelbyville
Patriot Project No.: 23-1481-01G

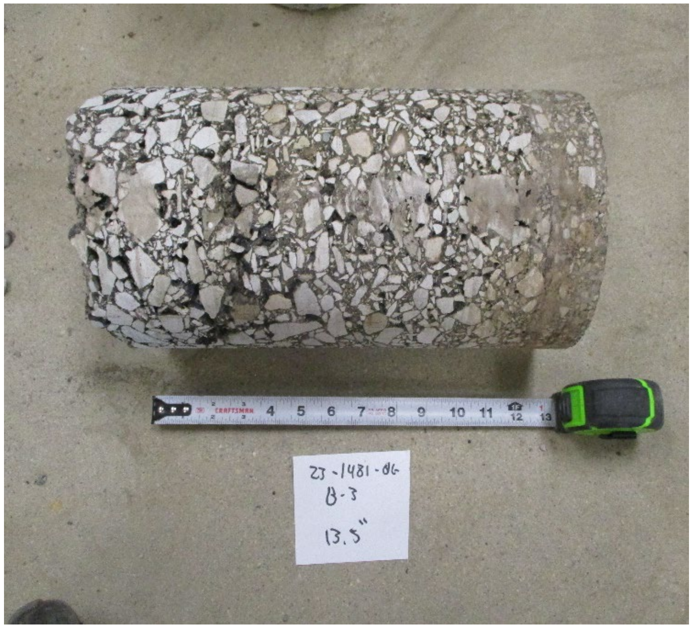
Core No.	Date Cored	Core Dia.	Latitude	Longitude
B-2	10/05/2023	6”	39°32'50.74"N	85°46'53.26"W

Depth (in)	Pavement Type	Notes	Recovered Core Length (in)	In-hole Depth (in)	Recovery (%)
0 – 12	Asphalt	Intact	12	12	100
12 – 14	Crushed Stone	-			

PAVEMENT CORE REPORT

Pavement Cores – Shelbyville
West Rampart Road
Shelbyville, Indiana
The City of Shelbyville
Patriot Project No.: 23-1481-01G

Core No.	Date Cored	Core Dia.	Latitude	Longitude
B-3	10/05/2023	6”	39°32'50.99"N	85°47'4.11"W



Depth (in)	Pavement Type	Notes	Recovered Core Length (in)	In-hole Depth (in)	Recovery (%)
0 – 13.5	Asphalt	Intact	13.5	13.5	100
13.5 – 16.5	Crushed Stone	-			

PAVEMENT CORE REPORT

Pavement Cores – Shelbyville
North Michigan Road
Shelbyville, Indiana
The City of Shelbyville
Patriot Project No.: 23-1481-01G

Core No.	Date Cored	Core Dia.	Latitude	Longitude
B-4	10/06/2023	6”	39°32'49.36"N	85°47'14.52"W

Depth (in)	Pavement Type	Notes	Recovered Core Length (in)	In-hole Depth (in)	Recovery (%)
0 – 6	Asphalt	Intact	13	13	100
6 -13	Concrete	Intact			

PAVEMENT CORE REPORT

Pavement Cores – Shelbyville
North Michigan Road
Shelbyville, Indiana
The City of Shelbyville
Patriot Project No.: 23-1481-01G

Core No.	Date Cored	Core Dia.	Latitude	Longitude
B-5	10/06/2023	6”	39°32'37.49"N	85°47'8.23"W

Depth (in)	Pavement Type	Notes	Recovered Core Length (in)	In-hole Depth (in)	Recovery (%)
0 – 3	Asphalt	Broken	9	9	100
3 -9	Concrete	Intact			

PAVEMENT CORE REPORT

Pavement Cores – Shelbyville
North Michigan Road
Shelbyville, Indiana
The City of Shelbyville
Patriot Project No.: 23-1481-01G

Core No.	Date Cored	Core Dia.	Latitude	Longitude
B-6	10/06/2023	6”	39°32'26.83"N	85°47'2.09"W

Depth (in)	Pavement Type	Notes	Recovered Core Length (in)	In-hole Depth (in)	Recovery (%)
0 – 17.5	Asphalt	Intact	17.5	17.5	100

PAVEMENT CORE REPORT

Pavement Cores – Shelbyville
West Mausoleum Road
Shelbyville, Indiana
The City of Shelbyville
Patriot Project No.: 23-1481-01G

Core No.	Date Cored	Core Dia.	Latitude	Longitude
B-7	10/06/2023	6”	39°32'24.76"N	85°47'4.15"W

Depth (in)	Pavement Type	Notes	Recovered Core Length (in)	In-hole Depth (in)	Recovery (%)
0 – 10.5	Asphalt	Intact	10.5	10.5	100
10.5 – 18.5	Crushed Stone	-			

PAVEMENT CORE REPORT

Pavement Cores – Shelbyville
West Mausoleum Road
Shelbyville, Indiana
The City of Shelbyville
Patriot Project No.: 23-1481-01G

Core No.	Date Cored	Core Dia.	Latitude	Longitude
B-8	10/06/2023	6”	39°32'24.13"N	85°47'18.50"W

Depth (in)	Pavement Type	Notes	Recovered Core Length (in)	In-hole Depth (in)	Recovery (%)
0 – 10.5	Asphalt	Intact	10.5	10.5	100
10.5 – 18.5	Crushed Stone	-			

PAVEMENT CORE REPORT

Pavement Cores – Shelbyville
West Mausoleum Road
Shelbyville, Indiana
The City of Shelbyville
Patriot Project No.: 23-1481-01G

Core No.	Date Cored	Core Dia.	Latitude	Longitude
B-9	10/06/2023	6”	39°32'24.08"N	85°47'36.73"W

Depth (in)	Pavement Type	Notes	Recovered Core Length (in)	In-hole Depth (in)	Recovery (%)
0 – 5	Asphalt	Intact	5	5	100
5 – 9	Crushed Stone	-			

APPENDIX C

BORING LOGS

BORING LOG KEY

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

PATRIOT ENGINEERING and Environmental Inc.
Indianapolis, Terre Haute, Evansville, Fort Wayne, Lafayette, Bloomington Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-1

Pavement Cores - Shelbyville
Rampart Rd, Michigan Rd, & Mausoleum Rd
Shelbyville, Indiana

Client Name	: City of Shelbyville	Driller	: G. McDougle
Project Number	: 23-1481-01G	Sampling	: Splitspoon
Logged By	: J. Rogers	Approx. Elevation	: +/- 781 feet
Start Date	: 10/05/2023	Latitude	: 39°32'51.12"N
Drilling Method	: HSA	Longitude	: 85°46'42.06"W

Water Levels
▼ During Drilling - Dry
▽ After Completion - Dry
◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					ASPHALT (14")						
					CRUSHED STONE (2")						
			CL		Gray, moist, stiff, SILTY CLAY with little sand	1	89	4/5/8	1.5	23	
			CL		Brown, moist, stiff, SILTY CLAY with trace sand	2	67	WOH/2/8	2.6	23	Boring caved to 4 feet upon auger removal. WOH - Weight of Hammer
5			CL		Brown, moist, very stiff, SANDY CLAY with trace gravel and trace shale	3	100	6/6/13		23	
			CL		Brown, slightly moist, medium stiff to stiff, SANDY CLAY with trace gravel	4	67	WOH/3/5	1.3	15	
10					Boring terminated at 10 feet.						Groundwater was not encountered during drilling, nor upon completion.
15											

PATRIOT ENGINEERING and Environmental Inc.
Indianapolis, Terre Haute, Evansville, Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-2

Pavement Cores - Shelbyville
Rampart Rd, Michigan Rd, & Mausoleum Rd
Shelbyville, Indiana

Client Name	: City of Shelbyville	Driller	: G. McDougle
Project Number	: 23-1481-01G	Sampling	: Splitspoon
Logged By	: J. Rogers	Approx. Elevation	: +/- 794 feet
Start Date	: 10/05/2023	Latitude	: 39°32'50.74"N
Drilling Method	: HSA	Longitude	: 85°46'53.26"W

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					ASPHALT (12")						
					CRUSHED STONE (2")						
			CL		Gray, very moist, soft, SILTY CLAY with little sand	1	83	3/2/2		27	
			CL		Brown, slightly moist, very stiff to hard, SANDY CLAY with trace gravel	2	78	10/14/14	>6.0	7	
5											Boring caved to 5.5 feet upon auger removal.
			CL		Gray and brown, moist, hard, SILTY CLAY with trace sand and little gravel	3	44	9/18/29		22	
			CL		Brown, slightly moist, hard, SANDY CLAY with trace gravel	4	100	11/21/25	>6.0	7	
10					Boring terminated at 10 feet.						Groundwater was not encountered during drilling, nor upon completion.
15											

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PATRIOT ENGINEERING and Environmental Inc.
Indianapolis, Terre Haute, Evansville, Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-3

Pavement Cores - Shelbyville
Rampart Rd, Michigan Rd, & Mausoleum Rd
Shelbyville, Indiana

Client Name	: City of Shelbyville	Driller	: G. McDougle
Project Number	: 23-1481-01G	Sampling	: Splitspoon
Logged By	: J. Rogers	Approx. Elevation	: +/- 790 feet
Start Date	: 10/05/2023	Latitude	: 39°32'50.99"N
Drilling Method	: HSA	Longitude	: 85°47'4.11"W

Water Levels
- ▼ During Drilling - Dry
- ▽ After Completion - Dry
- ◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					ASPHALT (13.5")						
					CRUSHED STONE (3")						
			CL		Gray, moist, medium stiff, SILTY CLAY with little sand and trace crushed concrete	1	44	2/3/3		22	
			CL		Gray and brown, slightly moist, medium stiff, SILTY CLAY with trace sand	2	44	3/3/5	4.2	15	
5			CL		Brown, slightly moist, medium stiff, SANDY CLAY and gravel						
			CL		Brown, slightly moist, very stiff to hard, SANDY CLAY with little to trace gravel	3	100	3/10/15	>6.0	12	Boring caved to 6 feet upon auger removal.
						4	100	14/27/50-5"	>6.0	7	
10					Boring terminated at 9.9 feet.						Groundwater was not encountered during drilling, nor upon completion.
15											

PATRIOT ENGINEERING and Environmental Inc.
Indianapolis, Terre Haute, Evansville, Fort Wayne, Lafayette, Bloomington Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-4

Pavement Cores - Shelbyville
Rampart Rd, Michigan Rd, & Mausoleum Rd
Shelbyville, Indiana

Client Name	: City of Shelbyville	Driller	: G. McDougle
Project Number	: 23-1481-01G	Sampling	: Splitspoon
Logged By	: J. Rogers	Approx. Elevation	: +/- 787 feet
Start Date	: 10/06/2023	Latitude	: 39°32'49.36"
Drilling Method	: HSA	Longitude	: 85°47'14.52"W

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					ASPHALT (6")						
					CONCRETE (7")						
			CL		Gray and brown, very moist to moist, medium stiff, SILTY CLAY with trace to little sand	1	94	2/3/3	2.3	25	
						2	89	2/4/3	1.7	19	
5											Boring caved to 5 feet upon auger removal.
			CL		Brown, slightly moist, very stiff, SILTY CLAY with trace sand	3	89	4/7/9	1.6	15	
			CL		Brown, slightly moist, very stiff, SANDY CLAY with trace gravel						
			CL		Brown and gray, slightly moist, hard, SANDY CLAY with little gravel	4	78	11/14/19		11	
10					Boring terminated at 10 feet.						Groundwater was not encountered during drilling, nor upon completion.
15											

PATRIOT ENGINEERING
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Indianapolis, Terre Haute, Evansville,
Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-5

Pavement Cores - Shelbyville
Rampart Rd, Michigan Rd, & Mausoleum Rd
Shelbyville, Indiana

Client Name	: City of Shelbyville	Driller	: G. McDougle
Project Number	: 23-1481-01G	Sampling	: Splitspoon
Logged By	: J. Rogers	Approx. Elevation	: +/- 787 feet
Start Date	: 10/06/2023	Latitude	: 85°47'14.52"W
Drilling Method	: HSA	Longitude	: 85°47'8.23"W

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					ASPHALT (3")						
					CONCRETE (6")						
			CL		Gray and brown, moist, soft, SILTY CLAY with little sand	1	44	1/1/2		16	
						2	56	WOH/2/2	2.1	22	WOH - Weight of Hammer
5											
			CL		Brown, slightly moist, stiff, SANDY CLAY with trace gravel	3	67	WOH/2/9	3.3	9	Boring caved to 6.5 feet upon auger removal.
			CL		Brown and gray, slightly moist, very stiff, SANDY CLAY with trace gravel	4	100	5/10/20	>6.0	8	
10					Boring terminated at 10 feet.						Groundwater was not encountered during drilling, nor upon completion.
15											

PATRIOT ENGINEERING and Environmental Inc.
Indianapolis, Terre Haute, Evansville, Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-6

Pavement Cores - Shelbyville
Rampart Rd, Michigan Rd, & Mausoleum Rd
Shelbyville, Indiana

Client Name	: City of Shelbyville	Driller	: G. McDougle
Project Number	: 23-1481-01G	Sampling	: Splitspoon
Logged By	: J. Rogers	Approx. Elevation	: +/- 785 feet
Start Date	: 10/06/2023	Latitude	: 39°32'26.83"N
Drilling Method	: HSA	Longitude	: 85°47'2.09"W

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					ASPHALT (17.5")						
			CL		Brown, slightly moist to moist, soft, SANDY CLAY with trace gravel	1	56	1/1/2		15	
			CL		Brown, moist, medium stiff to stiff, SANDY CLAY with trace gravel	2	78	2/2/4	2.0	18	
5											Boring caved to 4.9 feet upon auger removal.
			CL		Brown, slightly moist, stiff, SANDY CLAY with trace gravel and trace brick	3	100	5/5/10	1.8	9	
			CL		Brown, slightly moist, hard, SANDY CLAY with trace gravel	4	89	15/23/30	>6.0	7	
10					Boring terminated at 10 feet.						Groundwater was not encountered during drilling, nor upon completion.
15											

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PATRIOT ENGINEERING and Environmental Inc.
Indianapolis, Terre Haute, Evansville, Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-7

Pavement Cores - Shelbyville
Rampart Rd, Michigan Rd, & Mausoleum Rd
Shelbyville, Indiana

Client Name	: City of Shelbyville	Driller	: G. McDougle
Project Number	: 23-1481-01G	Sampling	: Splitspoon
Logged By	: J. Rogers	Approx. Elevation	: +/- 785 feet
Start Date	: 10/06/2023	Latitude	: 39°32'24.76"N
Drilling Method	: HSA	Longitude	: 85°47'4.15"W

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					ASPHALT (10.5")						
					CRUSHED STONE (8")						
			CL		Brown and gray, slightly moist, medium stiff to stiff, SANDY CLAY with little gravel	1	89	2/3/3	2.8	10	
5			CL		Brown, slightly moist, medium stiff to stiff, SANDY CLAY with trace gravel	2	67	1/3/3	2.2	10	
			CL		Brown, slightly moist, hard, SANDY CLAY with trace gravel	3	100	6/15/23	>6.0	8	Boring caved to 5.8 feet upon auger removal.
			CL		Brown and gray, slightly moist, very stiff to hard, SANDY CLAY with trace gravel	4	89	9/18/9	>6.0	7	
10					Boring terminated at 10 feet.						Groundwater was not encountered during drilling, nor upon completion.
15											

PATRIOT ENGINEERING and Environmental Inc.
Indianapolis, Terre Haute, Evansville, Fort Wayne, Lafayette, Bloomington
Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-8

Pavement Cores - Shelbyville
Rampart Rd, Michigan Rd, & Mausoleum Rd
Shelbyville, Indiana

Client Name	: City of Shelbyville	Driller	: G. McDougle
Project Number	: 23-1481-01G	Sampling	: Splitspoon
Logged By	: J. Rogers	Approx. Elevation	: +/- 783 feet
Start Date	: 10/06/2023	Latitude	: 85°47'4.15"W
Drilling Method	: HSA	Longitude	: 85°47'18.50"W

Water Levels
- ▼ During Drilling - Dry
- ▽ After Completion - Dry
- ◆ After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					ASPHALT (10.5")						
					CRUSHED STONE (8")						
			CL		Brown and gray, moist, medium stiff to stiff, SILTY CLAY with trace sand	1	100	2/2/3	2.2	23	
						2	89	2/3/3	2.0	19	
5											
			CL		Gray and brown, moist, medium stiff to stiff, SANDY CLAY	3	100	4/4/3	3.0	21	Boring caved to 6.2 feet upon auger removal.
			CL		Gray, moist, stiff, SANDY CLAY	4	78	2/5/9		21	
10					Boring terminated at 10 feet.						Groundwater was not encountered during drilling, nor upon completion.
15											

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PATRIOT ENGINEERING and Environmental Inc.
Indianapolis, Terre Haute, Evansville, Fort Wayne, Lafayette, Bloomington Louisville, KY Dayton, Cincinnati, OH

LOG OF BORING B-9

Pavement Cores - Shelbyville
Rampart Rd, Michigan Rd, & Mausoleum Rd
Shelbyville, Indiana

Client Name	: City of Shelbyville	Driller	: G. McDougle
Project Number	: 23-1481-01G	Sampling	: Splitspoon
Logged By	: J. Rogers	Approx. Elevation	: +/- 778 feet
Start Date	: 10/06/2023	Latitude	: 39°32'24.08"N
Drilling Method	: HSA	Longitude	: 85°47'36.73"W

Water Levels
- During Drilling - Dry
- After Completion - Dry
- After 24 Hours - N/A

Depth (Feet)	Elevation (Feet)	Water Level	USCS	GRAPHIC	DESCRIPTION	Samples	Rec %	SPT Results	qp tsf	w %	REMARKS
0					ASPHALT (5")						
					CRUSHED STONE (4")						
			CL		Brown and gray, very moist, soft, SILTY CLAY with little sand	1	56	1/1/2		26	
			CL		Brown and gray, slightly moist, medium stiff to stiff, SANDY CLAY with some gravel	2	78	2/3/4	2.5	11	
5											
			CL		Brown, slightly moist, stiff to very stiff, SANDY CLAY with trace gravel and interbedded sand seams	3	100	2/4/9	3.8	9	Boring caved to 7.2 feet upon auger removal.
			CL		Brown, slightly moist, hard, SANDY CLAY with trace gravel	4	100	6/15/23	>6.0	8	
10					Boring terminated at 10 feet.						Groundwater was not encountered during drilling, nor upon completion.
15											

PATRIOT ENGINEERING and Environmental, Inc.
Engineering Value for Project Success
Consulting Environmental, Geotechnical and Materials Engineers

BORING LOG KEY

UNIFIED SOIL CLASSIFICATION SYSTEM
FIELD CLASSIFICATION SYSTEM
FOR SOIL EXPLORATION

NON COHESIVE SOILS
(Silt, Sand, Gravel and Combinations)

Density

Very Loose	-4 blows/ft. or less
Loose	-5 to 10 blows/ft.
Medium Dense	-11 to 30 blows/ft.
Dense	-31 to 50 blows/ft.
Very Dense	-51 blows/ft. or more

Grain Size Terminology

Soil Fraction		Particle Size	US Standard Sieve Size
Boulders		Larger than 12"	Larger than 12"
Cobbles		3" to12"	3" to 12"
Gravel:	Coarse	¾" to 3"	¾" to 3"
	Small	4.76mm to ¾"	#4 to ¾"
Sand:	Coarse	2.00mm to 4.76mm	#10 to #4
	Medium	0.42mm to 2.00mm	#40 to #10
	Fine	0.074mm to 0.42mm	#200 to #40
Silt		0.005mm to 0.074 mm	Smaller than #200
Clay		Smaller than 0.005mm	Smaller than #200

RELATIVE PROPORTIONS FOR SOILS

Descriptive Term	Percent
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

COHESIVE SOILS
(Clay, Silt and Combinations)

Consistency	Unconfined Compressive Strength (tons/sq. ft.)	Field Identification (Approx.) SPT Blows/ft.
Very Soft	Less than 0.25	0 - 2
Soft	0.25 – < 0.5	3 - 4
Medium Stiff	0.5 - < 1.0	5 - 8
Stiff	1.0 - < 2.0	9 -15
Very Stiff	2.0 - < 4.0	16 - 30
Hard	Over 4.0	> 30

Classification on logs are made by visual inspection.

Standard Penetration Test - Driving a 2.0" O.D., $1^{3/8}$" I.D., sampler a distance of 1.0 foot into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. It is customary for **Patriot** to drive the spoon 6.0 inches to seat into undisturbed soil, then perform the test. The number of hammer blows for seating the spoon and making the tests are recorded for each 6.0 inches of penetration on the drill log (Example - 6/8/9). The standard penetration test results can be obtained by adding the last two figures (i.e. 8 + 9 = 17 blows/ft.).

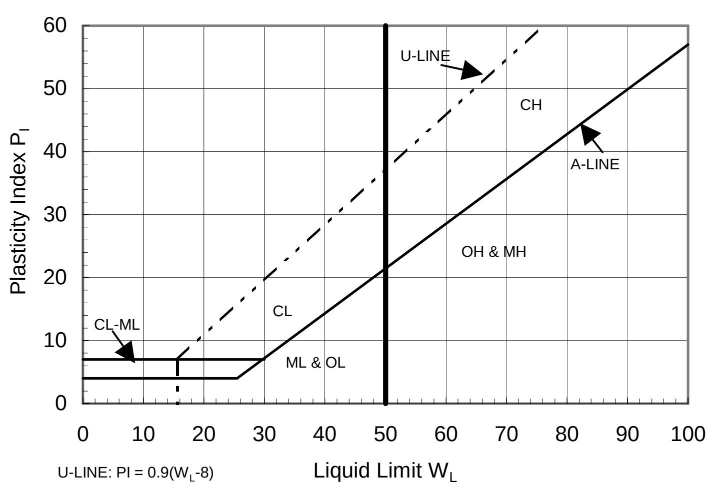
Strata Changes - In the column "Soil Descriptions" on the drill log the horizontal lines represent strata changes. A solid line (———) represents an actually observed change, a dashed line (- - - - - -) represents an estimated change.

Groundwater observations were made at the times indicated. Porosity of soil strata, weather conditions, site topography, etc., may cause changes in the water levels indicated on the logs.

Groundwater symbols: ▼-observed groundwater elevation, encountered during drilling; ∇-observed groundwater elevation upon completion of boring.

Unified Soil Classification System

Major Divisions			Group Symbol	Typical Names	Classification Criteria for Coarse-Grained Soils	
Coarse-grained soils (more than half of material is larger than No. 200)	Gravels (more than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_U \geq 4$; $1 \leq C_C \leq 3$; $C_U = \frac{D_{60}}{D_{10}}$	$C_C = \frac{D^2_{30}}{D_{10}\,D_{60}}$
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW ($C_U < 4$ or $1 > C_C > 3$)	
		Gravels with fines (appreciable amount of fines)	GM (d / u)	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below A line or $P_I < 4$	Above A line with $4 < P_I < 7$ are borderline cases requiring use of dual symbols
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above A line or $P_I > 7$	
	Sands (more than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_U \geq 6$; $1 \leq C_C \leq 3$; $C_U = \frac{D_{60}}{D_{10}}$	$C_C = \frac{(D_{30})^2}{D_{10}\,D_{60}}$
			SP	Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW ($C_U < 6$ or $1 > C_c > 3$)	
		Sands with fines (appreciable amount of fines)	SM (d / u)	Silty sands, sand-silt mixtures	Atterberg limits below A line or $P_I < 4$	Limits plotting in hatched zone with $4 \leq P_I \leq 7$ are borderline cases requiring use of dual symbols
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above A line with $P_I > 7$	
Fine-grained soils (more than half of material is smaller than No. 200)	Silt and clays (liquid limit <50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity	1. Determine percentages of sand and gravel from grain size curve. 2. Depending on percentages of fines (fraction smaller than 200 sieve size), coarse-grained soils are classified as follows: Less than 5% - GW, GP, SW, SP; More than 12% - GM, GC, SM, SC; 5-12% - Borderline cases requiring dual symbols	
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays		
			OL	Organic silts and organic silty clays of low plasticity		
	Silts and clays (liquid limit >50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts		
			CH	Inorganic clays or high plasticity, fat clays		
			OH	Organic clays of medium to high plasticity, organic silts		
	Highly organic soils		PT	Peat and other highly organic soils		



U-LINE: PI = 0.9(W_L-8)
A-LINE: PI = 0.73(W_L-20)

Plasticity Chart

<u>APPENDIX D</u>

GENERAL QUALIFICATIONS

STANDARD CLAUSE FOR UNANTICIPATED SUBSURFACE CONDITIONS

GENERAL QUALIFICATIONS

of Patriot Engineering's Geotechnical Engineering Investigation

This report has been prepared at the request of our client for his use on this project. Our professional services have been performed, findings obtained, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report or on the test borings logs regarding vegetation types, odors or staining of soils, or other unusual conditions observed are strictly for the information of our client and the owner.

This report may not contain sufficient information for purposes of other parties or other uses. This company is not responsible for the independent conclusions, opinions or recommendations made by others based on the field and laboratory data presented in this report. Should there be any significant differences in structural arrangement, loading or location of the structure, our analysis should be reviewed.

The recommendations provided herein were developed from the information obtained in the test borings, which depict subsurface conditions only at specific locations. The analysis, conclusions, and recommendations contained in our report are based on site conditions as they existed at the time of our exploration. Subsurface conditions at other locations may differ from those occurring at the specific drill sites. The nature and extent of variations between borings may not become evident until the time of construction. If, after performing on-site observations during construction and noting the characteristics of any variation, substantially different subsurface conditions from those encountered during our explorations are observed or appear to be present beneath excavations, we must be advised promptly so that we can review these conditions and reconsider our recommendations where necessary.

If there is a substantial lapse of time between the submission of our report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, we urge that our report be reviewed to determine the applicability of the conclusions and recommendations considering the changed conditions and time lapse.

We urge that Patriot be retained to review those portions of the plans and specifications that pertain to earthwork and foundations to determine whether they are consistent with our recommendations. In addition, we are available to observe construction, particularly the compaction of structural backfill and preparation of the foundations, and such other field observations as may be necessary.

In order to fairly consider changed or unexpected conditions that might arise during construction, we recommend the following verbiage (Standard Clause for Unanticipated Subsurface Conditions) be included in the project contract.

STANDARD CLAUSE FOR UNANTICIPATED SUBSURFACE CONDITIONS

"The owner has had a subsurface exploration performed by a soils consultant, the results of which are contained in the consultant's report. The consultant's report presents his conclusions on the subsurface conditions based on his interpretation of the data obtained in the exploration. The contractor acknowledges that he has reviewed the consultant's report and any addenda thereto, and that his bid for earthwork operations is based on the subsurface conditions as described in that report. It is recognized that a subsurface exploration may not disclose all conditions as they actually exist and further, conditions may change, particularly groundwater conditions, between the time of a subsurface exploration and the time of earthwork operations. In recognition of these facts, this clause is entered in the contract to provide a means of equitable additional compensation for the contractor if adverse unanticipated conditions are encountered and to provide a means of rebate to the owner if the conditions are more favorable than anticipated.

At any time during construction operations that the contractor encounters conditions that are different than those anticipated by the soils consultant's report, he shall immediately (within 24 hours) bring this fact to the owner's attention. If the owner's representative on the construction site observes subsurface conditions which are different than those anticipated by the consultant's report, he shall immediately (within 24 hours) bring this fact to the contractor's attention. Once a fact of unanticipated conditions has been brought to the attention of either the owner or the contractor, and the consultant has concurred, immediate negotiations will be undertaken between the owner and the contractor to arrive at a change in contract price for additional work or reduction in work because of the unanticipated conditions. The contract agrees that the following unit prices would apply for additional or reduced work under the contract. For changed conditions for which unit prices are not provided, the additional work shall be paid for on a time and materials basis."

Another example of a changed conditions clause can be found in paper No. 4035 by Robert F. Borg, published in ASCE Construction Division Journal, No. CO2, September 1964, page 37.